LA-UR-07-0212

Approved for public release; distribution is unlimited.

Title: TECHNICAL AREA 55 PART B PERMIT APPLICATION, REVISION 0.0, JUNE 1996

Author(s): Jack E. Ellvinger, ENV-RCRA

Intended for: New Mexico Environment Department- Hazardous Waste Bureau

Los Alamos
NATIONAL LABORATORY
EST. 1943

Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by the Los Alamos National Security, LLC for the National Nuclear Security Administration of the U.S. Department of Energy under contract DE-AC52-06NA25396. By acceptance of this article, the publisher recognizes that the U.S. Government retains a nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or to allow others to do so, for U.S. Government purposes. Los Alamos National Laboratory requests that the publisher identify this article as work performed under the auspices of the U.S. Department of Energy. Los Alamos National Laboratory strongly supports academic freedom and a researcher's right to publish; as an institution, however, the Laboratory does not endorse the viewpoint of a publication or guarantee its technical correctness.

Form 836 (7/06)

4413

Document:	LANL TA-55 Part B
Revision No.:	0.0
Date:	June 28, 1996

Technical Area 55
Part B Permit Application
Volume I

Building 4, Container Storage Areas 1–11
Storage Tank Systems
Cementation Treatment Unit

Container Storage Pad

Building 185, Container Storage Area

Los Alamos National Laboratory
Hazardous and Solid Waste Group (ESH-19)
Los Alamos, New Mexico 87545

June 1996

TABLE OF CONTENTS

LIST OF TABLES xi
LIST OF FIGURES xiii
LIST OF ATTACHMENTS xvi
LIST OF MAPS xvii
LIST OF ABBREVIATIONS/ACRONYMS xviii

1.0 INTRODUCTION 1-1

2.0 FACILITY DESCRIPTION 2-1
2.1 GENERAL DESCRIPTION [20 NMAC 4.1, Subpart IX, 270.14(b)(1) and 270.14(b)(19)(xii)] 2-1
2.1.1 TA-55 Waste Management Units 2-4
2.1.2 Topographic Maps [20 NMAC 4.1, Subpart IX, 270.14(b)(19)] 2-5
2.1.3 Wells and Surface Waters [20 NMAC 4.1, Subpart IX, 270.14(b)(19)(iii) and (ix)] 2-7
2.1.4 Wind Rose [20 NMAC 4.1, Subpart IX, 270.14(b)(19)(v)] 2-8
2.1.5 Land Use [20 NMAC 4.1, Subpart IX, 270.14(b)(19)(iv)] 2-9
2.2 LOCATION INFORMATION 2-9
2.2.1 Seismic Standard [20 NMAC 4.1, Subpart IX, 270.14(b)(11)(i and ii) and 20 NMAC 4.1, Subpart V, 264.18(a)] 2-9
2.2.2 Floodplain Standard [20 NMAC 4.1, Subpart IX, 270.14(b)(11)(iii) and 270.14(b)(19)(ii)] 2-9
2.2.3 Soils 2-10
2.2.4 Geology 2-11
2.2.4.1 Regional Geology 2-11
2.2.4.2 Site-Specific Geology 2-12
2.2.4.2.1 Stratigraphy 2-13
2.2.4.2.2 Structural Geology 2-16
2.2.5 Ground Water 2-17
2.3 TRAFFIC PATTERNS [20 NMAC 4.1, Subpart IX, 270.14(b)(10)] 2-19
2.3.1 General 2-19
2.3.2 Waste Collection Areas 2-20
2.3.3 Routes of Travel 2-20
2.3.4 Traffic Volumes 2-20
2.3.5 Traffic Control Signals 2-21
2.3.6 Road Load-Bearing Capacity 2-21

3.0 WASTE ANALYSIS PLAN FOR HAZARDOUS AND MIXED WASTE STORAGE AND TREATMENT AT TECHNICAL AREA 55 3-1
3.1 GENERAL WASTE ANALYSIS REQUIREMENTS 3-2
3.1.1 Facility Description 3-2
3.1.2 Description of Hazardous and Mixed Waste Management Units 3-3
3.1.3 Sample Handling, Preservation, and Storage 3-3
3.1.4 Analytical Laboratory Selection and Analytical Methods [20 NMAC 4.1, Subpart V, 264.13(b)(2)] 3-4
3.1.5 Special Procedural Requirements [20 NMAC 4.1, Subpart V, 264.13(b)(6)] 3-5

3.1.5.1 Procedures for Ignitable and Reactive Wastes 3-5
3.1.5.2 Procedures for Incompatible Wastes 3-5
3.1.5.3 Procedures to Ensure Compliance with LDR Requirements [20 NMAC 4.1, Subpart VIII, 268.7(a), 268.7(b)(1), (3), (4), and (5) and 268.9(b), (c), and (d)] 3-6

3.2 WASTE ANALYSIS REQUIREMENTS FOR THE STORAGE OF TRU MIXED WASTE 3-6
3.2.1 Facility Waste-Generating Processes, Activities, and Identification of TRU Mixed Wastes Stored 3-7
3.2.1.1 LANL TRUCON Codes 3-8
3.2.2 Waste Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)] 3-10
3.2.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)] 3-10
3.2.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)] 3-10
3.2.3 Characterization of TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)] 3-11
3.2.3.1 Waste Profiling System [20 NMAC 4.1, Subpart V, 264.13(a)(3), 264.13(b)(4) and (5), and Subpart IX, 270.14(b)(2)] 3-13
3.2.3.2 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2), 264.13(b)(5), and Subpart IX, 270.14(b)(2)] . 3-14
3.2.3.3 Sampling and Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2) and (3), and Subpart IX, 270.14(b)(2)] 3-17
3.2.3.3.1 Visual Examination [20 NMAC 4.1, Subpart V, 264.13(b)(2), and Subpart IX, 270.14(b)(2)] 3-17
3.2.3.3.2 TRU Solid Mixed Waste Sampling and Analysis [20 NMAC 4.1, Subpart V, 264.13(b)(3)] 3-18
3.2.4 Verification Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3)] 3-18
3.3 WASTE ANALYSIS REQUIREMENTS FOR THE TREATMENT OF TRU MIXED WASTE 3-19
3.3.1 Facility Waste-Generating Processes, Activities, and Identification of TRU Mixed Wastes Managed 3-19
3.3.1.1 TRUCON Codes 3-19
3.3.2 Waste Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)] 3-19
3.3.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)] 3-19
3.3.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)] 3-20
3.3.3 Characterization of Treated TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)] 3-20
3.3.3.1 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2), 264.13(b)(5), and Subpart IX, 270.14(b)(2)] . 3-21

3.3.3.2 Sampling and Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2) and (3), and Subpart IX, 270.14(b)(2)] 3-21
3.3.3.2.1 TRU Solid Mixed Waste Sampling and Analysis [20 NMAC 4.1, Subpart V, 264.13(b)(3)] 3-22
3.3.3.2.2 TRU Liquid Mixed Waste Sampling and Analysis 3-22
3.3.4 Verification Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3)] 3-22
3.4 WASTE ANALYSIS REQUIREMENTS FOR THE STORAGE OF LOW-LEVEL MIXED WASTE 3-23
3.4.1 Facility Waste-Generating Processes, Activities, and Identification of Low-Level Mixed Wastes Managed 3-23
3.4.1.1 Homogeneous Low-Level Solid Mixed Wastes 3-23
3.4.1.2 Heterogeneous Low-Level Solid Mixed Wastes 3-24
3.4.1.3 Low-Level Liquid Mixed Wastes 3-25
3.4.2 Waste Analysis Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)] 3-26
3.4.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)] 3-26
3.4.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)] 3-27
3.4.3 Characterization of Low-Level Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)] 3-27
3.4.3.1 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2), 264.13(b)(5), and Subpart IX, 270.14(b)(2)] . 3-28
3.4.3.2 Sampling and Analysis for Low-Level Solid Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3), 264.13(b)(2), (3), and (4), and Subpart IX, 270.14(b)(2)] 3-28
3.4.3.3 Sampling and Analysis for Low-Level Liquid Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2), (3), and (4), and Subpart IX, 270.14(b)(2)] 3-30
3.4.4 Verification Analysis for Low-Level Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3)] 3-30
3.5 WASTE ANALYSIS REQUIREMENTS FOR THE STORAGE OF HAZARDOUS WASTE 3-31
3.5.1 Facility Waste-Generating Processes, Activities, and Identification of Hazardous Wastes Managed 3-31
3.5.1.1 Hazardous Wastes Managed 3-32
3.5.2 Waste Analysis Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)] 3-34
3.5.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)] 3-34
3.5.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)] 3-34
3.5.3 Characterization of Hazardous Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)] 3-35
3.5.3.1 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2) and (3), 264.13(b)(4) and (5), and Subpart IX, 270.14(b)(2)] 3-36

3.5.3.2 Sampling and Analysis for Hazardous Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2), (3), and (4), and Subpart IX, 270.14(b)(2)] 3-36
3.5.4 Verification Analysis for Hazardous Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3) and (b)(4)] 3-37

4.0 DESIGN, OPERATIONS, AND PROCESS INFORMATION 4-1
4.1 CONTAINER STORAGE AREAS [20 NMAC 4.1, Subpart IX, 270.15; 20 NMAC 4.1, Subpart V, Part 264, Subpart I] 4-1
4.1.1 Container Storage Areas 1, 2, and 3 4-2
4.1.2 Container Storage Area 4 4-3
4.1.3 Container Storage Area 5 4-3
4.1.4 Container Storage Area 6 4-4
4.1.5 Container Storage Area 7 4-4
4.1.6 Container Storage Areas 8 and 9 4-5
4.1.7 Container Storage Area 10 4-6
4.1.8 Container Storage Area 11 4-6
4.1.9 Container Storage Pad 4-7
4.1.10 Container Storage Area/TA-55-185 4-7
4.2 WASTE MANAGEMENT PRACTICES APPLICABLE TO THE CONTAINER STORAGE AREAS [20 NMAC 4.1, Subpart V, Part 264, Subpart I] 4-8
4.2.1 Container Types 4-8
4.2.2 Storage Configuration 4-10
4.2.3 Handling and Inspection [20 NMAC 4.1, Subpart V, 264.171, 264.173, and 264.174] 4-11
4.2.4 Ignitable, Reactive, and Incompatible Wastes [20 NMAC 4.1, Subpart V, 264.17(a), 264.176, and 264.177] 4-11
4.2.5 Removal of Liquids [20 NMAC 4.1, Subpart IX, 270.15(a)(5)] 4-12
4.3 MIXED WASTE STORAGE TANK SYSTEMS [20 NMAC 4.1, Subpart IX, 270.16; 20 NMAC 4.1, Subpart V, 264.191, 264.192, and 264.193] 4-13
4.3.1 Evaporator Glovebox Storage Tank System [20 NMAC 4.1, Subpart V, 264.191(b)(4)] 4-13
4.3.1.1 Design, Construction, and Materials [20 NMAC 4.1, Subpart IX, 270.16(b), (c), (d), and (i); 20 NMAC 4.1, Subpart V, 264.191(b)(1) and (3)] 4-14
4.3.1.2 Installation, Testing, and Certification [20 NMAC 4.1, Subpart IX, 270.16(a); 20 NMAC 4.1, Subpart V, 264.191(b) and 264.193(i)] 4-16
4.3.2 Cementation Unit Storage Tank System [20 NMAC 4.1, Subpart IX, 270.16(e); 20 NMAC 4.1, Subpart V, 264.192(a)(3), (4), and (5)(i), (ii), and (iii), and 264.192(c), (e), and (f)] 4-16
4.3.2.1 Design, Construction, and Materials [20 NMAC 4.1, Subpart IX, 270.16(b), (c), (d), and (i); 20 NMAC 4.1, Subpart V, 264.192(a)(1)] 4-17
4.3.2.2 Installation, Testing, and Certification [20 NMAC 4.1, Subpart IX, 270.16(a) and (f); 20 NMAC 4.1, Subpart V, 264.192(a), (b), (d), and (g) and 264.193(i)] 4-19
4.3.3 Secondary Containment for the Storage Tank Systems [20 NMAC 4.1, Subpart IX, 270.16(g); 20 NMAC 4.1, Subpart V, 264.193] 4-20

4.4 WASTE MANAGEMENT PRACTICES APPLICABLE TO STORAGE TANK SYSTEMS [20 NMAC 4.1, Subpart V, Part 264, Subpart J] 4-21
4.4.1 Hazardous Characteristics of the Waste to be Stored [20 NMAC 4.1, Subpart IX, 270.16(j); 20 NMAC 4.1, Subpart V, 264.17(a), 264.191(b)(2), 264.192(a)(2), 264.198, and 264.199] 4-21
4.5 MIXED WASTE CEMENTATION UNIT [20 NMAC 4.1, Subpart IX, 270.23; 20 NMAC 4.1, Subpart V, Part 264, Subpart X] 4-22
4.5.1 Design, Materials of Construction, and Operation [20 NMAC 4.1, Subpart IX, 270.23(a); 20 NMAC 4.1, Subpart X, 264.101] 4-22
4.5.2 Secondary Containment 4-24
4.6 WASTE MANAGEMENT PRACTICES APPLICABLE TO THE CEMENTATION UNIT 4-24
4.6.1 Hazardous Characteristics of the Waste to be Treated [20 NMAC 4.1, Subpart V, 264.17(a)] 4-24
4.6.2 Treatment Effectiveness [20 NMAC 4.1, Subpart IX, 270.23(d)] 4-25
4.6.3 Environmental Performance Standards [20 NMAC 4.1, Subpart V, Part 264, Subpart X] 4-25
4.6.3.1 Protection of the Ground Water [20 NMAC 4.1, Subpart V, 264.601(a)] 4-26
4.6.3.2 Protection of Surface Water [20 NMAC 4.1, Subpart V, 264.601(b)] 4-27
4.6.3.3 Protection of Soil Surface [20 NMAC 4.1, Subpart V, 264.601(b)] 4-28
4.6.3.4 Protection of the Atmosphere [20 NMAC 4.1, Subpart V, 264.601(c)] 4-28
4.7 RECORDKEEPING REQUIREMENTS [20 NMAC 4.1, Subpart V, Part 264, Subpart E] 4-29
4.7.1 Operating Record [20 NMAC 4.1, Subpart V, 264.73 and 264.74] . . 4-29
4.7.2 Biennial Report [20 NMAC 4.1, Subpart V, 264.75] 4-30
4.7.3 Additional Reports [20 NMAC 4.1, Subpart V, 264.77] 4-31

5.0 PROCEDURES TO PREVENT HAZARDS 5-1
5.1 SECURITY [20 NMAC 4.1, Subpart IX, 270.14 (b)(4) and 270.14(b)(19)(viii); 20 NMAC 4.1, Subpart V, 264.14] 5-1
5.2 PREPAREDNESS AND PREVENTION REQUIREMENTS [20 NMAC 4.1, Subpart V, Part 264, Subpart C] 5-2
5.2.1 Required Equipment [20 NMAC 4.1, Subpart V, 264.32] 5-3
5.2.2 Testing and Maintenance of Equipment [20 NMAC 4.1, Subpart V, 264.33] 5-6
5.2.3 Access to Communications or Alarm System [20 NMAC 4.1, Subpart V, 264.34] 5-7
5.2.4 Aisle Space Requirements [20 NMAC 4.1, Subpart V, 264.35] 5-7
5.2.5 Support Agreements with Outside Agencies [20 NMAC 4.1, Subpart V, 264.37(a)] 5-7
5.3 PREVENTIVE PROCEDURES, STRUCTURES, AND EQUIPMENT [20 NMAC 4.1, Subpart IX, 270.14(b)(8)] 5-8
5.4 PREVENTION OF ACCIDENTAL IGNITION OR REACTION OF IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTE [20 NMAC 4.1, Subpart IX,

270.14(b)(9), 270.15(c) and (d), 270.16(j), 270.23(a)(2); 20 NMAC 4.1, Subpart V, 264.17, 264.176, 264.177, 264.198, 264.199, and 264.601] 5-11
5.5 AIR EMISSIONS STANDARDS FOR EQUIPMENT LEAKS [20 NMAC 4.1, Subpart V, Part 264, Subpart BB] 5-12
5.6 ORGANIC AIR EMISSION STANDARDS [20 NMAC 4.1, Subpart V, Part 264, Subpart CC] 5-13

6.0 INSPECTION PLAN 6-1
6.1 GENERAL INSPECTION REQUIREMENTS AND SCHEDULES [20 NMAC 4.1, Subpart IX, 270.14(b)(5); 20 NMAC 4.1, Subpart V, 264.15(a),(b), and (c)] .. 6-1
6.1.1 Inspection Records [20 NMAC 4.1, Subpart V, 264.15(d)] 6-2
6.1.1.1 Inspection Record Form 6-2
6.1.2 Inspection Frequency 6-3
6.1.3 Actions Resulting From Inspections [20 NMAC 4.1, Subpart V, 264.15(c), 264.171, 264.196, and 264.601] 6-3
6.1.3.1 Preventive Action 6-4
6.1.3.2 Remedial and Emergency Action 6-4
6.2 INSPECTION SCHEDULE AND REQUIREMENTS FOR CONTAINER STORAGE AREAS [20 NMAC 4.1, Subpart V, 264.15(b) and 264.174] 6-4
6.2.1 Daily 6-4
6.3 INSPECTION SCHEDULE AND REQUIREMENTS FOR STORAGE TANK SYSTEMS [20 NMAC 4.1, Subpart V, 264.15(b) and 264.195(a)] 6-5
6.3.1 Daily 6-5
6.4 INSPECTION SCHEDULE AND REQUIREMENTS FOR THE CEMENTATION UNIT [20 NMAC 4.1, Subpart V, 264.15(b) and 264.602] 6-6
6.4.1 Daily 6-6
6.5 INSPECTION PROCEDURES AND FREQUENCIES FOR AREA 6 AT TA-55 [20 NMAC 4.1, Subpart V, 264.15(b) and 264.174] 6-7
6.5.1 Daily 6-7
6.5.2 Area 6 Receipt and Issue Inspection 6-8
6.5.3 Material Control and Accountability 6-9
6.5.4 Safeguards 6-9
6.6 ADDITIONAL INSPECTION ITEMS 6-9

7.0 CONTINGENCY PLAN 7-1
7.1 TA-55 EMERGENCIES AND EMERGENCY NOTIFICATION STRUCTURES . 7-1
7.2 HAZARDOUS AND MIXED WASTE EMERGENCY RESPONSE RESOURCES [20 NMAC 4.1, Subpart V, 264.52(c) and 264.53] 7-2
7.2.1 TA-55 Emergency Response Personnel 7-4
7.2.2 Emergency Management and Response Office [20 NMAC 4.1, Subpart V, 264.52(d) and 264.55] 7-5
7.2.3 Hazardous Materials Response Group 7-6
7.2.4 Other ESH Response Groups 7-7
7.2.4.1 Air Quality Group 7-7
7.2.4.2 Water Quality and Hydrology Group 7-7
7.2.4.3 Hazardous and Solid Waste Group 7-8
7.2.4.4 Environmental Assessments and Resource Evaluations Group 7-8
7.2.5 Other LANL Response Resources 7-8

7.2.5.1 CST Division 7-8
7.2.6 Contracted Response Groups 7-8
7.2.6.1 Protection Technology Los Alamos 7-8
7.2.6.2 Johnson Controls World Services Inc. 7-8
7.2.6.3 Los Alamos County Fire Department 7-9
7.2.7 LANL Support Groups 7-9
7.2.7.1 Health Physics Operations Group 7-9
7.2.7.2 Occupational Medicine Group 7-9
7.2.7.3 Industrial Hygiene and Safety Group 7-10
7.2.7.4 Criticality Safety Group 7-10
7.2.7.5 Occurrence Investigation Group 7-10
7.2.8 Outside Response Agencies 7-10
7.2.8.1 Los Alamos County Police Department 7-11
7.2.8.2 Los Alamos Medical Center 7-11
7.3 EMERGENCY EQUIPMENT AND COMMUNICATIONS [20 NMAC 4.1, Subpart V, 264.52(e)] 7-11
7.3.1 Emergency Equipment 7-11
7.3.2 Emergency Communications [20 NMAC 4.1, Subpart V, 264.56(a)] . 7-11
7.3.2.1 TA-55 Operations Center 7-12
7.3.2.2 Emergency Central Alarm Station 7-12
7.3.2.3 Utilities Control Center 7-12
7.3.2.4 Additional Communication Systems 7-13
7.4 CONTINGENCY PLAN IMPLEMENTATION [20 NMAC 4.1, Subpart V, 264.56] 7-14
7.4.1 Guidelines For Implementation [20 NMAC 4.1, Subpart V, 264.51(b) and 264.56] 7-14
7.4.2 Emergency Notification [20 NMAC 4.1, Subpart V, 264.56(a) and (b)] 7-15
7.4.3 Emergency Manager Actions [20 NMAC 4.1, Subpart V, 264.56 (b-h)] 7-16
7.5 SPILLS [20 NMAC 4.1, Subpart V, 264.56(e)] 7-17
7.5.1 Spill Control Procedures 7-19
7.5.1.1 Tank System Spill Control and Reporting 7-19
7.5.1.2 Tank System/Secondary Containment Repair and Closure 7-20
7.5.1.3 Certification of Major Repairs 7-20
7.5.2 Decontamination Verification 7-20
7.6 EXPLOSION 7-22
7.7 FIRE 7-22
7.8 UNPLANNED NONSUDDEN RELEASES 7-23
7.8.1 Responsibility 7-23
7.8.2 Nonsudden Releases 7-24
7.8.3 Nonsudden Release Surveillance 7-24
7.9 EXPOSURE TO HAZARDOUS OR MIXED WASTE 7-25
7.10 EVACUATION [20 NMAC 4.1, Subpart V, 264.52(f)] 7-25
7.10.1 Emergency Process Shutdown Prior To Evacuation 7-25
7.10.1.1 TA-55-4 Cementation Unit 7-26
7.10.2 Evacuation Plan 7-26
7.11 SALVAGE AND CLEANUP [20 NMAC 4.1, Subpart V, 264.56(g) and (h)] . . 7-27
7.12 POST-EMERGENCY ASSESSMENT 7-28

7.13 EMERGENCY RESPONSE RECORDS AND REPORTS [20 NMAC 4.1, Subpart V, 264.56(j)] . . . 7-29
7.14 CONTINGENCY PLAN AMENDMENT [20 NMAC 4.1, Subpart V, 264.54] . . 7-29

8.0 PERSONNEL TRAINING . . . 8-1
8.1 HAZARDOUS AND MIXED WASTE MANAGEMENT/RESPONSIBILITIES . . . 8-1
8.2 TRAINING CONTENT, FREQUENCY, AND TECHNIQUES [20 NMAC 4.1, Subpart IX, 270.14(b)(12); 20 NMAC 4.1, Subpart V, 264.16(a)(b) and (d)] . . 8-2
8.2.1 LANL-Wide Training . . . 8-4
8.2.2 Facility-Specific Training . . . 8-4
8.2.3 On-the-Job Training . . . 8-5
8.2.4 Training Coordinator [20 NMAC 4.1, Subpart V, 264.16(a)(2)] . . . 8-5
8.3 EMERGENCY TRAINING [20 NMAC 4.1, Subpart V, 264.16(a)(3) and (c)] . . 8-5
8.4 IMPLEMENTATION OF TRAINING PROGRAMS . . . 8-6

9.0 CLOSURE PLAN . . . 9-1
9.1 GENERAL CLOSURE INFORMATION . . . 9-2
9.1.1 Closure Performance Standard [20 NMAC 4.1, Subpart V, 264.111] . . 9-2
9.1.2 Partial and Final Closure Activities [20 NMAC 4.1, Subpart V, 264.112(d)] . . . 9-3
9.1.3 Closure Schedule [20 NMAC 4.1, Subpart V, 264.112(b)(6) and 264.113] . . . 9-3
9.1.4 Amendment of the Closure Plan [20 NMAC 4.1, Subpart V, 264.112(c)] . . . 9-4
9.1.5 Financial and Liability Requirements [20 NMAC 4.1, Subpart V, 264.140(c)] . . . 9-5
9.1.6 Closure Certification [20 NMAC 4.1, Subpart V, 264.115] . . . 9-5
9.1.7 Security . . . 9-5
9.1.8 Quality Assurance/Quality Control . . . 9-5
9.1.9 Closure Report . . . 9-6
9.1.10 Survey Plat and Post-Closure Requirements [20 NMAC 4.1, Subpart V, 264.116, 264.117 through 264.120] . . . 9-6
9.2 CLOSURE PROCEDURES FOR CONTAINER STORAGE AREAS [20 NMAC 4.1, Subpart V, 264.112] . . . 9-7
9.2.1 Estimate of Maximum Waste in Storage . . . 9-8
9.2.2 Description of Waste . . . 9-8
9.2.3 Removal of Waste . . . 9-9
9.2.4 Closure Procedures and Decontamination . . . 9-9
9.2.5 Decontamination Equipment . . . 9-11
9.2.6 Decontamination Verification . . . 9-11
9.3 CLOSURE PROCEDURES FOR THE STORAGE TANK SYSTEMS [20 NMAC 4.1, Subpart V, 264.112] . . . 9-12
9.3.1 Estimate of Maximum Waste in Storage . . . 9-13
9.3.2 Description of Waste . . . 9-13
9.3.3 Removal of Waste . . . 9-13
9.3.4 Closure Procedures and Decontamination . . . 9-13
9.3.5 Decontamination Equipment . . . 9-15
9.3.6 Decontamination Verification . . . 9-16

9.4 CLOSURE PROCEDURES FOR THE CEMENTATION UNIT [20 NMAC 4.1, Subpart V, 264.112] 9-16
9.4.1 Estimate of Maximum Waste Capacity of the Cementation Unit 9-17
9.4.2 Description of Waste 9-17
9.4.3 Removal of Waste 9-17
9.4.4 Closure Procedures and Decontamination 9-17
9.4.5 Decontamination Equipment 9-19
9.4.6 Decontamination Verification 9-19
9.5 SAMPLING AND ANALYTICAL PROCEDURES [20 NMAC 4.1, Subpart V, 264.112(b)(4)] 9-20
9.5.1 Soil and Sediment Sampling 9-20
9.5.1.1 Sampling Procedures 9-21
9.5.1.2 Cleaning of Samplers 9-22
9.5.2 Liquid Sampling 9-22
9.5.2.1 Sampling Procedure 9-22
9.5.2.2 Cleaning of Samplers 9-23
9.5.3 Sample Handling and Documentation 9-23
9.5.4 Analytical Procedures 9-25
9.5.5 Field and Laboratory QA/QC 9-25

10.0 CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS 10-1
10.1 SWMU DESCRIPTIONS 10-1
10.1.1 SWMUs Identified for Corrective Actions in Module VIII 10-1
10.1.1.1 Incinerator Complex 10-2
10.1.1.2 Decontamination Areas 10-2
10.1.1.3 Septic System 10-2
10.1.1.4 Sumps and Tanks 10-3
10.1.1.5 Monitoring Sump 10-3
10.1.2 SWMUs Identified in the 1990 SWMU Report 10-3
10.1.2.1 Cementation Unit 10-4
10.1.2.2 Evaporators 10-4
10.1.2.3 Filtration Unit 10-4
10.1.2.4 Container Storage Areas 10-5
10.1.2.5 Containment Area 10-6
10.1.2.6 Glass Breaker 10-6
10.1.2.7 Thermal Treatment Units 10-6
10.1.2.8 Solvent Spill 10-6
10.1.2.9 Drains and Outfalls 10-7
10.1.3 Active Hazardous/Mixed Waste Management Units Not Identified in the 1990 SWMU Report 10-7
10.1.3.1 Container Storage Areas 10-7
10.1.3.2 Oxygen Sparging Unit 10-9
10.2 RELEASES 10-9
10.2.1 Characterization of Releases 10-10
10.2.2 Corrective Actions 10-10

11.0 OTHER FEDERAL LAWS 11-1

12.0 CERTIFICATION [20 NMAC 4.1, Subpart IX, 270.11(d)] 12-1

13.0 LIST OF REFERENCES 13-1

APPENDIX A — Determination of 100-Year Floodplain Elevations at Los Alamos National Laboratory

APPENDIX B — 1991 and 1992 Traffic Studies at Intersection of Diamond Drive and Trinity Drive

APPENDIX C — Manufacturer's Information on Protective Coating Materials

APPENDIX D — Manufacturer's Information on Waste Containers and Containment Units

APPENDIX E — Manufacturer's Information on Fixed-Mount Mixers

APPENDIX F — Contract Between the U.S. Department of Energy and the Incorporated County of Los Alamos

APPENDIX G — Memorandum of Understanding Between the U.S. Department of Energy Los Alamos Area Office and the Incorporated County of Los Alamos, New Mexico Concerning Mutual Aid and Emergency Response

APPENDIX H — Memorandum of Understanding Between the U.S. Department of Energy and the Los Alamos Medical Center Concerning Mutual Assistance and Emergency Support

LIST OF TABLES

TABLE NO.	TITLE
1-1	Regulatory References and Corresponding Permit Application Location
3-1	Recommended Sample Containers, Preservation Techniques, and Holding Times
3-2	Summary of Waste Characterization Techniques for Transuranic Mixed Waste
3-3	Summary of Waste Characterization Techniques for Low-Level Mixed Waste
3-4	Summary of Waste Characterization Techniques for Hazardous Waste
3-5	Cross Reference of Matrix Parameter Codes and TRUPACT-II Content Codes
3-6	Transuranic Mixed Waste Characterization Matrix for Currently Generated Waste at Technical Area 55
3-7	Parameters, Characterization Methods, and Rationale for Transuranic Mixed Waste Stored and Treated at Technical Area 55
3-8	Descriptions of Low-Level Mixed Waste Stored at Technical Area 55
3-9	Parameters, Characterization Methods, and Rationale for Low-Level Mixed Waste Stored at Technical Area 55
3-10	Descriptions of Hazardous Waste Stored at Technical Area 55
3-11	Parameters, Characterization Methods, and Rationale for Hazardous Waste Stored at Technical Area 55
4-1	Transuranic Mixed Waste Stored at Technical Area 55
4-2	Low-Level Solid Mixed Waste Stored at Technical Area 55
4-3	Solid Hazardous Waste Stored at Technical Area 55
4-4	Low-Level Liquid Mixed Waste Stored at Technical Area 55
4-5	Liquid Hazardous Waste Stored at Technical Area 55

LIST OF TABLES
(Continued)

TABLE NO.	TITLE
4-6	Transuranic Mixed Waste Characterized for Treatment in the Cementation Unit at Technical Area 55
6-1	Inspection Schedule for Hazardous and/or Mixed Waste Units at Technical Area 55
7-1	Response Groups and Agencies Available to the Emergency Management and Response Office for Guidance and/or Emergency Assistance
7-2	Emergency Management and Response Office Emergency Managers
7-3	Waste Analysis Parameters and Test Methods
7-4	Evacuation Determination and Reentry Conditions
9-1	Closure Schedule for the Container Storage Areas at Technical Area 55
9-2	Closure Schedule for the Storage Tank Systems at Technical Area 55
9-3	Closure Schedule for the Cementation Unit at Technical Area 55
9-4	Analytical Parameters and Test Methods for Technical Area 55 Container Storage Areas, Storage Tank Systems, and Cementation Unit
9-5	Sample Containers, Preservation, and Holding Times for Sediment/Soil/ Sludge Samples
9-6	Sample Containers, Preservation, and Holding Times for Liquid Samples
9-7	Target Detection Limits, Analytical Methods, and Instrumentation for Metals Analysis
9-8	Target Detection Limits, Analytical Methods, and Instrumentation for Organics Analysis
9-9	Summary of Field Quality Control Samples
9-10	Summary of Laboratory Quality Control Procedures by Analytical Method
10-1	Solid Waste Management Unit (SWMU) Descriptions

LIST OF FIGURES

FIGURE NO.	TITLE
2-1	Regional Location Map of Los Alamos National Laboratory and Surrounding Land Use
2-2	Location Map of Los Alamos National Laboratory (LANL) Technical Areas
2-3	Locations of Waste Management Units at Technical Area (TA) 55
2-4	Annual Wind Roses for Los Alamos National Laboratory (LANL) - Day
2-5	Annual Wind Roses for Los Alamos National Laboratory (LANL) - Night
2-6	Location Map of Access Roads and Traffic Control Signs in the Vicinity of Technical Area (TA) 55
2-7	Relationship of Slope, Vegetation, and Parent Material to Frijoles, Typic Eutroboralfs, Clayey-Skeletal, and Carjo Soils
2-8	Relationship of Slope and Parent Material to Carjo, Tocal, Typic Eutroboralfs, Fine, and Pogna Soils
2-9	Index Map Showing Major Tectonic Elements of North-Central New Mexico
2-10	Physiographic Features of the Jemez Mountains
2-11	East - West Geologic Section Showing Stratigraphy and Structure from the Sierra de Los Valles across the Pajarito Plateau to the Rio Grande
2-12	Location Map of Los Alamos National Laboratory Facilities Relative to Nearby Active or Potentially Active Fault Traces
2-13	Generalized Piezometric Surface of Main Aquifer
2-14	Major Roads and Primary Traffic Routes at Los Alamos National Laboratory (LANL)
3-1	Land Disposal Restrictions Notification Form
3-2	Waste Profile Form
4-1	Technical Area 55, Building 4, Basement Showing Container Storage Areas 1 through 7
4-2	Technical Area 55, Building 4, First Floor Showing Container Storage Areas 8 through 11

LIST OF FIGURES
(Continued)

FIGURE NO.	TITLE
4-3	Container Storage Pad West of Building 4 at Technical Area 55
4-4	Technical Area 55, Building 185, Container Storage Area
4-5	Mechanical Symbols for Storage Tank Systems and Cementation Unit Drawings
4-6	Technical Area 55, Building 4, Storage Tank Systems and Cementation Unit Process Isometric Drawing
4-7	Technical Area 55, Building 4, Evaporator Glovebox Storage Tank, Front View
4-8	Technical Area 55, Building 4, Evaporator Glovebox Storage Tank, Side Views.
4-9	Technical Area 55, Building 4, Evaporator Glovebox Storage Tank, Top View
4-10	Technical Area 55, Building 4, Evaporator Glovebox Storage Tank, Support Frame and Legs
4-11	Technical Area 55, Building 4, Evaporator Glovebox Storage Tank System Process Flow Diagram
4-12	Technical Area 55, Building 4, Evaporator Glovebox Storage Tank System Piping and Instrumentation Diagram
4-13	Technical Area 55, Building 4, First Floor and Foundation Plan
4-14	Technical Area 55, Building 4, First Floor Plan Showing Penetration Locations
4-15	Technical Area 55, Building 4, Cementation Unit Storage Tanks
4-16	Technical Area 55, Building 4, Cementation Unit Storage Tank System Process Flow Diagram
4-17	Technical Area 55, Building 4, Cementation Unit Storage Tank System Piping and Instrumentation Diagram
4-18	Technical Area 55, Building 4, Cementation Unit Front Elevation

LIST OF FIGURES
(Continued)

FIGURE NO.	TITLE
4-19	Technical Area 55, Building 4, Cementation Unit Plan View
4-20	Technical Area 55, Building 4, Cementation Unit Process Flow Diagram
4-21	Technical Area 55, Building 4, Cementation Unit Piping and Instrumentation Diagram
5-1	Location Map Showing Security Fences, Entry Gates, and Entry Station at Technical Area (TA) 55
7-1	Emergency Notification Structure for Technical Area (TA) 55-Specific Emergency Responses
7-2	General Hazardous and Mixed Waste Emergency Notification Structure
7-3	Emergency Facilities
7-4	Evacuation Routes and Muster Area at Technical Area (TA) 55
7-5	Evacuation Routes at Technical Area (TA) 55, Building 4, Basement
7-6	Evacuation Routes at Technical Area (TA) 55, Building 4, First Floor
7-7	Evacuation Routes at Technical Area 55, Building 185
9-1	Location of Technical Area (TA) 55
9-2	Technical Area (TA) 55
10-1	Solid Waste Management Units (SWMU) in Technical Area (TA) 55

LIST OF ATTACHMENTS

ATTACHMENT NO.	TITLE
4-1	Index to Selected Buildings/Structures at Technical Area 55
4-2	Registered Professional Engineer Written Assessment/Certification for the Evaporator Glovebox Storage Tank System
4-3	Registered Professional Engineer Written Assessment/Certification for the Cementation Unit Storage Tank System
4-4	Tightness Testing Certification for the Cementation Unit Storage Tank System
4-5	Installation Inspection Certification for the Cementation Unit Storage Tank System
4-6	Demonstration of Treatment Effectiveness for the Cementation Unit
6-1	Hazardous and Mixed Waste Facility Inspection Record Form (and Instructions for Use)
7-1	Emergency Equipment
8-1	Los Alamos National Laboratory-Wide Training Program
8-2	Facility-Specific and On-the-Job Training for Hazardous and Mixed Waste Handling Operations

LIST OF MAPS

MAP NO.	TITLE
1	Contour Map Showing Mixed Waste Units at TA-3, TA-55, TA-50
2	Contour Map Showing Mixed Waste Units at TA-15 and TA-36
3	Contour Map Showing Mixed Waste Units at TA-16
4	Contour Map Showing Mixed Waste Units at TA-21
5	Contour Map Showing Hazardous and Mixed Waste Units at Technical Area (TA) 50
6	Contour Map Showing Mixed Waste Units at TA-53
7	Contour Map Showing Mixed Waste Units at Technical Area (TA) 54, Areas G and L
8	Contour Map Showing Mixed Waste Units at Technical Area (TA) 54 West
9	Contour Map Showing the Location of the TA-14 Firing Point and Burn Cage and the TA-40 Scrap Detonation Site
10	Contour Map Showing the Locations of the Technical Area (TA) 15 and TA-36 Firing Points
11	Contour Map Showing Location of TA-16 Open Burning Unit and TA-16-1150 Incinerator
12	Contour Map Showing the Locations of the TA-35-125 and TA-35-85 Surface Impoundments
13	Contour Map Showing the Locations of the Technical Area (TA) 39 Firing Points
14	Contour Map Showing the Locations of the Batch Treatment System and Container Storage Area and the Waste Incinerator
15	Contour Map Showing the Location of the TA-54, Area L Treatment Tanks, Surface Impoundments, Waste Packaging and Storage Pad, Shafts, and TA-54, Area G

LIST OF ABBREVIATIONS/ACRONYMS

ACI	American Concrete Institute
ALARA	as low as reasonably achievable
amsl	above mean sea level
ANSI	American National Standards Institute
"AR"	action required
ASTM	American Society for Testing and Materials
BEP	building emergency plan
CAM	continuous air monitor
CAS	Central Alarm Station
29 CFR	Code of Federal Regulations, Title 29
40 CFR	Code of Federal Regulations, Title 40
CFR	Code of Federal Regulations
CH	clay
CL	clay loam
CL-ML	clay loam-loam
cm	centimeter(s)
cm/cm	centimeter per centimeter
cm/hr	centimeters per hour
cm/s	centimeters per second
COLIWASA	composite liquid waste sampler
CST	LANL's Chemical Science and Technology Division
CST-9	LANL's Inorganic Trace Analysis Group
D&D	decontamination and decommissioning

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DPF	Drum Prep Facility
EDS	Employee Development System
EM&R	LANL's Emergency Management and Response Office
EMP	Emergency Management Plan
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
EOC	Emergency Operations Center
EPA	U.S. Environmental Protection Agency
ERT	TA-55 Emergency Response Team
ES&H	Environment, Safety, and Health
ESH	LANL's Environment, Safety, and Health Division
ESH-1	LANL's Health Physics Operations Group
ESH-2	LANL's Occupational Medicine Group
ESH-5	LANL's Industrial Hygiene and Safety Group
ESH-6	LANL's Criticality Safety Group
ESH-7	LANL's Occurrence Investigation Group
ESH-10	LANL's Hazardous Materials Response Group
ESH-13	LANL's ES&H Training Group
ESH-14	LANL's Quality Assurance Support Group
ESH-17	LANL's Air Quality Group
ESH-18	LANL's Water Quality and Hydrology Group

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

ESH-19	LANL's Hazardous and Solid Waste Group
ESH-20	LANL's Environmental Assessments and Resource Evaluations Group
°F	degrees Fahrenheit
FIC	Facility Incident Commander
FMCS	facility monitor/control system
FSS	LANL's Facilities, Security, and Safeguards Division
FSS-9	LANL's Operations and Maintenance Services
FSS-20	LANL's EM&R Office
ft	foot (feet)
ft/mi	feet per mile
ft/yr	feet per year
gal	gallon(s)
gal/min	gallons per minute
gal/min/ft	gallons per minute per foot
GET	General Employee Training
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	high-efficiency particulate air
HMGS	Hazardous Materials Group Supervisor
HWF	Hazardous Waste Facility
IC	Incident Commander
in.	inch(es)
IRF	Inspection Record Form

LIST OF ABBREVIATIONS/ACRONYMS (Continued)

IWP	Installation Work Plan
JCI	Johnson Controls World Services Inc.
L	liter(s)
LAAO	DOE's Los Alamos Area Office
LACFD	Los Alamos County Fire Department
LACPD	Los Alamos County Police Department
LAMC	Los Alamos Medical Center
LANL	Los Alamos National Laboratory
LDR	land disposal restrictions
m	meter(s)
m^3	cubic meter(s)
mi	mile(s)
mi^2	square mile(s)
ML	loam
MOU	memorandum of understanding
mph	miles per hour
m/s	meters per second
MSDS	Material Safety Data Sheet
NA	not applicable
NAWAS	National Warning System
NIIMS	National Interagency Incident Management System
20 NMAC 4.1	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
NMED	New Mexico Environment Department

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

NMT	LANL's Nuclear Materials Technology Division
NMT-7	TA-55's Waste Management and Environmental Compliance Group
NMT-8	TA-55's Facilities Management Group
NPDES	National Pollutant Discharge Elimination System
OJT	on-the-job training
OSHA	Occupational Safety and Health Administration
PA	public address
pCi/g	picocuries per gram
PPE	personal protective equipment
ppmw	parts per million by weight
psig	pounds per square inch gauge
PTLA	Protection Technology Los Alamos
Pu238	plutonium 238
QA	quality assurance
QAPP	Quality Assurance Program Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RCT	radiological control technician
R&D	research and development
RTD	reagent transfer device
RTL	regulatory threshold limit
RTR	real-time radiography
SAR	safety analysis report

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

SM	sandy loam
SM-409	ESH-2's central medical facility
SOP	standard operating procedure
SVOC	semivolatile organic compound
SW-846	EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
SWB	standard waste box
SWMU	solid waste management unit
TA	technical area
TC	toxicity characteristic
TCLP	toxicity characteristic leaching procedure
TID	tamper-indicating device
TRU	transuranic
TRUCON	TRUPACT-II Content
TSR	technical safety requirement
UC	Unified Command
UCC	Utilities Control Center
UCNI	Unclassified Controlled Nuclear Information
USC	United States Code
USCS	Unified Soil Classification System
USQD	unreviewed safety question determination
VCID	Vault Container Inspection Database
VOC	volatile organic compound
WAC	waste acceptance criteria

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

WAP	waste analysis plan
WIPP	Waste Isolation Pilot Plant
WPF	Waste Profile Form

1.0 INTRODUCTION

This Part B permit application has been prepared for submittal to the New Mexico Environment Department (NMED) to meet the requirements of the New Mexico Hazardous Waste Act. Additionally, this permit application has been prepared to meet the requirements of the implementing regulations, specifically the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), for those units identified as hazardous and mixed waste storage and treatment units at Los Alamos National Laboratory (LANL), Technical Area (TA) 55. Continuous initiatives are administered to ensure identification of additional units, if any, that may potentially be regulated under 20 NMAC 4.1.

This Part B permit application addresses all of the units at TA-55 that have previously been included in LANL's Part A permit application submittals. The original Part A permit application (LANL, 1991a) for mixed waste units at LANL was submitted to NMED in January 1991 and included units at TA-55. Additional TA-55 units were subsequently included in Revision 1.0 (LANL, 1993a) and Revision 2.0 (LANL, 1994a) of the original Part A and were submitted to NMED in September 1993 and September 1994, respectively. In July 1995, per direction from NMED, a TA-55-specific Part A permit application was submitted to NMED pursuant to 20 NMAC 4.1, Subpart IX, 270.72, revised November 1, 1995. Following is a list of the units at TA-55 included in previous Part A submittals and for which this Part B permit application is being submitted. (These units are shown in detail on Figures 4-1 through 4-21 which are provided under separate cover to comply with Unclassified Controlled Nuclear Information procedures.)

- **TA-55, Building 4 (TA-55-4), Areas 1 through 5**, container storage areas for hazardous waste, transuranic (TRU) mixed waste, and low-level mixed waste in the basement. These units were included in the January 1991 Part A permit application.

- **TA-55-4, Area 6**, a container storage area for TRU mixed waste in the basement. This unit was included in the January 1991 Part A permit application.

- **TA-55-4, Area 7**, a container storage area that may be used for hazardous waste, TRU mixed waste, and low-level mixed waste in the northwest section of the basement. This unit was included in Revision 1.0 of the Part A permit application.

- **TA-55-4, Areas 8 and 9**, container storage areas that may be used for TRU mixed waste and low-level mixed waste in Room 401 (TA-55-4-401). These units were included in Revision 1.0 of the Part A permit application.

- **TA-55-4, Area 10**, a container storage area that may be used for TRU mixed waste and low-level mixed waste in TA-55-4-433. This unit was included in Revision 1.0 of the Part A permit application.

- **TA-55-4, Area 11**, a container storage area that may be used for TRU mixed waste in TA-55-4-432. This unit was included in Revision 1.0 of the Part A permit application.

- **A container storage pad** outside near TA-55-4 for hazardous waste, TRU mixed waste, and low-level mixed waste. This unit was included in the January 1991 Part A permit application.

- **TA-55-185**, a building that may be used for container storage of hazardous waste, TRU mixed waste, and low-level mixed waste. This unit was included in Revision 2.0 of the Part A permit application.

- **TA-55-4, a storage tank system** consisting of a glovebox and ancillary equipment for TRU mixed waste associated with the evaporator process in TA-55-4-401. This unit was included as eight storage tanks and a container storage area in the January 1991 Part A permit application. In this Part B permit application, this unit is referred to as the "evaporator glovebox storage tank system."

- **TA-55-4, a storage tank system** consisting of five tanks and ancillary equipment for TRU mixed waste associated with the cementation unit in TA-55-4-401. The five tanks were included in the January 1991 Part A permit application. In this Part B permit application, this unit is referred to as the "cementation unit storage tank system."

- **TA-55-4, a cementation unit** for mixed waste located within glovebox GB-454 in TA-55-4-401. This unit was included in the January 1991 Part A permit application.

In both the Part A and Part B permit applications, a unit to be permitted or an area within LANL may sometimes be referred to as a "facility" (e.g., the Plutonium Facility). The term "facility," as it appears in this context, is used only to denote building or area names and does not imply the regulatory meaning of "facility" as defined in 20 NMAC 4.1, Subpart I, 260.10, revised November 1, 1995. However, pursuant to 20 NMAC 4.1, Subpart I, 260.10, revised November 1, 1995, LANL as a whole does meet the regulatory definition of a facility.

An outline of this permit application with citations of the regulations covered by each section is given in Table 1-1. Where applicable, regulatory citations in this application reference 20 NMAC 4.1, which adopts, with a few limited exceptions, all of the Code of Federal Regulations, Title 40, Parts 260-266, Part 268, and Part 270.

Table 1-1

Regulatory References and Corresponding Permit Application Location

Regulatory Reference[a]			
20 NMAC 4.1, Subpart IX	20 NMAC 4.1, Subpart V	Description of Requirement	Location in this Permit Application
270.10(a)	--	Permit application	1.0
270.10(g)(1)	--	Updating permit applications	1.0
270.11(a)	--	Signatories	12.0
270.11(d)	--	Certification	12.0
270.13	--	Contents of Part A permit application	Technical Area (TA) 55 Part A[b]
270.13(a)	--	Activities conducted	TA-55 Part A
270.13(b)	--	Name, mailing address, and location	TA-55 Part A
270.13(c)	--	Principal standard industrial classification (SIC) codes	TA-55 Part A
270.13(d)	--	Operator information	TA-55 Part A
270.13(e)	--	Owner information	TA-55 Part A
270.13(f)	--	Whether located on Indian lands	TA-55 Part A
270.13(g)	--	New or existing facility	TA-55 Part A
270.13(h)	--	Scale drawing and photographs	TA-55 Part A
270.13(i)	--	Description of waste processes	TA-55 Part A
270.13(j)	--	Specification and quantity of hazardous wastes	TA-55 Part A
270.13(k)	--	List of permits and construction approvals	TA-55 Part A
270.13(l)	--	Topographic maps	TA-55 Part A
270.13(m)	--	Description of nature of business	TA-55 Part A
270.14(b)(1)	--	General facility description	2.1
270.14(b)(2)	264.13(a)	Chemical and physical analyses	3.0
270.14(b)(3)	264.13(b)	Waste analysis plan	3.0

Refer to footnotes at end of table.

Table 1-1 (Continued)

Regulatory References and Corresponding Permit Application Location

Regulatory Reference[a]			
20 NMAC 4.1, Subpart IX	20 NMAC 4.1, Subpart V	Description of Requirement	Location in this Permit Application
	264.13(b)(1)	Parameters and rationale	3.0
	264.13(b)(2)	Test methods	3.0
	264.13(b)(3)	Sampling methods	3.0
	264.13(b)(4)	Frequency of analyses	3.0
	264.13(b)(5)	Waste analysis information for off-site facilities	3.0
270.14(b)(4)	264.14	Security procedures and equipment	5.1
270.14(b)(5)	264.15(b)	General inspection requirements	6.1
	264.174	Inspection requirements for container storage areas	6.2 and 6.5
	264.195	Inspection requirements for storage tanks	6.3
	264.602	Inspection requirements for miscellaneous units	6.4
270.14(b)(7)	264 Subpart D	Contingency plan	7.0
	264.51	Contingency plan design and implementation	7.0 and 7.4
	264.52	Contingency plan content	7.0
	264.53	Contingency plan copies	7.2
	264.54	Contingency plan amendment	7.14
	264.55	Emergency coordinator	7.2.2
	264.56	Emergency procedures	7.3 – 7.12
270.14(b)(8)	264 Subpart C	Preparedness and prevention	5.2
	264.31	Design and operation of facility	5.0
	264.32	Required equipment	5.2.1 and 5.3
	264.33	Testing and maintenance of equipment	5.2.2
	264.34	Communications/alarm system	5.2.1 and 7.3

Refer to footnotes at end of table.

Table 1-1 (Continued)

Regulatory References and Corresponding Permit Application Location

Regulatory Reference[a]			
20 NMAC 4.1, Subpart IX	20 NMAC 4.1, Subpart V	Description of Requirement	Location in this Permit Application
	264.35	Required aisle space	5.2.4
	264.37	Arrangements with local authorities	5.2.5 and 7.2
270.14(b)(9)	264.17	Prevention of accidental ignition or reaction	5.4
270.14(b)(10)	--	Traffic pattern, volume, and controls	2.3
270.14(b)(11)(i) & (ii)	264.18(a)	Seismic standard	2.2.1
270.14(b)(11)(iii)	264.18(b)	Floodplain standard	2.2.2
270.14(b)(12)	264.16	Personnel training	8.0
270.14(b)(13)	264 Subpart G	Closure and post-closure plans	9.0
	264.111	Closure performance standard	9.1.1
	264.112(a)&(b)	Written content of closure plan	9.2 – 9.5
	264.112(c)	Amendment of closure plan	9.1.4
	264.112(d)	Notification of partial and final closure	9.1.2
	264.112(e)	Removal of wastes and decontamination/dismantling of equipment	9.2 – 9.4
	264.113	Time allowed for closure	9.1.3
	264.114	Disposal/decontamination	9.2 – 9.4
	264.115	Certification of closure	9.1.6
	264.117	Post-closure care and use of property	9.1.10
	264.120	Certification of post-closure	9.1.10
	264.178	Closure of container storage areas	9.2
	264.197	Closure of tank systems	9.3
	264.603	Closure of miscellaneous units	9.4

Refer to footnotes at end of table.

Table 1-1 (Continued)

Regulatory References and Corresponding Permit Application Location

Regulatory Reference[a]			
20 NMAC 4.1, Subpart IX	20 NMAC 4.1, Subpart V	Description of Requirement	Location in this Permit Application
270.14(b)(19)(i)(vi) (vii) & (x)	--	Topographic maps	2.1.2
270.14(b)(19)(ii)	264.18(b)	100-year floodplain	2.2.2
270.14(b)(19)(iii)	--	Surface waters	2.1.3
270.14(b)(19)(iv)	--	Land use	2.1.5
270.14(b)(19)(v)	--	Wind rose	2.1.4
270.14(b)(19)(viii)	264.14(b)	Access control	5.1
270.14(b)(19)(ix)	--	Wells	2.1.3
270.14(b)(19)(xi)	--	Drainage barriers	5.3
270.14(b)(19)(xii)	--	Location of operational units	2.1
270.14(b)(20)	--	Other federal laws	11.0
270.14(c)	264.90(a)	Ground-water monitoring	2.2.5
270.14(d)(1)	--	Requirements for solid waste management units (SWMU)	10.0
270.14(d)(1)(i)	--	Location of SWMUs on topographic map	Figure 10-1
270.14(d)(1)(ii)	--	Types of SWMUs	10.1
270.14(d)(1)(iii)	--	Structural description of SWMUs	10.1
270.14(d)(1)(iv)	--	Dates of operation	10.1
270.14(d)(1)(v)	--	Waste types managed at SWMUs	10.1
270.15	264 Subpart I	Containers	4.1 and 4.2.1
270.15(a)	264.175	Containment system	4.1, 4.3.3, and 4.5.2
270.15(b)	264.175(c)	No free liquids	4.1.1 – 4.1.10
270.15(c)	264.176	Ignitable or reactive wastes	4.2.4 and 5.4
270.15(d)	264.177	Incompatible wastes	4.2.4 and 5.4
270.16	264 Subpart J	Tank systems	4.3
270.16(a)	264.191 264.192	Written assessment and certification	4.3.1.2, 4.3.2.2, and Attachments 4-2 and 4-3

Refer to footnotes at end of table.

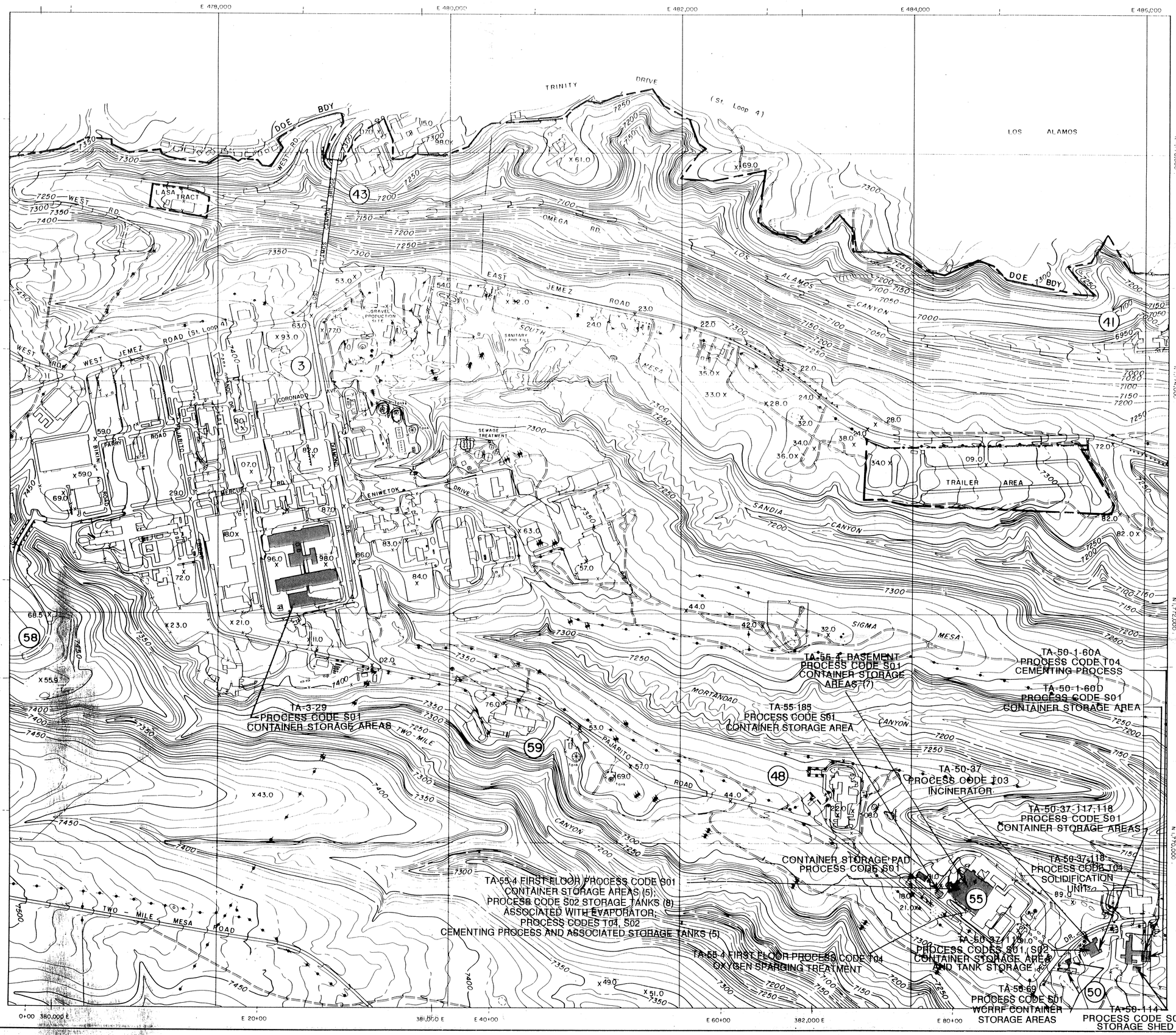
Table 1-1 (Continued)

Regulatory References and Corresponding Permit Application Location

Regulatory Reference[a]			
20 NMAC 4.1, Subpart IX	20 NMAC 4.1, Subpart V	Description of Requirement	Location in this Permit Application
270.16(b)	264.191 264.192	Capacity/dimensions	4.3.1 and 4.3.2
270.16(c)	--	Systems and controls	4.3.1 and 4.3.2
270.16(d)	--	Piping and process flow	4.3.1 and 4.3.2
270.16(e)	264.192	External corrosion protection	4.3.1.1 and 4.3.2.1
270.16(f)	264.192	Installation	4.3.1.2 and 4.3.2.2
270.16(g)	264.193	Secondary containment system	4.3.3
270.16(i)	264.194	Spill prevention	4.3.1.1 and 4.3.2.1
270.16(j)	264.198 264.199	Ignitable, reactive, or incompatible wastes	4.4.1 and 5.4
270.23	264 Subpart X	Miscellaneous units	4.5
270.23(a)(1) & (2)	--	Detailed unit description	4.5.1
270.23(b)	264.601	Hydrologic, geologic, and meteorologic assessments	4.6.3
270.23(c)	264.601	Potential exposure pathways	4.6.3
270.23(d)	--	Demonstration of treatment effectiveness	4.6.2 and Attachment 4-6
	264.602	Monitoring, analysis, inspection, response, reporting, and corrective action	4.6.3

[a] The New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), adopts, with a few limited exceptions, Title 40 of the Code of Federal Regulations (40 CFR), Parts 260–266, Part 268, and Part 270 (1995). 20 NMAC 4.1, Subparts V and IX, contain equivalent regulations to 40 CFR Parts 264 and 270, respectively.

[b] The Technical Area 55 RCRA Part A Permit Application, Revision 1.0, is being submitted to the New Mexico Environment Department (NMED) with this Part B permit application. The units included therein were previously described in Los Alamos National Laboratory's original Part A permit application submitted to NMED in January 1991, and in Revisions 1.0 and 2.0, which were submitted in September 1993 and September 1994, respectively.

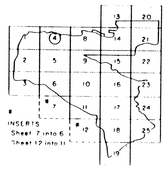


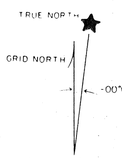
LEGEND

X 93.0	SPOT ELEVATION	N 1,768,000	NMSP GRID
6900	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 2400+00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES		

35	TECHNICAL AREA NO.		TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD		TANK
	JEEP TRAIL		POND
	CULVERT		RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL		EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		

SHEET LAYOUT





MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY, MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

400 200 0 400 800 1200 1600 FEET
100 50 0 100 200 300 400 500 METER

GRAPHIC SCALE: 1 in.=400 ft.

CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

3 SM–SITE	41 W–SITE	59 WM–SITE
43 HRL–SITE	48 RC–SITE	
58 TWO MILE NORTH–SITE	55 PLUTONIUM FACILITY SITE	
59 OH–SITE		

LOS ALAMOS SCIENTIFIC LABORATORY

MAP 1
CONTOUR MAP SHOWING
MIXED WASTE UNITS
AT TA-3, TA-55, TA-50

Revised as of September 1995

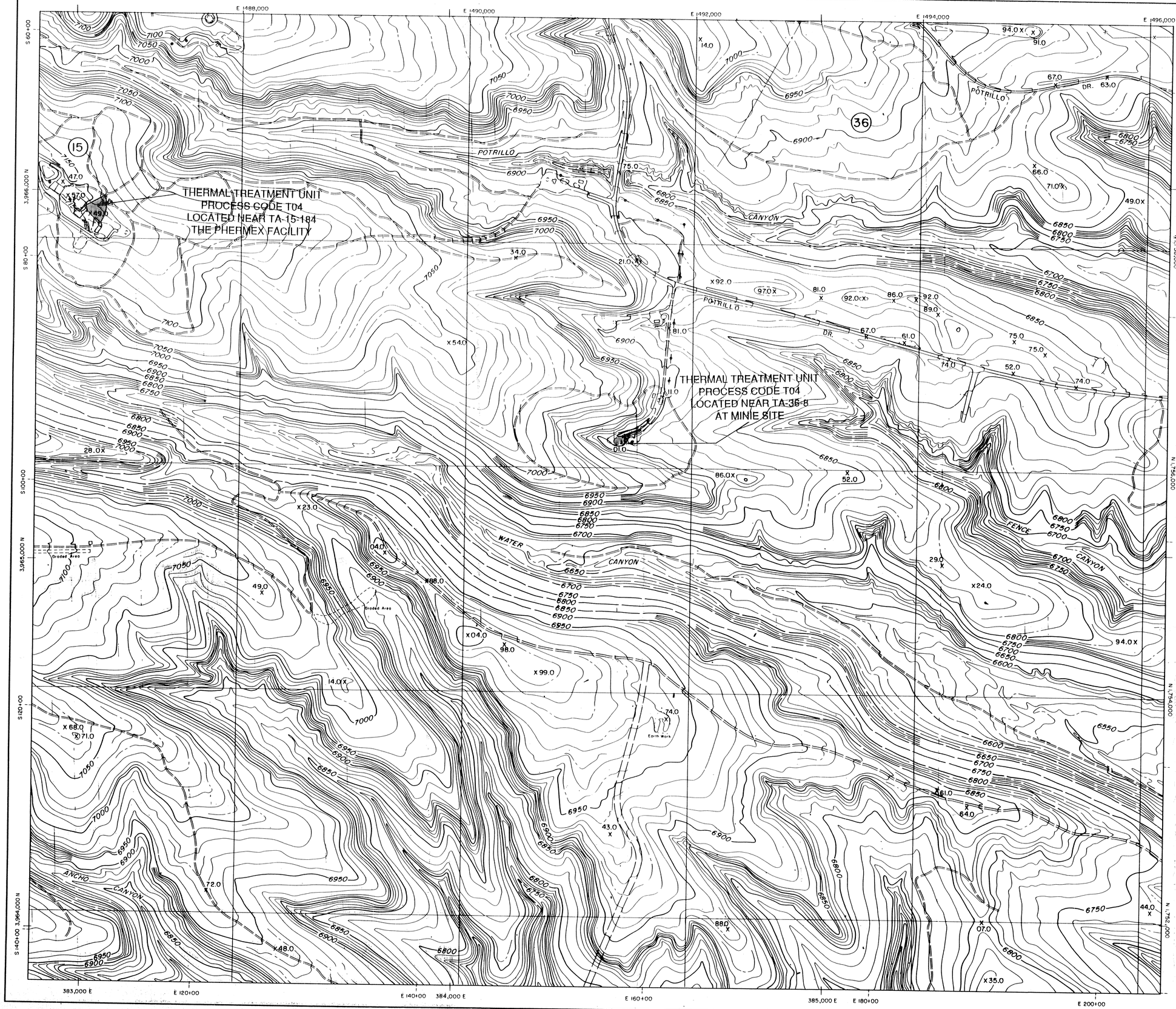
4413-A

LAB JOB NO. 5682

1"=400' SCALE

PLAN / TOPO

SHEET 4 OF 25



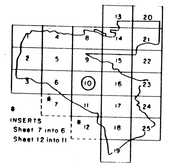
LEGEND

X 93.0	SPOT ELEVATION
6900	INDEX CONTOUR
	INTERMEDIATE CONTOUR 10ft.
	SUPPLEMENTARY CONTOUR 5ft.
	CONTOURS THROUGH HEAVY VEGETATION
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.

N 1,768,000	NMSP GRID
3,989,000 N	UTM GRID
N 240+00	LASL GRID

(35)	TECHNICAL AREA NO.	⊠	TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT	RW	RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth Work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		

SHEET LAYOUT



NORTH

TRUE NORTH
GRID NORTH
-00°00'57
GRID NMSP NORTH

MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY, MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

400 200 0 400 800 1200 1600 FEET
100 50 0 100 200 300 400 500 METER

GRAPHIC SCALE: 1 in.=400 ft.

CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

(36) KAPPA SITE

(15) R–SITE

LOS ALAMOS SCIENTIFIC LABORATORY

MAP 2
CONTOUR MAP SHOWING
MIXED WASTE UNITS
AT TA-15 AND TA-36

LAB JOB NO. 5682

1"=400' SCALE

PLAN / TOPO

SHEET 10 OF 25

Revised as of April 14, 1995

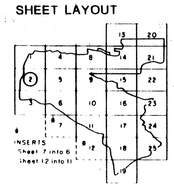
4413-B

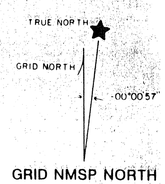
LEGEND

x 93.0	SPOT ELEVATION	N 1,768,000	NMSP GRID
6900	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240+00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.		

35	TECHNICAL AREA NO.		TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT	RW	RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth Work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		

SHEET LAYOUT





MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY, MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

400 200 0 400 800 1200 1600 FEET
100 50 0 100 200 300 400 500 METER

GRAPHIC SCALE: 1 in.=400 ft. CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

(8) ANCHOR WEST SITE (9) ANCHOR EAST SITE (16) S–SITE
(22) TD–SITE

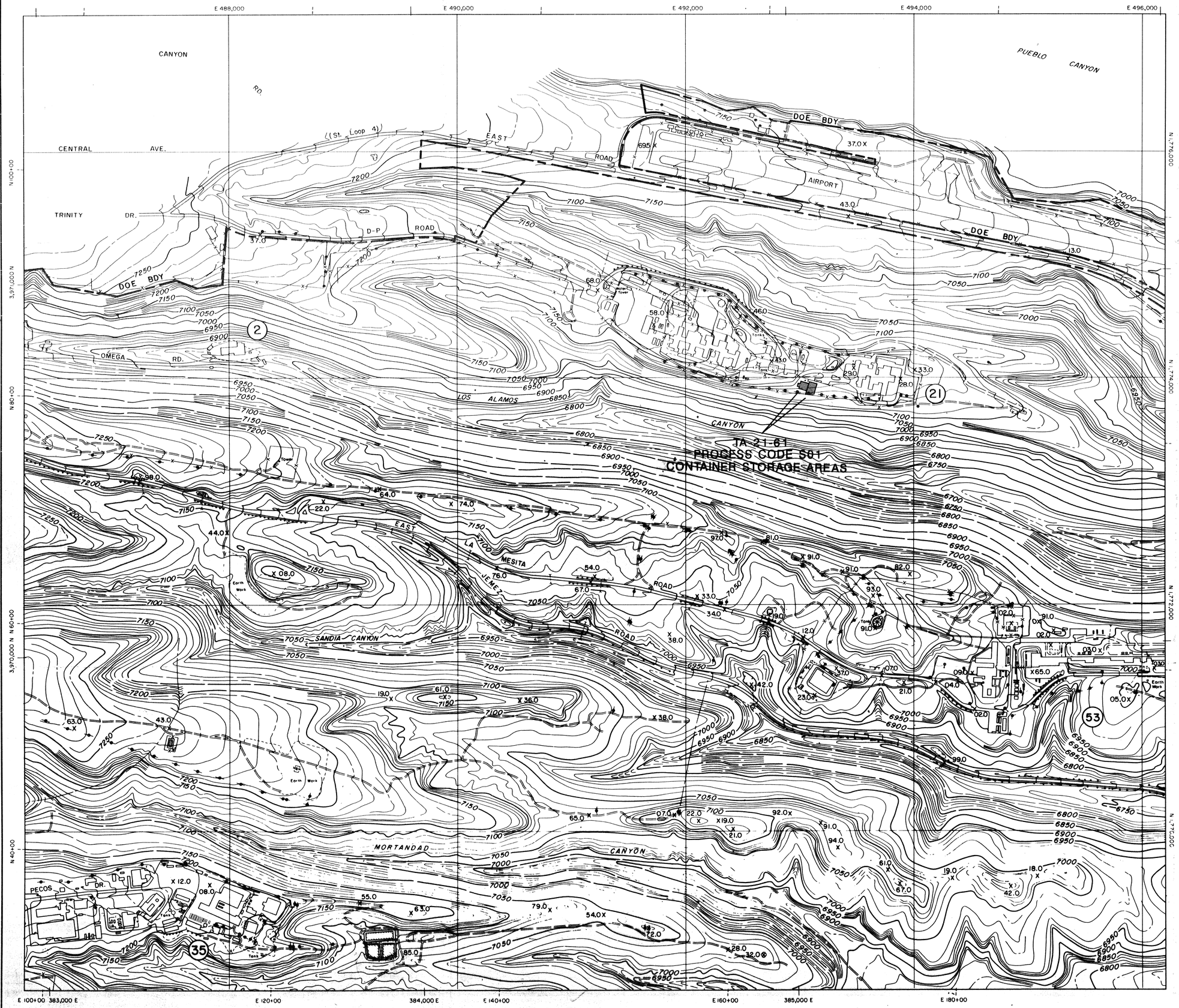
LOS ALAMOS SCIENTIFIC LABORATORY

MAP 3
CONTOUR MAP
SHOWING MIXED WASTE
UNITS AT TA-16

4413-C

Revised as of January 1991

LAB JOB NO. 566
1" = 400' SCALE
PLAN / TOP
SHEET 2 OF 2

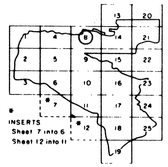


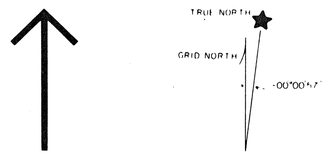
LEGEND

X 93.0	SPOT ELEVATION	N.M. 768,000	NMSP GRID
—6900—	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240+00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.		

(35)	TECHNICAL AREA NO.	⊠	TOWER
	BUILDING		PIPE LINE
—x—x—	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT	—RW—	RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth Work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS	—x—x—	GATE
	POWER POLE		

SHEET LAYOUT





MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY, MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

400 200 0 400 800 1200 1600 FEET
100 50 0 100 200 300 400 500 METER

GRAPHIC SCALE: 1 in.=400 ft. CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

(2) OMEGA SITE (21) DP-SITE (39) TEN SITE
(53) MPF-SITE

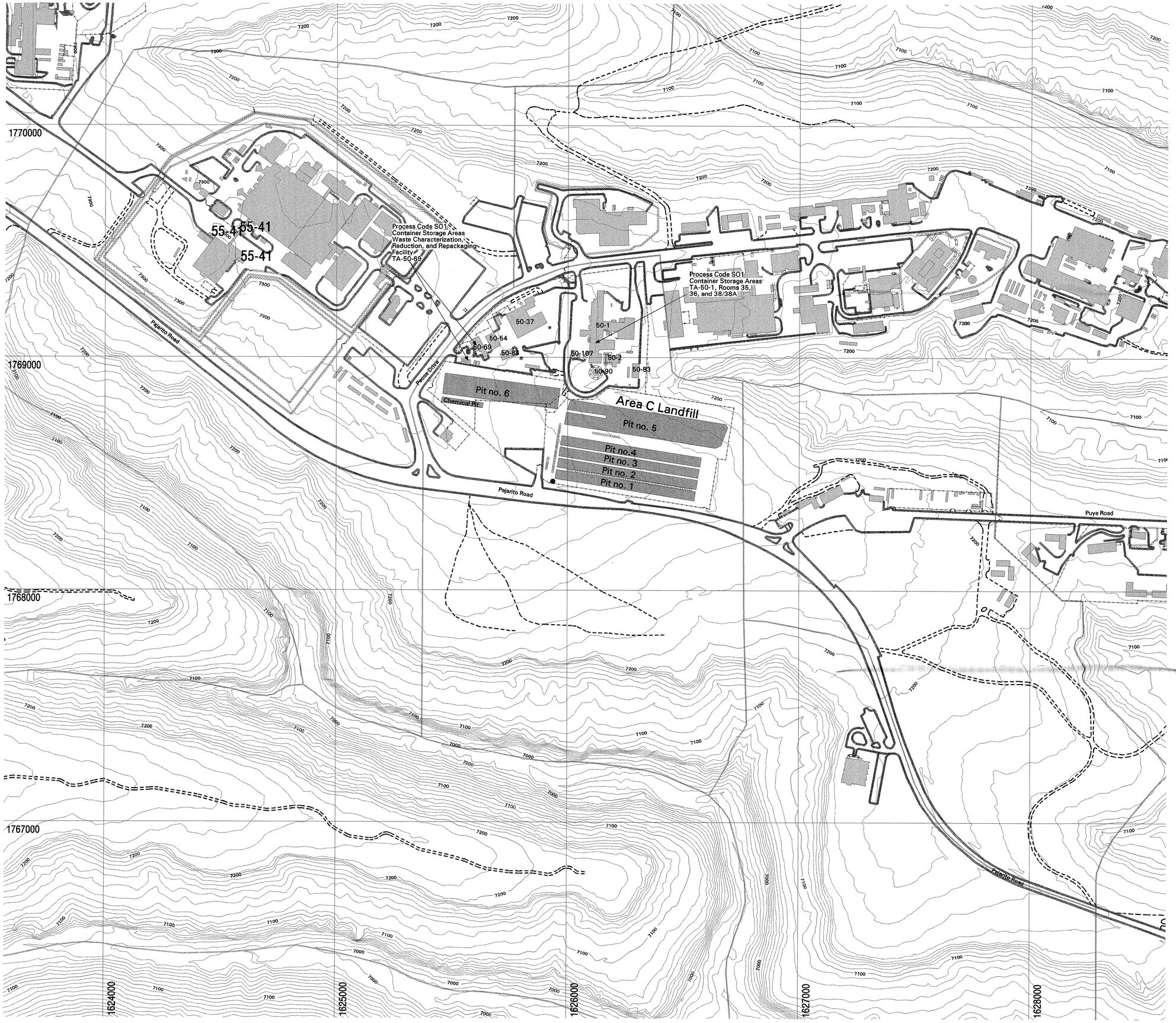
LOS ALAMOS SCIENTIFIC LABORATORY

MAP 4
CONTOUR MAP SHOWING
MIXED WASTE UNITS AT
TA-21

4413-D

Revised as of January 1991

LAB JOB NO. 5682
1"=400' SCALE
PLAN / TOPO
SHEET 8 OF 25



LEGEND

- Contours, 100 ft
- Contours, 10 ft
- Fence, Industrial
- Fence, Security
- Retaining Wall
- Road/Parking, Dirt
- Road/Parking, Paved
- Building or Structure
  - 50-1 = Liquid Waste Treatment Plant
  - 50-37 = Incinerator
  - 50-69 = Waste Characterization, Reduction, and Repackaging Facility
- Disposal Pit (location approximate)

MAP 5: Contour Map Showing Hazardous and Mixed Waste Units at Technical Area (TA) 50

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 1000
Feet per inch on map = 200

SCALE 1:2400

FEET: 0, 61, 122, 183, 244

METERS: 0, 200, 400, 600, 800

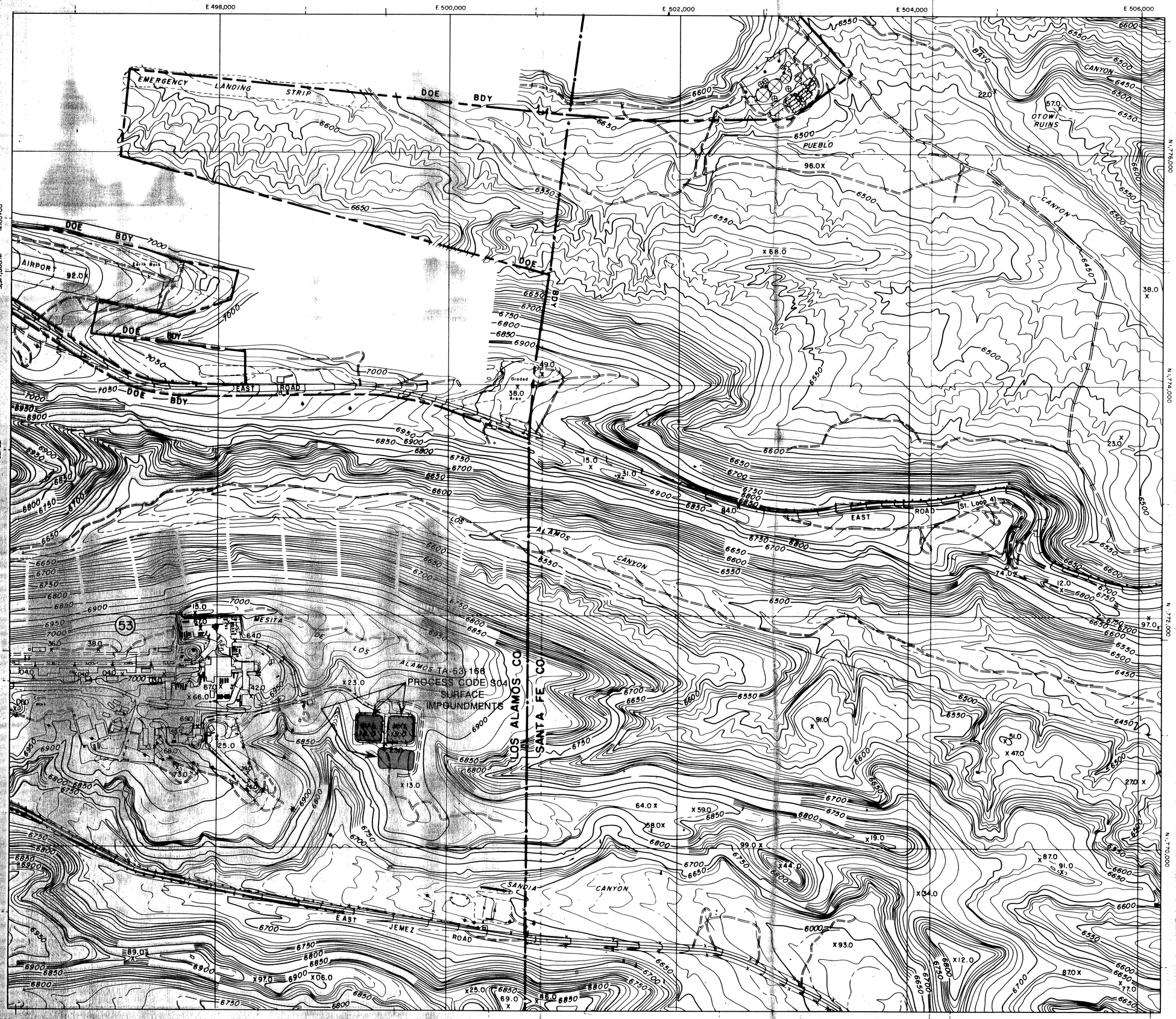
NOTICE: The information on this map is provisional. Feature locations are dependent on scale and symbology and their accuracy may not have been confirmed. Los Alamos National Laboratory boundary is based on legal description established in 1995. Other boundary, structure, and utility data are from Los Alamos National Laboratory Engineering Division and Los Alamos County Utility and Engineering Departments. Contour data are from Los Alamos National Laboratory Environmental Restoration Project aerial survey, September 1991.

4413-E

University of California
Los Alamos National Laboratory
Earth and Environmental Sciences Division

FIMAD Facility for Information Management, Analysis, and Display
FIMAD is the electronic data repository for the Environmental Restoration Project at Los Alamos National Laboratory.

Produced by: Belinda Scheber
Date: November 27, 1995 FIMAD Plot ID: G104051

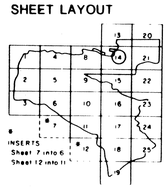


LEGEND

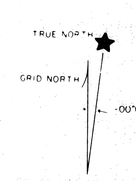
X 93.0	SPOT ELEVATION	N 1,768,000	NMSP GRID
6900	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240+00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.		

35	TECHNICAL AREA NO.		TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT		RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth Work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		

SHEET LAYOUT

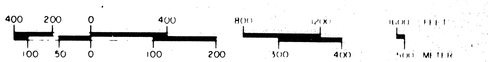


NORTH



GRID NMSP NORTH

MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY, MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.



GRAPHIC SCALE: 1 in.=400 ft.

CONTOUR INTERVAL 10 ft

TECHNICAL AREAS

(53) MPF–SITE

LOS ALAMOS SCIENTIFIC LABORATORY

MAP 6

CONTOUR MAP SHOWING
MIXED WASTE UNITS
AT TA-53

4413-F

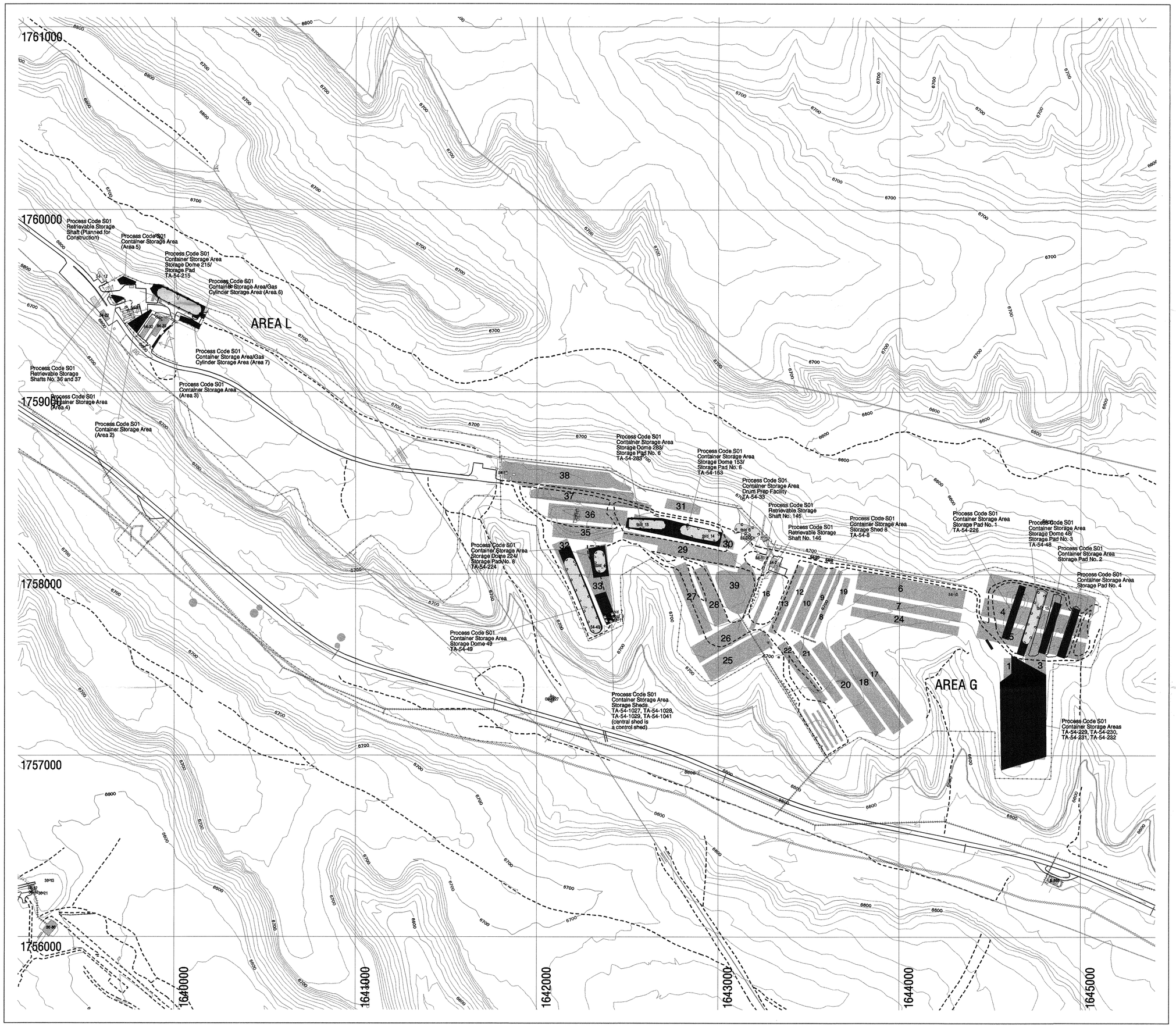
Revised as of June 1992

LAB JOB NO. 5682

1"=400' SCALE

PLAN / TOPO

SHEET 14 OF 25



LEGEND

- Boundary, TA
- Contours, 100 ft
- Contours, 10 ft
- Fence, Industrial
- Fence, Security
- Power Line >13.2 kV
- Power Line <13.2 kV
- Retaining Wall
- Road, Dirt
- Road, Paved
- Road/Trail
- Sewer Line
- Storm Drain/Culvert
- Telephone Line
- Water Line
- Material Disposal Area
- Pad
- Pit
- Shaft
- Permanent Structure
- Temporary Structure
- Denotes engineering information supplied by a source other than LANL Engineering Division

MAP 7:
Contour Map Showing Mixed Waste Units at Technical Area (TA) 54, Areas G and L

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 1000
Feet per inch on map = 250

SCALE 1:3000

0 76 152 228 304

METERS

0 250 500 750 1000

FEET

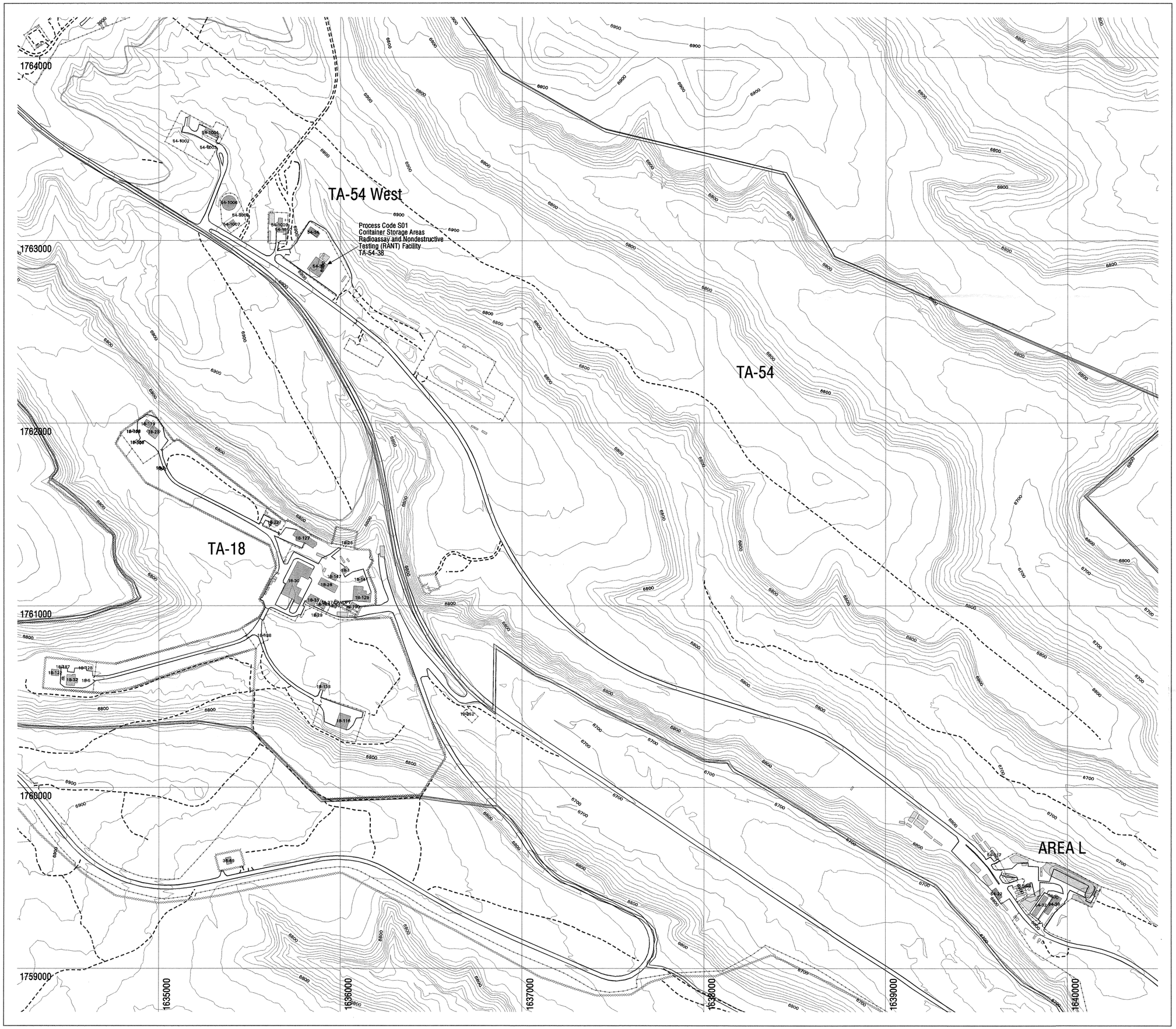
NOTICE: The information on this map is provisional. Feature locations are dependent on scale and symbology and their accuracy may not have been confirmed. Los Alamos National Laboratory boundary is based on legal description established in 1986. Other boundary, structure, and utility data are from Los Alamos National Laboratory Engineering Division and Los Alamos County Utility and Engineering Departments. Contour data are from Los Alamos National Laboratory Environmental Restoration Project aerial survey, September 1991.

4413-G

University of California
Los Alamos National Laboratory
Earth and Environmental Sciences Division
FIMAD Facility for Information Management, Analysis, and Display
FIMAD is the electronic data repository for the Environmental Restoration Project at Los Alamos National Laboratory.

Produced by: Marcia Jones

Date: January 25, 1996 FIMAD Plot ID: G104207



LEGEND

- Boundary, TA
- Contours, 100 ft
- Contours, 10 ft
- Fence, Industrial
- Fence, Security
- Road, Dirt
- Road, Paved
- Road/Trail
- Permanent Structure
- Temporary Structure

MAP 8:
Contour Map Showing Mixed Waste Units at Technical Area (TA) 54 West

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 1000
Feet per inch on map = 250

SCALE 1:3000

0 76 152 228 304

METERS

0 250 500 750 1000

FEET

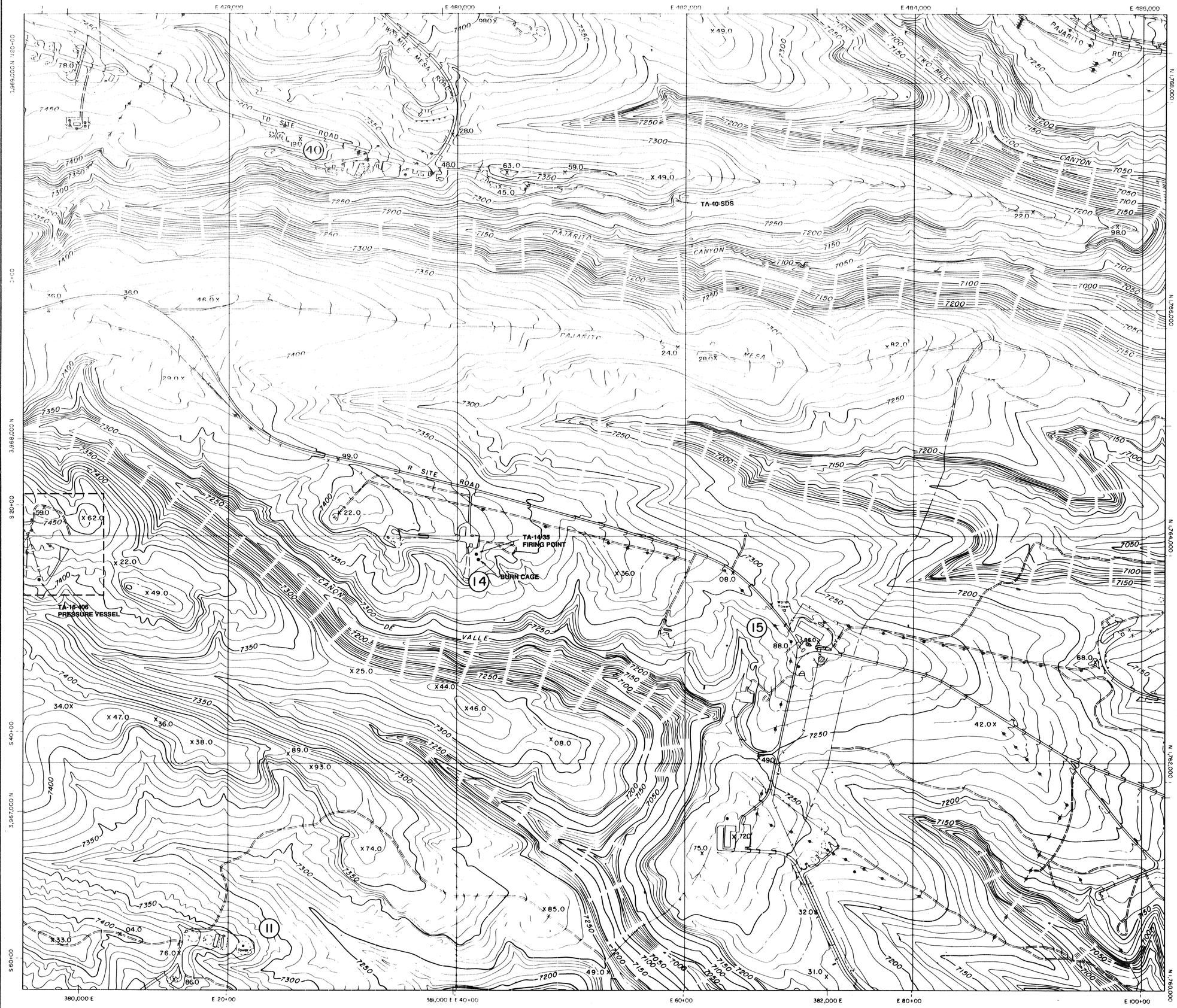
NOTICE: The information on this map is provisional. Feature locations are dependent on scale and symbology and their accuracy may not have been confirmed. Los Alamos National Laboratory boundary is based on legal description established in 1986. Other boundary, structure, and utility data are from Los Alamos National Laboratory Engineering Division and Los Alamos County Utility and Engineering Departments. Contour data are from Los Alamos National Laboratory Environmental Restoration Project aerial survey, September 1991.

4413-H

University of California
Los Alamos National Laboratory
Earth and Environmental Sciences Division
FIMAD Facility for Information Management, Analysis, and Display
FIMAD is the electronic data repository for the Environmental Restoration Project at Los Alamos National Laboratory.

Produced by: Marcia Jones

Date: January 25, 1996 FIMAD Plot ID: G104208

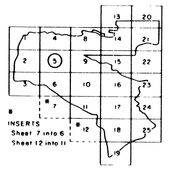


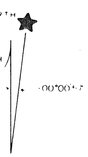
LEGEND

X 93.0	SPOT ELEVATION	N 1,768,000	NMSP GRID
6900	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240+00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.		

(35)	TECHNICAL AREA NO.		TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD		TANK
	JEEP TRAIL		POND
	CULVERT		RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL		EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		

SHEET LAYOUT





MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY, MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

400 200 0 400 800 1200 1600 FEET
100 50 0 100 200 300 400 500 METER

GRAPHIC SCALE: 1 in.=400 ft. CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

(11) K–SITE (14) Q–SITE (15) R–SITE
(40) DF–SITE

4413-I

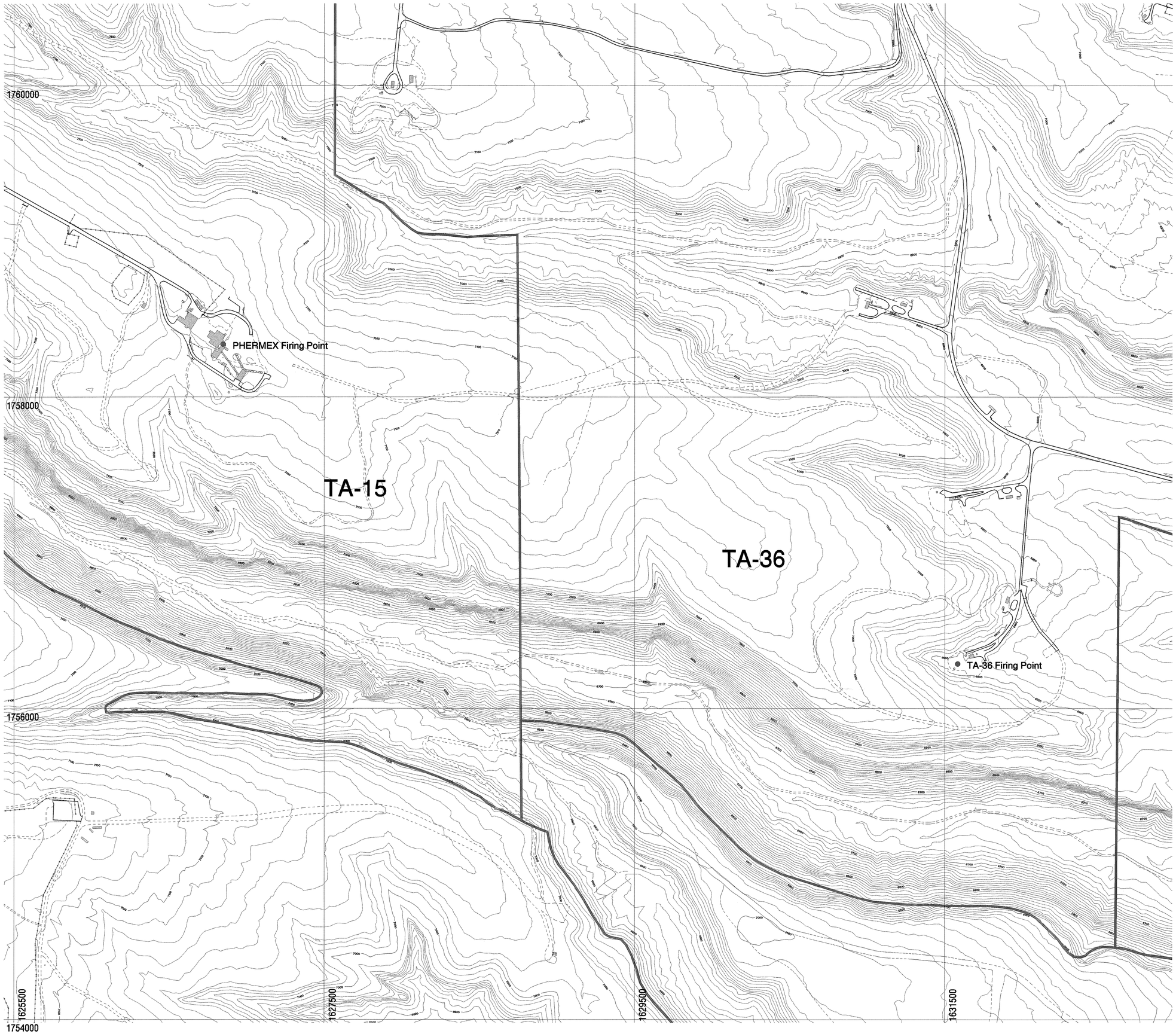
LOS ALAMOS SCIENTIFIC LABORATORY

MAP 9

CONTOUR MAP SHOWING THE LOCATION OF THE TA-14 FIRING POINT AND BURN CAGE AND THE TA-40 SCRAP DETONATION SITE

General Revisions, November 1987

LAB JOB NO. 5682
1"=400' SCALE
PLAN / TOPO
SHEET 5 OF 25



LEGEND

- Boundary, LANL
- Boundary, TA
- Contours, 10 foot
- Contours, 100 foot
- Fence, Industrial
- Fence, Security
- Roads, Dirt
- Roads, Paved
- Road/Trail
- Structure, Permanent
- Structure, Temporary
- Structure, Underground
- Firing Point

MAP 10: Contour Map Showing the Locations of the Technical Area (TA) 15 and TA-36 Firing Points

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 2000
Feet per inch on map = 300

SCALE 1:3600

0 91 182 273 364
METERS

0 300 600 900 1200
FEET

NOTICE: The information on this map is provisional. Feature locations are dependent on scale and symbology and their accuracy may not have been confirmed. Los Alamos National Laboratory boundary is based on legal description established in 1995. Other boundary, structure, and utility data are from Los Alamos National Laboratory Engineering Division and Los Alamos County Utility and Engineering Departments. Contour data are from Los Alamos National Laboratory Environmental Restoration Project aerial survey, September 1991.

4413-J

University of California
Los Alamos National Laboratory
Earth and Environmental Sciences Division

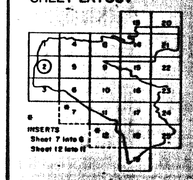
FIMAD Facility for Information Management, Analysis, and Display
FIMAD is the electronic data repository for the Environmental Restoration Project at Los Alamos National Laboratory.

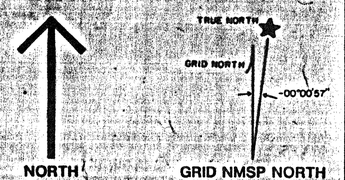
Produced by: Marcia Jones
Date: June 09, 1996 FIMAD Plot ID: G104768

LEGEND

- X 93.0 — SPOT ELEVATION
- 6900 — INDEX CONTOUR
- INTERMEDIATE CONTOUR 10ft.
- SUPPLEMENTARY CONTOUR 5ft.
- CONTOURS THROUGH HEAVY VEGETATION
- COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.
- DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.
- DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.
- DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.
- N 1,768,000 — NMSP GRID
- 3,989,000 N — UTM GRID
- N 240+00 — LASL GRID
- (35) TECHNICAL AREA NO.
- BUILDING
- FENCE
- PAVED ROAD
- DIRT ROAD
- JEEP TRAIL
- CULVERT
- GUARD RAIL
- TUNNEL
- EARTHEN BUNKERS
- POWER POLE
- TOWER
- PIPE LINE
- CUT LINE OR POWER LINE CLEARANCE SCAR
- WATER TOWER
- TANK
- POND
- RETAINING WALL
- EARTH DIKES OR BLASTING SHIELDS
- EARTH WORK OR GRADED AREAS
- GATE

SHEET LAYOUT





MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY. MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

400 200 0 400 800 1200 1600 FEET
100 50 0 100 200 300 400 500 METER

GRAPHIC SCALE: 1 in.=400 ft. CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

(8) ANCHOR WEST SITE (9) ANCHOR EAST SITE (16) S-SITE
(22) TD-SITE

4413-K

LOS ALAMOS SCIENTIFIC LABORATORY

MAP 11

CONTOUR MAP SHOWING
LOCATION OF TA-16
OPEN BURNING UNIT
AND TA-16-1150 INCINERATOR

General Revisions, November 1987

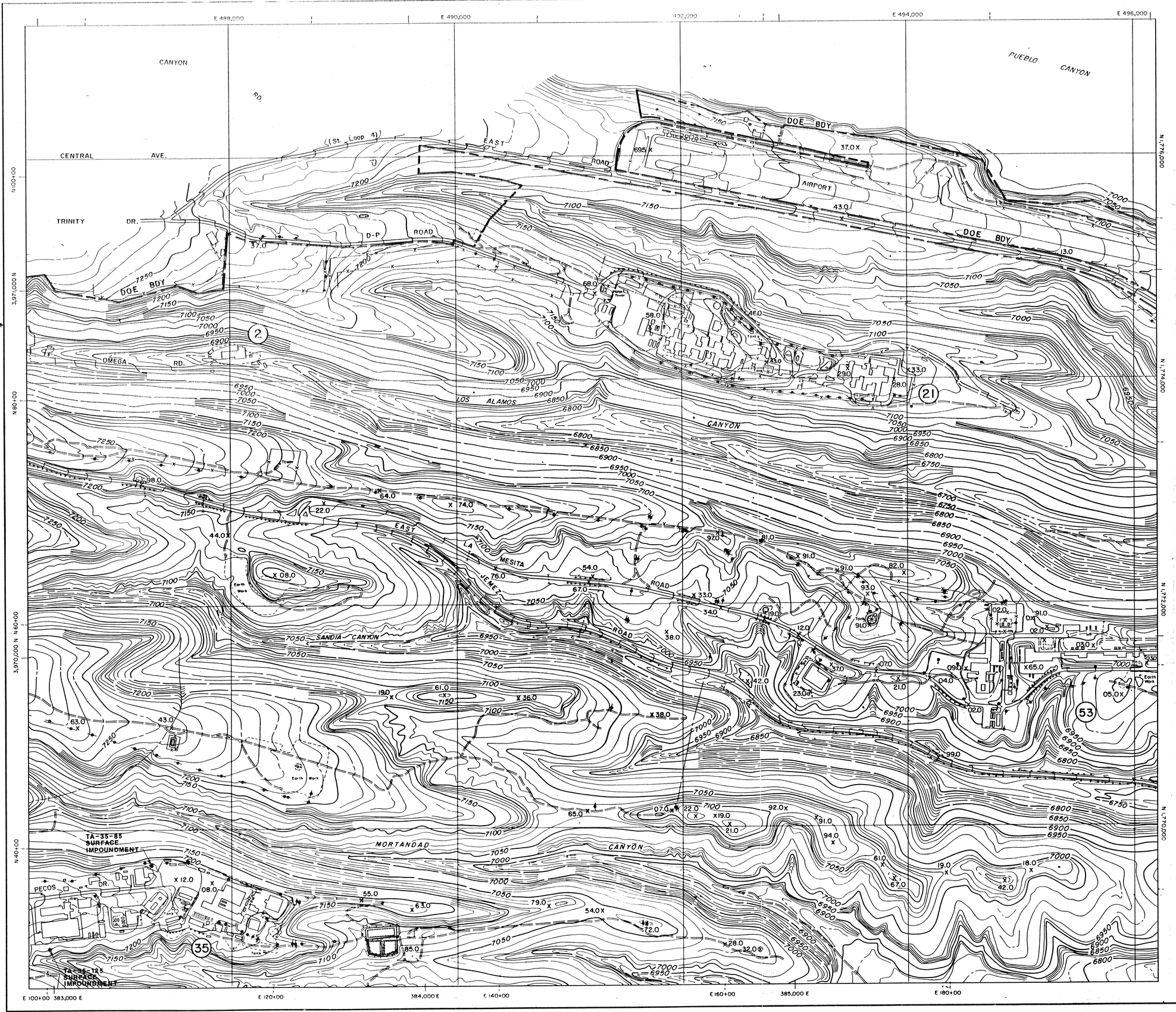
ENG-R 5277

LAB JOB NO. 5682

1"=400' SCALE

PLAN / TOPO

SHEET 2 OF 25

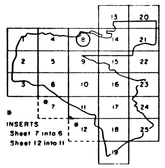


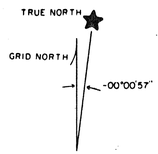
LEGEND

X 93.0	SPOT ELEVATION	N1,768,000	NMSP GRID
6900	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240+00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.		

35	TECHNICAL AREA NO.		TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT	RW	RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth Work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		

SHEET LAYOUT





MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY, MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

400 200 0 400 800 1200 1600 FEET
100 50 0 100 200 300 400 500 METER

GRAPHIC SCALE: 1 in.=400 ft. CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

2 OMEGA SITE
21 DP-SITE
35 TEN SITE
53 MPF-SITE

LOS ALAMOS SCIENTIFIC LABORATORY

SURVEY ENGINEERS, INC.
LOS ALAMOS
NEW MEXICO

MAP 12

CONTOUR MAP SHOWING THE LOCATIONS OF THE TA-35-125 AND TA-35-85 SURFACE IMPOUNDMENTS

4413-L

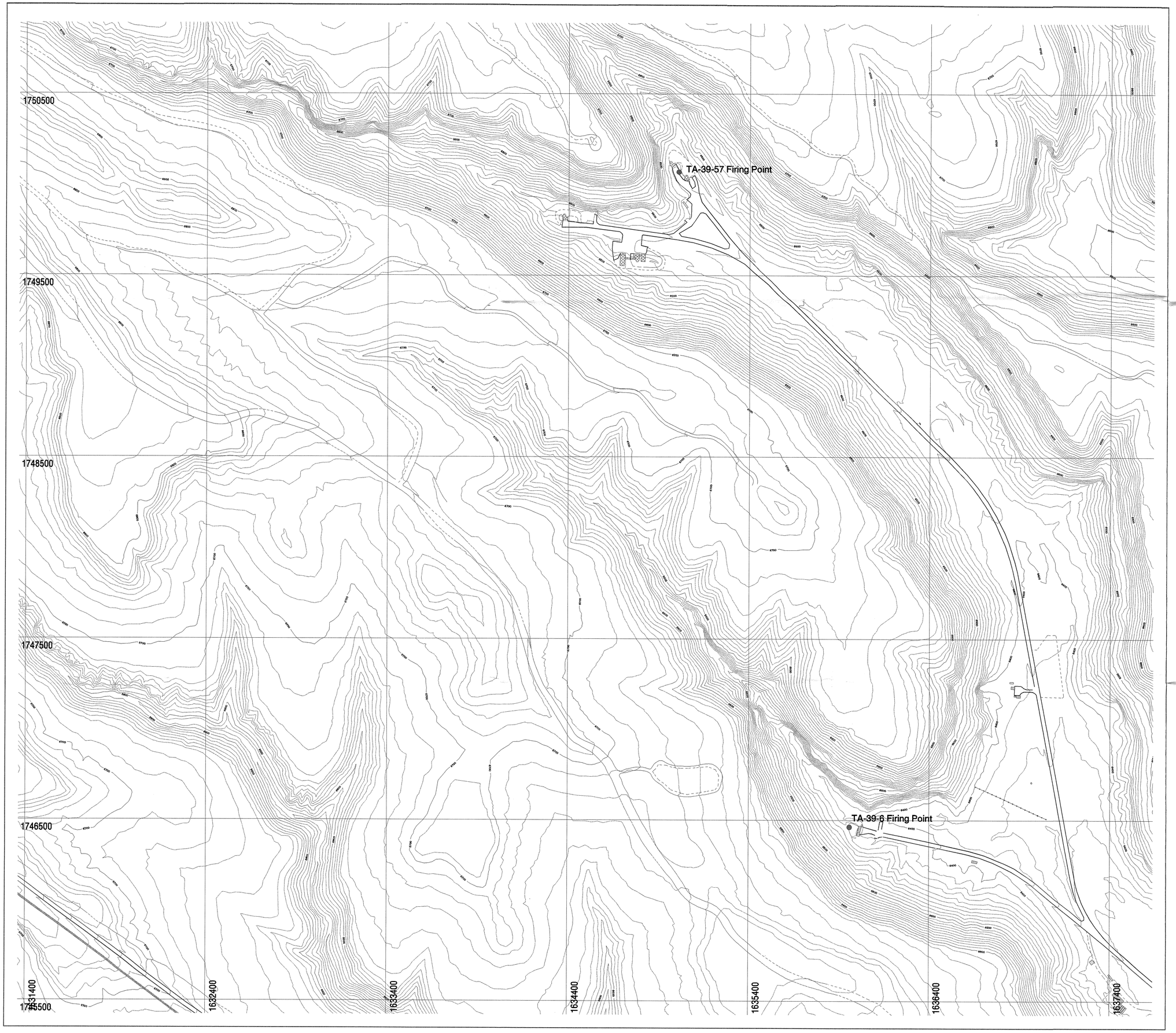
General Revisions, November 1987

LAB JOB NO. 5682

1"=400' SCALE

PLAN / TOPO

SHEET 8 OF 25



LEGEND

- Boundary, LANL
- Boundary, TA
- Contours, 10 foot
- Contours, 100 foot
- Fence, Industrial
- Fence, Security
- Roads, Dirt
- Roads, Paved
- Road/Trail
- Structure, Permanent
- Structure, Temporary
- Structure, Underground
- Firing Point

4413-M

MAP 13:
Contour Map Showing the Locations of the Technical Area (TA) 39 Firing Points

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 1000
Feet per inch on map = 250

SCALE 1:3000

0 76 152 228 304

METERS

0 250 500 750 1000

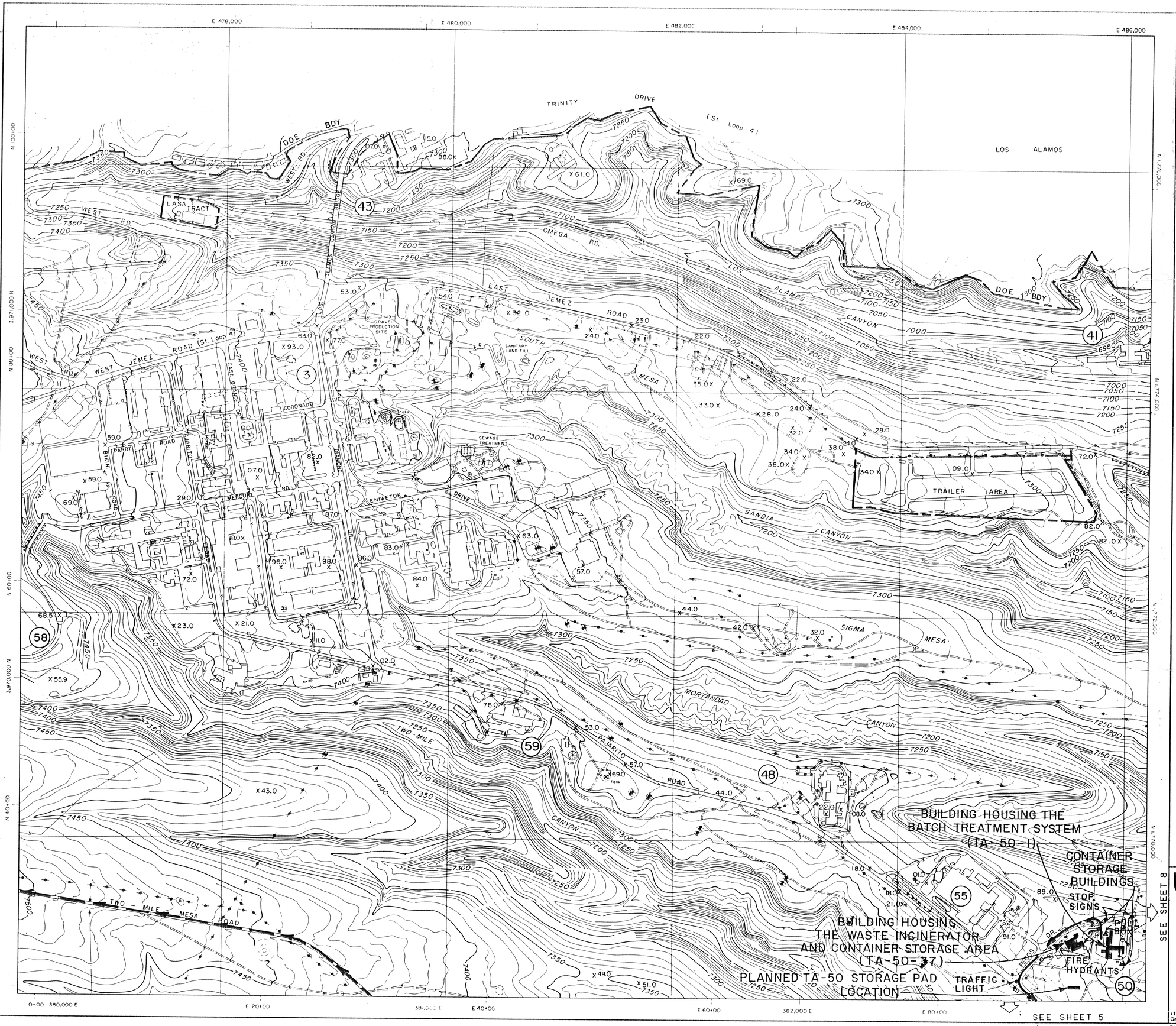
FEET

NOTICE: The information on this map is provisional. Feature locations are dependent on scale and symbology and their accuracy may not have been confirmed. Los Alamos National Laboratory boundary is based on legal description established in 1995. Other boundary, structure, and utility data are from Los Alamos National Laboratory Engineering Division and Los Alamos County Utility and Engineering Departments. Contour data are from Los Alamos National Laboratory Environmental Restoration Project aerial survey, September 1991.

University of California
Los Alamos National Laboratory
Earth and Environmental Sciences Division

FIMAD Facility for Information Management, Analysis, and Display
FIMAD is the electronic data repository for the Environmental Restoration Project at Los Alamos National Laboratory.

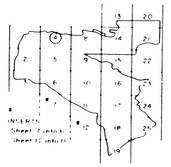
Produced by: Marcia Jones
Date: June 09, 1996 FIMAD Plot ID: G104769



LEGEND

X 93.0	SPOT ELEVATION	N 1,768,000	NMSP GRID
6900	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240+00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.		
35	TECHNICAL AREA NO.		TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD		TANK
	JEEP TRAIL		POND
	CULVERT		RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL		EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		EVACUATION ROUTE

SHEET LAYOUT



NORTH

GRID NMSP NORTH

MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY, MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

GRAPHIC SCALE: 1 in.=400 ft.

CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

- 3 SM–SITE
- 41 W–SITE
- 50 WM–SITE
- 43 HRL–SITE
- 48 RC–SITE
- 58 TWO MILE NORTH–SITE
- 55 PLUTONIUM FACILITY SITE
- 59 OH–SITE

LOS ALAMOS SCIENTIFIC LABORATORY

MAP 14

CONTOUR MAP SHOWING THE LOCATIONS OF THE BATCH TREATMENT SYSTEM AND CONTAINER STORAGE AREA AND THE WASTE INCINERATOR

IT Corporation
General Revisions Nov. 1987

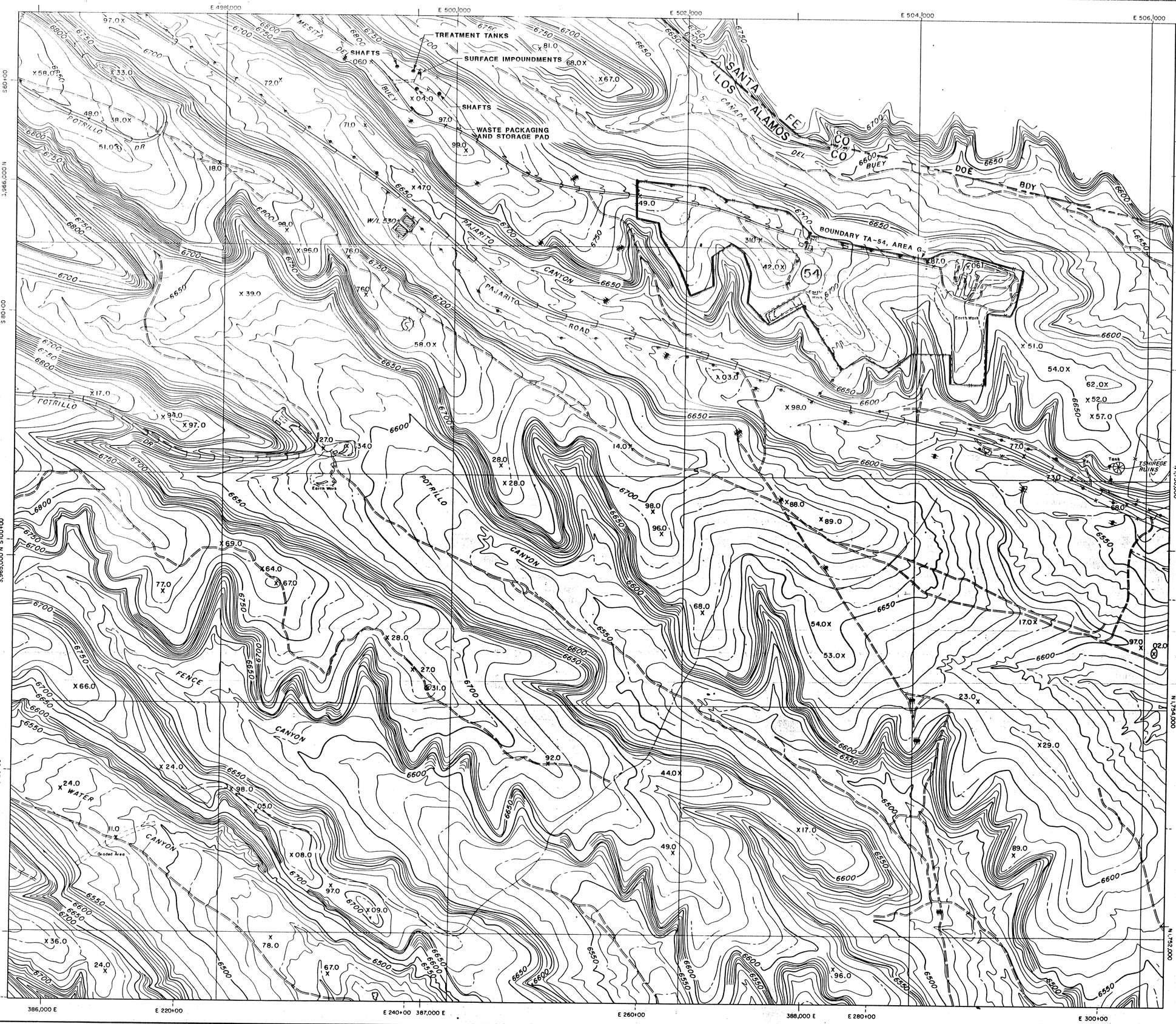
4413-N

LAB JOB NO. 5682

1"=400' SCALE

PLAN / TOPO

SHEET 4 OF 25

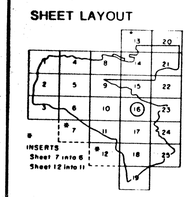


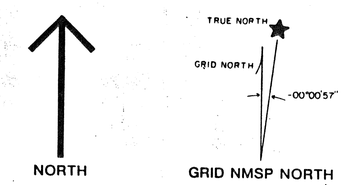
LEGEND

X 93.0	SPOT ELEVATION	N 1,768,000	NMSP GRID
6900	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240+00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.		

35	TECHNICAL AREA NO.		TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT		RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth Work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		

SHEET LAYOUT





MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY, MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

400 200 0 400 800 1200 1600 FEET
100 50 0 100 200 300 400 500 METER

GRAPHIC SCALE: 1 in.=400 ft.

CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

54 MD–SITE

LOS ALAMOS SCIENTIFIC LABORATORY

MAP 15
CONTOUR MAP SHOWING THE LOCATION OF THE TA-54, AREA L TREATMENT TANKS, SURFACE IMPOUNDMENTS, WASTE PACKAGING AND STORAGE PAD, SHAFTS, AND TA-54, AREA G

4413-O

General Revisions, November 1987

LAB JOB NO. 5682
1" = 400' SCALE
PLAN / TOPO
SHEET 16 OF 25

WASTE ANALYSIS PLAN FOR HAZARDOUS AND MIXED WASTE STORAGE AND TREATMENT AT TECHNICAL AREA 55

2.0 FACILITY DESCRIPTION

The information provided in this section is submitted in accordance with the applicable requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), for the following subject areas:

- A general description of the Los Alamos National Laboratory (LANL) facility, including a brief discussion of units at Technical Area (TA) 55 addressed in this permit application [20 NMAC 4.1, Subpart IX, 270.14, revised November 1, 1995]
- Topographic map requirements [20 NMAC 4.1, Subpart IX, 270.14(b)(19), revised November 1, 1995]
- Facility location information for compliance with the seismic standard and floodplain requirements [20 NMAC 4.1, Subpart IX, 270.14(b)(11)(i, ii, and iii), and 270.14(b)(19)(ii), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.18(a), revised November 1, 1995]
- Traffic patterns, volume, and control [20 NMAC 4.1, Subpart IX, 270.14(b)(10), revised November 1, 1995].

2.1 GENERAL DESCRIPTION [20 NMAC 4.1, Subpart IX, 270.14(b)(1) and 270.14(b)(19)(xii)]

LANL is located in Los Alamos County, an incorporated county, in north-central New Mexico, approximately 60 miles (mi) north-northeast of Albuquerque and 25 mi northwest of Santa Fe. The regional location of LANL is shown on Figure 2-1. LANL, which occupies an area of 43 square mi (mi^2), and the associated residential and commercial areas of Los Alamos County, which occupy an area of 109 mi^2, are situated on the Pajarito Plateau. The plateau consists of a series of finger-like mesas separated by deep east-west trending canyons. Ephemeral, or intermittent, streams lie at the bottoms of all the canyons. The mesa tops range in elevation from approximately 7,800 feet (ft) above mean sea level (amsl) at the flank of the Jemez Mountains, located to the west of Los Alamos, to about 6,200 ft amsl at their eastern extent, where they terminate above the Rio Grande Valley.

LANL, a multidisciplinary laboratory owned by the U.S. Department of Energy (DOE), is operated jointly by DOE and the University of California, DOE's management and operating contractor. The principal mission of LANL includes the research, design, development, and analysis of weapons components for the nation's nuclear arsenal. This effort is supported by research

programs such as nuclear physics, hydrodynamics, conventional explosives, chemistry, metallurgy, radiochemistry, and biology. In addition to its defense program efforts, LANL supports energy research and environmental missions with programs including medium-energy physics; space nuclear systems; controlled thermonuclear fusion; laser research; environmental research; geothermal, solar, and fossil energy research; nuclear safeguards; biomedical research; and space physics. In 1992, LANL expanded its mission in support of environmental management to include development of new programs in the areas of health and biotechnology, environmental technologies, and industrial partnerships.

LANL is divided into 49 TAs, 38 of which are developed (Figure 2-2). The hazardous and mixed waste management units addressed in this permit application are located at TA-55 and include the following:

- Seven container storage areas (Areas 1 through 7) in the basement of TA-55, Building 4 (TA-55-4)
- Four container storage areas (Areas 8 through 11) on the first floor of TA-55-4 in Rooms 401, 432, and 433 (TA-55-4-401, TA-55-4-432, and TA-55-4-433)
- One container storage pad located outside near TA-55-4
- One container storage area at TA-55-185
- Two storage tank systems in TA-55-4-401 associated with the evaporator process and cementation unit
- One cementation unit in TA-55-4-401.

Other hazardous and/or mixed waste management units located at or planned for construction at LANL (see Figure 2-2) include the following:

- Units that are permitted for hazardous waste storage and treatment
- Hazardous and mixed waste storage and treatment units that operate under standards pursuant to 20 NMAC 4.1, Subpart VI, revised November 1, 1995.

Units that are permitted for hazardous waste storage and treatment include the following:

- Container storage areas and treatment/storage tanks at TA-54, Area L.
- The controlled air incinerator and associated storage areas at TA-50-37.
- An industrial incinerator at TA-16.

Units that have received conditional approval for mixed waste storage include:

- Container storage areas for transuranic (TRU) mixed waste at TA-54, Area G. These container storage areas include storage domes designated TA-54-226, TA-54-229, TA-54-230, TA-54-231, and TA-54-232, and Storage Pads 2 and 4.

Units that are operating under the requirements of 20 NMAC 4.1, Subpart VI, revised November 1, 1995, for hazardous and mixed waste storage and treatment include the following:

- Thermal treatment units for open burning/open detonation of high-explosive waste at TA-14, TA-15, TA-16, TA-36, and TA-39.
- Container storage areas and storage tanks for hazardous and/or mixed waste located at TA-3, TA-16, TA-21, TA-50, and TA-54.
- Surface impoundments for storage of mixed waste at TA-53.
- A mixed waste treatment unit (waste solidification/cementation) at TA-50-1.
- An oxygen sparging unit in TA-55-4-429 for treatment of mixed waste. This unit has undergone closure pursuant to 20 NMAC 4.1, Subpart VI, revised November 1, 1995, and is pending final closure approval.
- Container storage areas for mixed waste at the Radioassay and Nondestructive Testing Facility (TA-54-38), formerly the Nondestructive Assay/Nondestructive Examination Facility, at TA-54 West.

Units that have been closed pursuant to 20 NMAC 4.1, Subpart VI, revised November 1, 1995, include the following:

- Two of four treatment/storage tanks at TA-54, Area L.
- A thermal treatment unit (the Scrap Detonation Site) at TA-40.
- The Batch Waste Treatment Unit at TA-50-1.

There are one existing and one planned hazardous/mixed waste decontamination areas at LANL. A centralized Decontamination Facility at TA-50 is used for cleanup of equipment, some of which is associated with hazardous and mixed waste operations. One decontamination area in the facility is located in Room 34B in the south wing of TA-50-1. TA-50-1-34B is a high bay that can accommodate equipment of all sizes, including heavy equipment. TA-50-1 is shown on Maps 1 and 5 of this section. A decontamination area was established at the Drum Prep Facility (DPF) at TA-54, Area G, during an upgrade of that facility, which was completed in 1995. This area will be used for drum cleaning, cleanup of equipment associated with drum venting and characterization activities at TA-54, Area G, and for general site activities. The decontamination area in the DPF is large enough to accommodate large earth-moving equipment. The location of the DPF (TA-54-33) is shown on Map 7 of this section.

2.1.1 TA-55 Waste Management Units

TA-55 is located on a finger mesa between a branch of Mortandad Canyon on the north and Two Mile Canyon on the south. Mesa-top elevations at TA-55 range from approximately 7,100 to 7,300 ft amsl. The locations of the units at TA-55 addressed in this Part B permit application are shown on Figure 2-3 of this section and on Map 2 of Revision 1.0 of the TA-55 Part A permit application (LANL, 1996).

TA-55 treats liquid mixed waste and stores solid and liquid hazardous waste and mixed waste. TA-55 is a plutonium-processing facility, which began operating in 1978. Plutonium processing and related activities occur in TA-55-4, which is the largest building at TA-55. The units addressed in this application are located at TA-55-4 and in the vicinity of TA-55-4 (Figure 2-3). A brief discussion of the units, their locations, and wastes managed at each unit is provided in the following paragraphs.

As described in Section 2.1, 13 container storage areas at TA-55 are addressed in this permit application. As provided in 20 NMAC 4.1, Subpart I, 260.10, revised November 1, 1995, the definition of "container" is "any portable device in which a material is stored, transported, treated, disposed of, or otherwise handled." Eleven of the 13 container storage areas are located in TA-55-4. Areas 1 through 7 are in the basement of TA-55-4 and Areas 8 through 11 are located on the first floor of TA-55-4. The types of wastes managed at these container storage areas are summarized as follows:

Unit(s)	Waste Types Stored
Areas 1 through 5	Hazardous waste, TRU mixed waste, and low-level mixed waste
Area 6	TRU mixed waste
Area 7	Hazardous waste, TRU mixed waste, and low-level mixed waste
Areas 8, 9, and 10	TRU mixed waste and low-level mixed waste
Area 11	TRU mixed waste

A container storage pad, located outside and west of TA-55-4 (Figure 2-3), is used to store hazardous waste, TRU mixed waste, and low-level mixed waste. The remaining container storage area is located in TA-55-185, a building located west of TA-55-4 (Figure 2-3). This building may be used to store hazardous waste, TRU mixed waste, and low-level mixed waste. The container storage areas may also be used to store nonwaste items.

The two storage tank systems addressed in this permit application are located in TA-55-4-401. The storage tank systems manage TRU mixed waste associated with the evaporator process and the cementation unit, which are also located in TA-55-4-401. The cementation unit located in TA-55-4-401 also manages TRU mixed waste.

2.1.2 Topographic Maps [20 NMAC 4.1, Subpart IX, 270.14(b)(19)]

Due to the size of LANL and the number of waste management units addressed in this permit application, several maps and figures are provided to meet the requirements of 20 NMAC 4.1, Subpart IX, 270.14(b)(19), revised November 1, 1995. All maps clearly show a map scale, the date of preparation, and a north arrow. The maps and figures used to fulfill these regulatory requirements include the following:

- The locations of the hazardous and mixed waste management units at TA-55 addressed in this permit application are shown on Map 2 of Revision 1.0 of the TA-55 Part A permit application.
- A LANL-wide 100-year floodplain map is provided on page 36 of the report included as Appendix A.

- Surface waters, including intermittent streams, are shown on Map 3 of Revision 1.0 of the TA-55 Part A permit application.
- Surrounding land uses are shown on Figure 2-1 of this section.
- Wind roses for LANL are shown on Figures 2-4 and 2-5 of this section.
- The legal boundaries of LANL are shown on Map 1 of Revision 1.0 of the TA-55 Part A permit application.
- Access control features (e.g., fences, gates) are shown on Figure 5-1 in Section 5.0 of this Part B permit application.
- Well locations are shown on Map 3 of Revision 1.0 of the TA-55 Part A permit application.
- Buildings and structures at TA-55 are shown on Map 2 of Revision 1.0 of the TA-55 Part A permit application.
- Natural surface drainages at TA-55 are shown on Map 2 of Revision 1.0 of the TA-55 Part A permit application.
- Access ways and internal roads are shown on Figure 2-6 of this section.

Map 1 of Revision 1.0 of the TA-55 Part A permit application is a topographic map at a scale of 1 inch (in.) = 3,000 ft. Map 2 of Revision 1.0 of the TA-55 Part A permit application is at a scale of 1 in. = 200 ft. Contour lines on Map 2 are in intervals of 10 ft, which are sufficient to detail natural drainage in the vicinity of the waste management units. As provided in 20 NMAC 4.1, Subpart IX, 270.14(b)(19), revised November 1, 1995, LANL requests that the New Mexico Environment Department (NMED) accept the maps at these scales and contour intervals due to the size of the waste management units, the extent of the LANL facility, and the topographic relief in the area.

Map 2 of Revision 1.0 of the TA-55 Part A permit application shows the locations and surrounding topography of the hazardous and mixed waste units at TA-55. Maps 1, 3, 4, and 5 are also included in Revision 1.0 of the TA-55 Part A permit application to satisfy the requirements of 20 NMAC 4.1, Subpart IX, 270.13(l), revised November 1, 1995. To meet the requirements of 20 NMAC 4.1, Subpart IX, 270.14(b)(19)(xii), revised November 1, 1995, topographic maps showing the locations of all the hazardous and mixed waste units and subunits at additional LANL locations are included in this section as Maps 1–15.

2.1.3 Wells and Surface Waters [20 NMAC 4.1, Subpart IX, 270.14(b)(19)(iii) and (ix)]

The municipal and industrial water supply for LANL and Los Alamos County is supplied by 11 deep wells in three well fields. The wells are located on the Pajarito Plateau and in canyons east of LANL. Water is pumped from the main aquifer, the surface of which ranges from approximately 600 to 1,200 ft below the surface of the plateau. The locations of supply wells, monitoring wells, test wells, springs, and surface-water sampling stations are shown on Map 3 of Revision 1.0 of the TA-55 Part A permit application. Surface water on LANL property is limited primarily to ephemeral, or intermittent, streams in the canyon bottoms. The volume of water flow in these streams is generally dependent upon storm runoff, snow melt, and numerous National Pollutant Discharge Elimination System (NPDES) outfalls discharging treated sanitary and industrial effluents. Perennial surface flow occurs in the Rito de los Frijoles south of LANL and in Santa Clara Canyon north of LANL. Springs on the flanks of the Jemez Mountains between elevations of 7,900 and 8,900 ft supply base flow throughout the year to the upper reaches of Cañon de Valle and in Guaje, Los Alamos, Pajarito, and Water Canyons (Purtymun, 1975). The flow volume from the springs is insufficient to maintain surface flow within more than the western third of the canyons before it is depleted by evaporation, transpiration, and infiltration into the underlying alluvium. Surface, well, and spring waters are sampled routinely and analyzed for radionuclides as well as organics (volatiles, semivolatiles, pesticides, herbicides, and polychlorinated biphenyls), heavy metals, fluorides, nitrates, carbonates, bicarbonates, silica, sodium, magnesium, and conductivity. Analytical results are published annually by LANL's Environmental Assessments and Resource Evaluations Group (ESH-20) (LANL, 1994b). Copies of this publication are submitted annually to the NMED and the U.S. Environmental Protection Agency (EPA), Region 6, Administrator.

LANL has one geothermal well at TA-57, the Fenton Hill Geothermal Site, approximately 20 air mi west of Los Alamos. An NPDES-permitted industrial outfall for geothermal discharge is located at this site. This industrial outfall is designated NPDES Serial No. 001. The Fenton Hill Geothermal Site is shown on Map 5 of Revision 1.0 of the TA-55 Part A permit application. Locations of all NPDES-permitted outfalls within the LANL boundary are provided on Map 4 of Revision 1.0 of the TA-55 Part A permit application.

2.1.4 Wind Rose [20 NMAC 4.1, Subpart IX, 270.14(b)(19)(v)]

Surface winds are light at Los Alamos, averaging 7 mi per hour (mph), or 3 meters per second (m/s). Typically, winds are strongest from March through May and weakest in December and January. The strongest winds are generally southwesterly to northwesterly and occur in the afternoon or evening. Night winds are usually west-northwesterly at the western edge of the Pajarito Plateau because of persistent cold air drainage down the plateau. Daytime winds are generally southeasterly to southwesterly, caused by upslope and up-valley winds. Daytime winds are also frequently westerly during the windy season (i.e., March through May).

Mean, annually averaged wind directions are plotted in wind roses at four sites (shown on Figures 2-4 and 2-5). Annually averaged daytime wind roses are depicted on Figure 2-4. Nighttime wind roses are shown on Figure 2-5. Day and night are defined by the times of sunrise and sunset. A wind rose is a circle with bars extending from the center, representing the direction from which the wind blows. The length of each bar is proportional to the wind-direction frequency. Each direction is 1 of 16 primary compass points (e.g., N, NNE) and is centered on a 22.5-degree-wide sector. The wind directions were taken at a height above ground of about 36 ft (11 meters [m]) at four stations: TA-6; TA-49; TA-53; and TA-54/White Rock. The wind direction at 300 ft (92 m) is also given for TA-6. The wind rose for this height is in the far upper-left corner of Figures 2-4 and 2-5. The numbers in the center of each wind rose represent the percent frequency of calm winds (i.e., winds less than 1 mph). Conditions at TA-55 are expected to most closely resemble those observed at TA-6, because TA-55 is located immediately adjacent to and east of TA-6.

Los Alamos surface winds often vary dramatically with time of day, location, and height above ground because of the complex terrain. On sunny days, thermally driven (convective) upslope winds develop over the Pajarito Plateau. Upslope winds are generally light, less than 6 mph (3 m/s). Winds usually become more south-southwesterly and southerly at locations toward the Rio Grande Valley, where a larger-scale, thermally driven up-valley wind predominates.

When sky conditions are clear and large-scale winds are light, locally produced winds reverse at night. At sunset, shallow drainage winds from the north to the northwest flow down the plateau, especially near the Jemez Mountains and in other areas with a greater slope. These winds can reach speeds of 6 to 8 mph (3 to 3.5 m/s).

2.1.5 Land Use [20 NMAC 4.1, Subpart IX, 270.14(b)(19)(iv)]

Los Alamos County, an incorporated county, encompasses several residential areas. The residential areas located closest to LANL are Los Alamos, located just north of LANL; White Rock, located east-southeast of LANL; and a trailer park within TA-61, which is located near the north-central boundary of LANL. According to 1992 University of New Mexico Bureau of Business and Economic Research data, the total population of Los Alamos County is approximately 18,200. Most of Los Alamos County, as well as adjoining portions of neighboring Sandoval, Rio Arriba, and Santa Fe Counties, is undeveloped. The only significant developments in Los Alamos County are the LANL facilities and the associated residential and commercial areas. Large tracts of land in the Jemez Mountains, west of LANL in Los Alamos County, are held by the U.S. Forest Service (i.e., Santa Fe National Forest) and the National Park Service (i.e., Bandelier National Monument) (Figure 2-1). This land is largely covered by piñon and ponderosa pine, juniper, fir, and aspen forests. Horticulture in the vicinity of LANL is limited to home gardens. In the river valleys to the east, agriculture is limited to the cultivation of relatively small irrigated plots. Primary crops are corn, chili, tree fruits, and alfalfa.

2.2 LOCATION INFORMATION

2.2.1 Seismic Standard [20 NMAC 4.1, Subpart IX, 270.14(b)(11)(i and ii) and 20 NMAC 4.1, Subpart V, 264.18(a)]

TA-55 is in compliance with the seismic standards of 20 NMAC 4.1, Subpart IX, 270.14(b)(11), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.18(a), revised November 1, 1995. A geologic field investigation, which consisted of exploratory trenching, was conducted within 3,000 ft of TA-55-4 and TA-55-185 during the fall of 1992 and summer of 1993. Based on trench stratigraphy, no evidence of Holocene faulting was observed (Woodward-Clyde Federal Services, 1995).

2.2.2 Floodplain Standard [20 NMAC 4.1, Subpart IX, 270.14(b)(11)(iii) and 270.14(b)(19)(ii)]

In accordance with 20 NMAC 4.1, Subpart IX, 270.14(b)(11)(iii), revised November 1, 1995, the hazardous and mixed waste units addressed in this permit application are not located within the 100-year floodplain boundary. As required in "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515" (EPA, 1990; EPA, 1994a), LANL has mapped all 100-year floodplain boundaries within the LANL complex.

A report was published documenting the floodplain mapping procedures (McLin, 1992). This report is included as Appendix A. A LANL-wide 100-year floodplain map is provided on page 36 of that report. Individual floodplain boundary location maps are being finalized that will supplement the floodplain report. The floodplain boundary maps will reside on LANL's computer-based Autometric™ Geographic Information System—Mapping Overlay Statistical System, a graphic information system database.

2.2.3 Soils

A comprehensive soil survey of Los Alamos County was prepared by Nyhan et al. (1978). This soil survey classifies the soils according to the soil series, soil type, and soil phase.

The principal parent materials of about 95 percent of the Los Alamos County soils are Bandelier Tuff, volcanic rocks of the Tschicoma Formation, volcaniclastic sedimentary rocks of the Puye Formation, basaltic rocks of Chino Mesa, and remnants of the El Cajete pumice. The remaining five percent of the soils were formed from colluvium, alluvium, andesitic rocks of the Paliza Canyon Formation, Cerro Rubio quartz latites, and tuffs associated with sediments of Cerro Toledo rhyolite. Textures of these soils range from very fine sandy loams (SM) and clay loams (CL) to gravelly, SM and stony, silty CL.

The soils at TA-55 are Carjo and Tocal series soils. The Carjo series consists of moderately deep, well-drained soils that formed in material weathered from tuff. The Carjo soil is classified in the Unified Soil Classification System (USCS) as clay-loam, loam (CL-ML). The top layer of the Carjo series consists of a grayish brown loam (ML), or very fine SM, approximately 10 centimeters (cm) thick. The subsoil is a brown to reddish brown CL and clay (CH) approximately 40 cm thick. The substratum, approximately 10 cm thick, is a light brown, very fine SM (Figure 2-7). Permeability rates range from 1.5 to 5.0 cm per hour (cm/hr) in the top layers to 0.15 to 5.0 cm/hr in the lower layers. The shrink-swell potential is low in the top and bottom layers and moderate in the middle layers. Available water holding capacity ranges from 0.14 to 0.21 cm per cm (cm/cm), and the soil pH is 6.3 to 7.8. Native vegetation for this soil type is mainly blue and black grama and ponderosa pine (Nyhan et al., 1978).

The Tocal series consists of very shallow to shallow, well-drained soils that formed in material weathered from tuff on gently to moderately sloping mesa tops. The Tocal soil is classified in the

USCS as very fine SM. The top layer of the Tocal series consists of a grayish brown, very fine SM, SM, or ML, approximately 10 cm thick. The subsoil is a reddish brown CL or CH, approximately 15 cm thick. The substratum is a light brown silt ML, about 5 cm thick (Figure 2-8). Permeability rates range from 1.5 to 15 cm/hr in the upper layers to 0.5 to 5 cm/hr in the lower layers. The shrink-swell potential is low in the upper layers, moderate in the middle layers, and low in the lower layers. Available water holding capacity ranges from 0.11 to 0.21 cm/cm, and the soil pH is 6.6 to 7.3. Native vegetation for this soil type is mainly ponderosa pine, mountain mahogany, and Kentucky bluegrass (Nyhan et al., 1978).

2.2.4 Geology

2.2.4.1 Regional Geology

The discussions of the regional geology, stratigraphy, structural geology, and ground water were extracted primarily from LANL's "Installation Work Plan for Environmental Restoration" (IWP) (LANL, 1993b). The IWP has been prepared in accordance with the Hazardous and Solid Waste Amendments Module VIII requirements of LANL's Hazardous Waste Facility Permit (New Mexico Environmental Improvement Division, 1989). One of the major components of the IWP is an installation description that provides information on current environmental conditions at LANL. The IWP is updated annually and submitted to the NMED.

LANL is located on the Pajarito Plateau along the eastern flank of the Jemez Mountains, which are part of the Jemez volcanic field. The Jemez volcanic field consists of approximately 432 cubic mi of volcanic rocks that cover an area of over 30 mi east to west and 50 mi north to south. The volcanic rocks were erupted from numerous vents, including a large multistage caldera (Gardner et al., 1986). The Jemez volcanic field (Figure 2-9) is located at the intersection of the Jemez lineament and the Rio Grande rift (Aldrich, 1986).

About 1.5 and 1.13 million years ago, respectively, two major volcanic eruptions in the Jemez Mountains produced widespread and voluminous ash-flow sheets. These ash-flow sheets are the Otowi and Tshirege Members of the Bandelier Tuff (Smith and Bailey, 1966; Spell et al., 1990). The Pajarito Plateau morphology is dominated by a gently eastward-sloping surface dissected by numerous steep-sided canyons. The Otowi and Tshirege Members of the Bandelier Tuff were erupted concomitantly with the collapse of the Toledo and Valles calderas, respectively. Volcanism continued after the formation of the calderas, as evidenced by the extrusion of domes

along ring fractures. The El Cajete pumice and Banco Bonito rhyolite flow comprise the latest eruption in the Jemez Mountains. This eruption occurred about 130,000 years ago (Gardner et al., 1986; Self et al., 1988). Solfataric and hot spring activity continue as vestiges of volcanic activity today, both within and outside of the Valles caldera (Goff et al., 1989).

The Pajarito Plateau is located in the western part of the Española basin of the Rio Grande rift, a major tectonic feature of the western United States. The eastern margin of the Española basin lacks distinct major faults, but faults of major vertical offset may exist within Precambrian rocks of the Sangre de Cristo uplift (Vernon and Riecker, 1989; Biehler et al., 1991). A prominent zone of major faults, which cuts Miocene to Quaternary rocks of the Jemez volcanic field, characterizes the western margin of the Española basin (Smith et al., 1970; Gardner and Goff, 1984; Goff et al., 1990). The location and development of the Jemez volcanic field was strongly influenced by these border faults (Gardner and Goff, 1984; Gardner et al., 1986).

Rocks exposed around the margins of and underlying the Española basin were deposited prior to the development of the Rio Grande rift. These rocks consist of Mississippian to Permian marine limestones, sandstones, and shales; Mesozoic marine to terrestrial sandstones and shales; and Eocene sandstones, shales, and freshwater limestones. Precambrian quartzite, granitic gneiss and schist, and greenstone are exposed in the cores of the flanking Sangre de Cristo, Nacimiento, and Brazos uplifts (Kelley, 1978) (Figure 2-9). Earliest sediments deposited in the Española basin are those of the Tertiary Abiquiu, Picuris, and Los Piños Formations. These formations consist of tuffaceous sandstones and volcaniclastic conglomerates derived largely from volcanic highlands to the north and northeast. They range in age from about 28 to 17 million years old (Baldridge et al., 1980; May, 1984; Ingersoll et al., 1990).

2.2.4.2 Site-Specific Geology

TA-55 is located in the central part of the Pajarito Plateau (Figure 2-10), which forms an apron of volcanic and sedimentary rocks around the eastern flanks of the Jemez Mountains. The plateau is aligned approximately north-south and is about 20 to 25 mi long and 5 to 10 mi wide. It is bounded on the east by White Rock Canyon (which contains the Rio Grande), on the north and northeast by the Puye escarpment, and on the west by Sierra de los Valles. The Pajarito Plateau slopes gently eastward from an elevation of about 7,500 ft near the mountains toward the Rio Grande, where it terminates at an elevation of about 5,400 ft in steep slopes and cliffs formed

by downcutting of the river. The plateau has been dissected into a number of narrow mesas by southeastward-trending streams. The stratigraphy and structural features of the Pajarito Plateau are described in the following sections.

2.2.4.2.1 Stratigraphy

The mesas of the Pajarito Plateau, comprised primarily of Bandelier Tuff, are covered by a veneer of soils and alluvial deposits and are underlain by a sequence of sedimentary and volcanic rocks typical of a terrain produced by concurrent sedimentation and volcanism (Figure 2-11). The oldest unit exposed around the margins of the Pajarito Plateau and penetrated by water-supply wells is the Miocene and early Pliocene age Santa Fe Group. The Santa Fe in this area is a thick series of terrestrial conglomerates, sandstones, and mudstones, with minor limestones, evaporites, volcanic tuffs, and intercalated basalts. Most production from water wells at Los Alamos is from the Santa Fe Group (Griggs and Hem, 1964; Purtymun, 1984). Sedimentary rocks usually dominate the Santa Fe, although basalts constitute up to 45 percent of the section penetrated by water-supply wells at LANL (Purtymun et al., 1984). In the Española basin and underlying the northern part of Los Alamos County, the Santa Fe is subdivided into two formations, the Tesuque and the Chamita. Several members of the Tesuque and Chamita Formations reflect the diversity of the coalesced alluvial fans deposited in the Española basin (Galusha and Blick, 1971; Ingersoll et al., 1990). Early investigators inferred that all Santa Fe rocks exposed around the flanks of the Pajarito Plateau and intersected by water-supply wells beneath the plateau belonged to the Tesuque Formation, although more recent investigations suggest that some of the upper Santa Fe is Chamita Formation (Turbeville et al., 1989).

Interfingering with the Santa Fe Group are the volcanic rocks of the Tschicoma Formation. This formation consists of a sequence of dacitic domes and lavas that were erupted from vents in the central to northeastern Jemez Mountains between about 7 and 3 million years ago (Gardner et al., 1986). These volcanic rocks outcrop extensively in the mountains immediately west of LANL. They are reported in the subsurface beneath the western and southern part of the LANL boundary (Weir and Purtymun, 1962; Griggs and Hem, 1964; Dransfield and Gardner, 1985).

Overlying the Santa Fe Group and interfingering with the Tschicoma Formation are the rocks of the Puye Formation. The Puye consists of a Pliocene-to-Pleistocene fanglomerate that was shed

eastward from Tschicoma volcanic centers in the northeastern Jemez volcanic field between about 4 and 1.7 million years ago. Earlier workers (e.g., Griggs and Hem, 1964) included the Totavi Lentil, now considered a separate formation, as part of the Puye. Most of the Puye conglomerates contain cobbles of dacite and andesite in a volcanic sand matrix. The Puye includes stream-flow deposits, debris-flow deposits, volcanic-ash and block-flow deposits, and ash-fall and pumice-fall deposits (Waresback and Turbeville, 1990). It is best exposed north of LANL; however, lithologically similar rocks have been penetrated in drill holes as far south as Frijoles Mesa (Weir and Purtymun, 1962; Dransfield and Gardner, 1985). The Puye is interstratified with basalts of the Cerros del Rio volcanic field under parts of LANL. In Los Alamos water-supply wells, the top of the main aquifer is usually within the Puye.

Immediately beneath the fanglomerates of the Puye Formation and unconformably overlying the Santa Fe Group is a section of poorly consolidated fluvial gravels. Griggs originally named this unit the Totavi Lentil of the Puye Formation (Griggs and Hem, 1964). The gravels contain clasts that differ lithologically from those in the Puye, including abundant well-rounded cobbles and boulders of quartzite, granite, and pegmatite that record a source area distant from the Jemez Mountains. This unit probably represents axial channel gravels of an ancestral Rio Grande. Waresback and Turbeville (1990) redefined these fluvial gravels as a separate formation, the Totavi Formation. The Totavi includes lacustrine sediments that are complexly interstratified with the upper Puye Formation. The Totavi was reported in some water-supply wells beneath LANL between the Santa Fe and the Puye, occurring at lower elevations in the eastern wells (Cooper et al., 1965; Purtymun et al., 1983; Purtymun et al., 1984). The presence of the Totavi at these levels suggests that river gravels of the Rio Grande were deposited on erosional surfaces. This setting is analogous to Quaternary terraces of the Rio Grande in the Española basin described by Dethier et al. (1988) before deposition of the Puye fans, which unconformably overlie older formations.

Overlying and interfingering the Totavi and Puye Formations are the basaltic flows, breccias, and scoria of the Cerros del Rio basalts. This formation occurs in the subsurface beneath much of the Pajarito Plateau (Dransfield and Gardner, 1985) and outcrops in the east and southeast parts of Los Alamos County (Griggs and Hem, 1964). These volcanic rocks are associated with the Pliocene-to-Pleistocene Cerros del Rio basalt field, east of the Rio Grande. Rocks from this field have been dated at 4.6 to 2.0 million years old (Gardner et al., 1986), and the youngest lava

flows occurred between 1.5 and 1.13 million years ago. Part of this volcanic field is also known as the basaltic rocks of Chino Mesa (Griggs and Hem, 1964). The top of the main aquifer beneath LANL is locally within this section of basaltic rocks.

In the subsurface beneath much of the Pajarito Plateau and in outcrops in many of the canyons, the Otowi Member of the Bandelier Tuff underlies the Tshirege Member (Griggs and Hem, 1964). The Otowi Member is mostly a nonwelded ash-flow tuff (ignimbrite) that was erupted from the Jemez Mountains approximately 1.5 million years ago (Spell et al., 1990). It is highly porous, poorly indurated, and composed of multiple flow units. Cooling joints are typically absent in outcrops because of relatively low emplacement temperatures and the lack of induration. Generally the Guaje Pumice Bed occurs at the base of the Otowi Member. The Guaje consists of sorted pumice fragments that average from 0.8 to 1.6 in. in size (Crowe et al., 1978). An interbedded sequence of rhyolitic tuffs and sediments commonly occurs between the Otowi and Tshirege Members of the Bandelier Tuff. The rhyolitic tuffs were erupted between 1.5 and 1.2 million years ago, predominantly from the Cerro Toledo domes in the northeastern Jemez Mountains (Heiken et al., 1986). Beneath the Pajarito Plateau, the sediments are epiclastic sands and sandy gravels that lithologically resemble Puye Formation fanglomerates. Deposits in this interval at LANL have sometimes been referred to as "Tsankawi pumice" or the "Tsankawi member."

The Tshirege Member of the Bandelier Tuff is the most widespread rock unit on the Pajarito Plateau (Griggs and Hem, 1964). The Tshirege was erupted from the Valles caldera about 1.13 million years ago (Spell et al., 1990). It is composed of multiple flow units of crystal-rich ignimbrite, which display significant variations in welding and alteration, both in a single stratigraphic section and with varying distance from the caldera. To the west, individual units tend to be thicker and more welded. Flow units are locally separated by volcanic surge deposits of well-sorted, fine-grained, cross-bedded crystal and pumice fragments. Vapor-phase alteration occurs in much of this unit. Often the base of the Tshirege is marked by 1.5 to 10 ft of bedded, unconsolidated, pumice-rich ash-fall tuff of Tsankawi pumice (Bailey et al., 1969; Crowe et al., 1978). In ash-flow tuffs, cooling joint spacing varies primarily with the thickness of the unit, emplacement temperature, substrate temperature, and topography. Joint density tends to be greatest in welded tuff and least in nonwelded tuff. Hydraulic conductivities are generally greatest

in the fractured, welded parts of ash flow tuffs and least in the nonwelded parts (Crowe et al., 1978).

2.2.4.2.2 Structural Geology

The Pajarito fault system forms the western margin of the Española basin. This fault system exhibits Holocene movement and historic seismicity (Gardner and House, 1987; Gardner et al., 1990). The fault system is made up of over 65 mi of mapped fault traces. It connects with regional structures that extend at least as far as Cochiti to the south and Taos to the northeast (Gardner and House, 1987).

Within Los Alamos County, the Pajarito fault system consists of a number of active or potentially active faults, including the Pajarito, Rendija Canyon, and Guaje Mountain faults (Figure 2-12). The Pajarito fault is a zone of faulting that is greater than 0.25 mi wide. Its major scarp forms the western boundary of LANL. Near the southwestern corner of LANL's boundary, the major scarp of the Pajarito fault is over 410 ft high in rocks about 1 million years old. Movement on this fault is normal-oblique. The eastern side of the fault is relatively downdropped. Where exposed north of Los Alamos Canyon, the Rendija Canyon and Guaje Mountain faults are characterized by zones of gouge and breccia ranging from 100 to 150 ft wide. The Rendija Canyon and Guaje Mountain faults produce visible offsets of stratigraphic horizons; both are dominantly normal-oblique faults whose west sides are downdropped. Some strike-slip movements on the Guaje Mountain fault have been noted (Wachs et al., 1988; Aldrich and Dethier, 1990; Gardner et al., 1990). The youngest movements on the Guaje Mountain fault have been constrained between roughly 4,000 and 6,000 years (Gardner et al., 1990). Displacement on the Guaje Mountain and Rendija Canyon faults apparently decreases south of Los Alamos Canyon, where narrow zones of faulting are replaced by over 300-ft-wide zones of intense brecciation and fracturing superimposed on the network of cooling joints in the Bandelier Tuff (Vaniman and Wohletz, 1990).

A variety of data have been integrated to produce structure contour and paleogeologic maps of the pre-Bandelier Tuff surface beneath the Pajarito Plateau (Dransfield and Gardner, 1985). These maps indicate that subsurface rock units are cut by a series of down-to-the-west normal faults. However, the overlying Bandelier Tuff is not obviously displaced by these buried faults.

Detailed fracture studies have shown that fracture abundances and apertures increase in the Bandelier Tuff over some of the buried fault projections (Vaniman and Wohletz, 1990).

2.2.5 Ground Water

In the Los Alamos area, ground water occurs in three modes: (1) water in shallow alluvium in some of the larger canyons, (2) as perched water (a ground-water body above a less permeable layer that separates it from the underlying main aquifer by an unsaturated zone), and (3) the main aquifer of the Los Alamos area.

Alluvium in canyons that head on the Pajarito Plateau is relatively fine-grained and consists of clays, silts, sands, and gravels derived from the Bandelier Tuff. Saturated hydraulic conductivity of the alluvium ranges from 10^{-2} cm per second (cm/s) for sand to 10^{-4} cm/s for silty sand (Abeele et al., 1981). Ephemeral runoff in some canyons infiltrates the alluvium until downward movement is impeded by the less permeable tuff and sediments. The impeded movement results in a buildup of a shallow alluvial ground-water body. The horizontal and vertical extent of the alluvial water is controlled primarily through depletion by evapotranspiration and by limited movement into the underlying rocks (Purtymun et al., 1977). The limited saturated thickness and extent of the alluvial ground water preclude its use as a viable source of municipal and industrial supply to LANL and the surrounding community.

Perched ground-water bodies occur at intermediate depths in the conglomerates and basalts beneath the alluvium in portions of Pueblo, Los Alamos, and Sandia Canyons. Depth to perched water ranges from about 90 ft in the midreach of Pueblo Canyon to about 450 ft in lower Sandia Canyon. Water from the Pueblo Canyon perched aquifer discharges at Basalt Spring in lower Los Alamos Canyon. Recent tritium measurements of intermediate depth perched ground water from four locations in Pueblo and Los Alamos Canyons indicate that recharge to these depths has occurred during the last several decades (Gallaher, 1995).

The only aquifer of the Pajarito Plateau capable of providing a large-scale municipal and industrial water supply is in rocks of the Santa Fe Group and Puye Formation. The upper surface of this main aquifer rises westward from the Rio Grande through the Santa Fe and into the lower part of the Puye beneath the central and western parts of the plateau (Figure 2-11). The exact source of recharge to the main aquifer is unknown. Three sources of recharge have been suggested by

Cushman (1965): infiltration of runoff in canyons, underflow from the Valles caldera through the Tschicoma Formation, and infiltration on mesas. A large quantity of hydrologic, structural, and geochemical data indicate, however, that the caldera may not serve as an appreciable source of recharge to the main aquifer (Conover et al., 1963; Griggs and Hem, 1964; Goff, 1991). Furthermore, natural recharge through undisturbed Bandelier Tuff on the mesa tops is believed to be insignificant (Purtymun and Kennedy, 1971; Kearl et al., 1986). Limited data exist to support an evaluation of canyon runoff and alluvial water as a recharge source. Recent work using tritium and carbon-14 as hydrologic tracers indicates that some downward movement of moisture occurs beneath the canyons (LANL, 1993b; LANL, 1994b) and that some recharge has occurred at three locations (i.e., Los Alamos, Mortandad, and Pueblo Canyons) over the last four decades (Gallaher, 1995). Investigations are continuing to further evaluate the possible pathways for tritium movement toward the main aquifer. Water-level elevations suggest that ground water flows from the Jemez Mountains east and east-southeast toward the Rio Grande, where a part is discharged into the river through seeps and springs (Purtymun et al., 1980) (Figure 2-13). It is inferred that major recharge occurs from the west because the piezometric surface slopes downward to the east. The ground-water flow rate ranges from 20 ft per year (ft/yr) in the Tesuque Formation to 345 ft/year in the more permeable Puye (Purtymun, 1984).

Figure 2-13 shows contours drawn to depict the piezometric surface of the main aquifer. The hydraulic gradient of the aquifer averages about 60 to 80 ft per mi (ft/mi) within the Puye but increases to 80 to 100 ft/mi along the eastern edge of the plateau as the water enters the Santa Fe. The depth to the water table under LANL ranges from about 600 to 1,200 ft. The wells in the main aquifer near the Rio Grande exhibit artesian conditions.

As expected, wells completed in the high permeability sediments and volcanics of the Santa Fe Group and Puye Formation are very productive. Wells located in the eastern well field, which penetrates about 1,600 ft of the fine-grained sediments of the Santa Fe, yield an average of 500 gallons per minute (gal/min), with a specific capacity of 8 gallons per minute per foot (gal/min/ft) of drawdown. Wells in the central part of the plateau, which are completed in the Puye and in the coarser sediments of the Santa Fe, are higher yielding and average 1,000 gal/min, with a specific capacity of about 35 gal/min/ft of drawdown.

Water-balance calculations for the area of LANL indicate that the annual evapotranspiration rate exceeds the annual precipitation rate. Additionally, field investigations have shown that infiltration of precipitation into the Bandelier Tuff is essentially zero. At depths below 10 ft, the volumetric moisture content of the tuff at LANL varies from about 4 to 6 percent on the mesas and from approximately 6 percent to saturation in the canyons with perched aquifers. In canyons where no perched aquifers are present, the volumetric moisture content of the tuff at depths below 10 ft ranges from about 4 to 10 percent. If sufficient moisture is present to permit migration of moisture, unsaturated flow would be the predominant mechanism of movement in the Bandelier Tuff. If insufficient moisture is present, vapor phase transport appears to be the predominant mechanism of movement. Additional information on Los Alamos ground-water and vadose zone characteristics is presented in "Hydrogeologic Assessment of Technical Area 54, Areas G and L, Los Alamos National Laboratory" (IT, 1987) and in the IWP (LANL, 1993b).

Ground-Water Monitoring [20 NMAC 4.1, Subpart IX, 270.14(c) and 20 NMAC 4.1, Subpart V, 264.90(a)]

Requirements for ground-water monitoring and protection specified in 20 NMAC 4.1, Subpart IX, 270.14(c), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.90(a), revised November 1, 1995, apply to owners and operators of the following "regulated units" only: surface impoundments, waste piles, land treatment units, and landfills. This permit application addresses container storage areas, storage tank systems, and a cementation unit, which are not regulated units subject to 20 NMAC 4.1, Subpart IX, 270.14(c), revised November 1, 1995.

2.3 TRAFFIC PATTERNS [20 NMAC 4.1, Subpart IX, 270.14(b)(10)]

2.3.1 General

The rugged topography of alternating mesas and canyons present at LANL limits traffic circulation to only a few major arterial roads. A total of 85 mi of paved roads are present within LANL (Pan Am World Services Inc., 1986). The major roads are shown on Figure 2-14. There are 19 mi of highway, 22 mi of TA access roads, and 44 mi of roads in LANL's TAs.

The main access route to LANL is State Road 502; the majority of traffic to LANL approaches from the east on this road. Alternate access routes are available from the south on State Roads 4 (NM 4) and 501 (West Jemez Road).

The pattern of east-west trending canyons at LANL prohibits north-south automobile travel in nearly all portions of LANL, with the exception of Diamond Drive. Los Alamos Canyon is spanned at Diamond Drive by an 820-ft-long steel-arch bridge that was completed in 1951 and improved in 1993. This bridge provides the main access between LANL facilities located on either side of Los Alamos Canyon.

Approximately 10,000 people are currently employed at LANL (including full-time, part-time, and casual LANL personnel and subcontractors). Roughly 4,000 people commute to LANL daily from communities outside Los Alamos County.

2.3.2 Waste Collection Areas

Hazardous and mixed waste is generated at TAs throughout LANL. Small quantities of waste are generally accumulated in containers at less-than-90-day storage areas or satellite accumulation areas and then packed in containers, such as drums, boxes, or crates, for transport, as necessary, to permitted storage or treatment areas or to storage or treatment areas operating under the requirements of 20 NMAC 4.1, Subpart VI, revised November 1, 1995. Bulk liquid waste is contained primarily in drums or tanks. Because hazardous and mixed waste may be generated throughout LANL, waste transport may occur on nearly all roads within LANL.

2.3.3 Routes of Travel

Hazardous and/or mixed waste stored and treated at TA-55 is generated at TA-3 and TA-55. Hazardous and/or mixed waste is occasionally transported from TA-55 to other areas at LANL (e.g., TA-54). The primary traffic routes that may be used to transport hazardous and mixed waste to and from TA-55 include Diamond Drive, Pajarito Road, Pecos Drive, and Mesita del Buey Road (Figures 2-6 and 2-14). Because DOE relies on TA-55 to maintain core capabilities, and to develop new technologies as necessary for the processing of nuclear materials (which may include the treatment of TRU mixed wastes currently inventoried at other sites within DOE), in the future, nuclear material and/or TRU mixed waste may be accepted from off site.

2.3.4 Traffic Volumes

According to a 1991 traffic study, the peak traffic periods are between 7:15 and 8:15 a.m., 12:20 and 1:20 p.m., and 4:25 and 5:25 p.m. (Los Alamos County, 1991). The 1991 traffic study was limited to the intersection of Diamond Drive and Trinity Drive, just north of TA-3. Consequently,

the data presented in the study should reflect the existing traffic conditions in the TA-3 area at LANL. TA-3 will typically have higher vehicular volumes than the rest of LANL; thus, this study provides a conservative estimate of facilitywide traffic volumes. Maps from the cited study depicting vehicular traffic-count movements at the intersection of Diamond and Trinity Drives are included in Appendix B. Based on the 1991 traffic study, the Diamond Drive and Trinity Drive intersection had a volume of 2,269 vehicles from 7:15 to 8:15 in the morning and 2,096 from 4:25 to 5:25 in the afternoon. The count is biased low for the following reasons: because the northbound traffic from Diamond Drive turning east onto Trinity Drive was not fully tallied during this study; and because alternate routes were being used while the Los Alamos Canyon bridge was being improved.

Appendix B also includes data from a traffic count conducted at the same intersection in September 1992 (Los Alamos County, 1992). In this count, the traffic volume from 7:15 to 8:15 a.m. was 3,047 vehicles. From 4:30 to 5:30 p.m., the volume was 3,313 vehicles. The traffic volumes in the 1992 study were higher than those in the 1991 study because in the 1992 study, northbound traffic from Diamond Drive turning east onto Trinity Drive was tallied, whereas it was not fully tallied in the 1991 study.

2.3.5 Traffic Control Signals

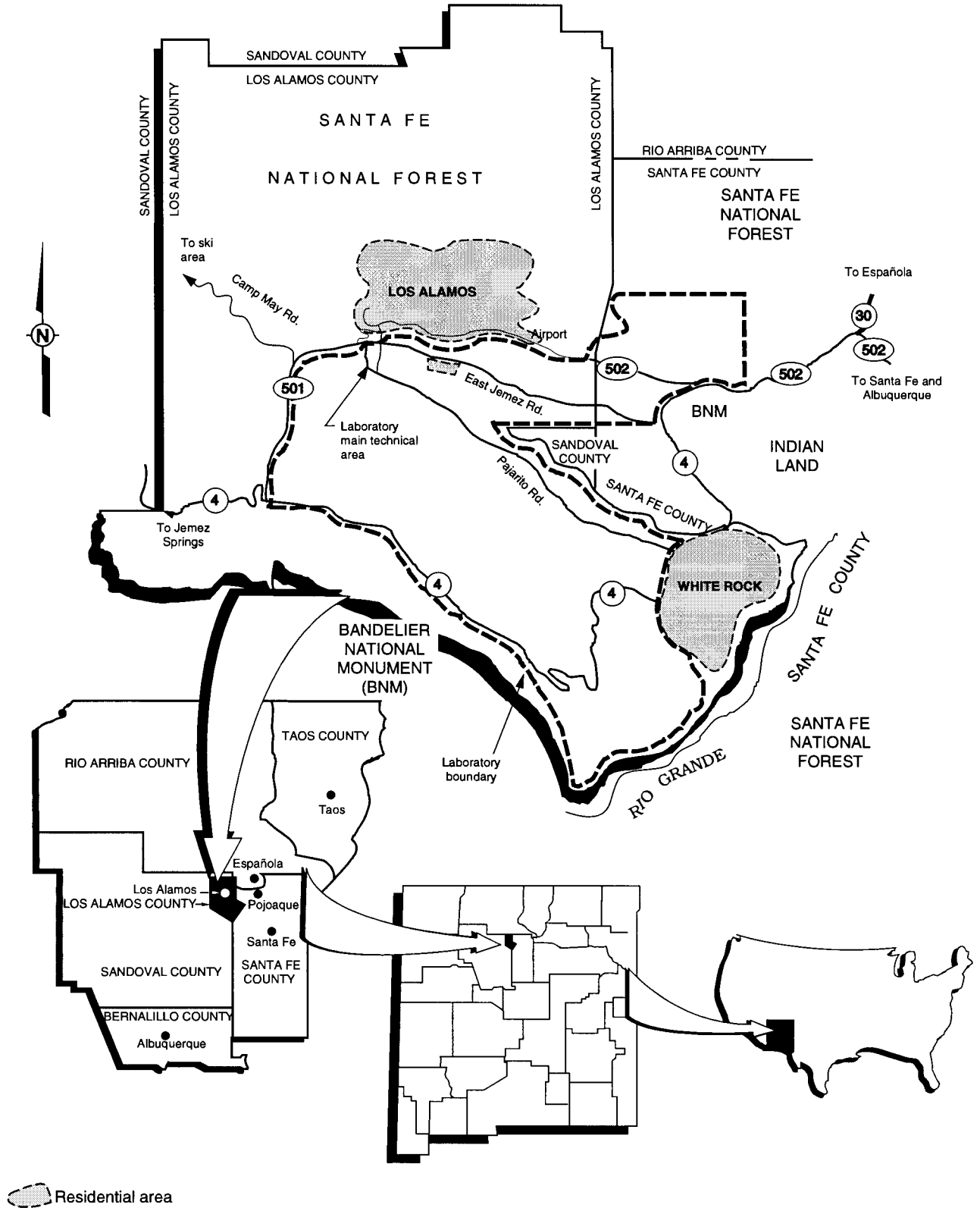
Sitewide traffic flow at LANL is controlled by traffic lights, stop signs, and yield signs. Traffic lights are in place at all major intersections. Traffic signs are used at "T" intersections throughout LANL. Access to the high-security TAs is controlled by security guards and is restricted to vehicles having specific identification. Only personnel having appropriate security clearance and identification or escorted visitors are allowed access to the secured TAs. Vehicles and personnel entering these TAs are subject to periodic search by security personnel.

Traffic control signals within TA-55 include stop signs, posted speed limits, and other traffic and pedestrian control signs. The locations of existing signs at TA-55 are shown on Figure 2-6.

2.3.6 Road Load-Bearing Capacity

Roads at LANL carrying the greatest traffic volumes include Diamond Drive, Pajarito Road, and East and West Jemez Roads. These roads were constructed with a 10-in.-thick base overlain with a 5-in.-thick asphaltic concrete surface. They were designed and built in conformance with

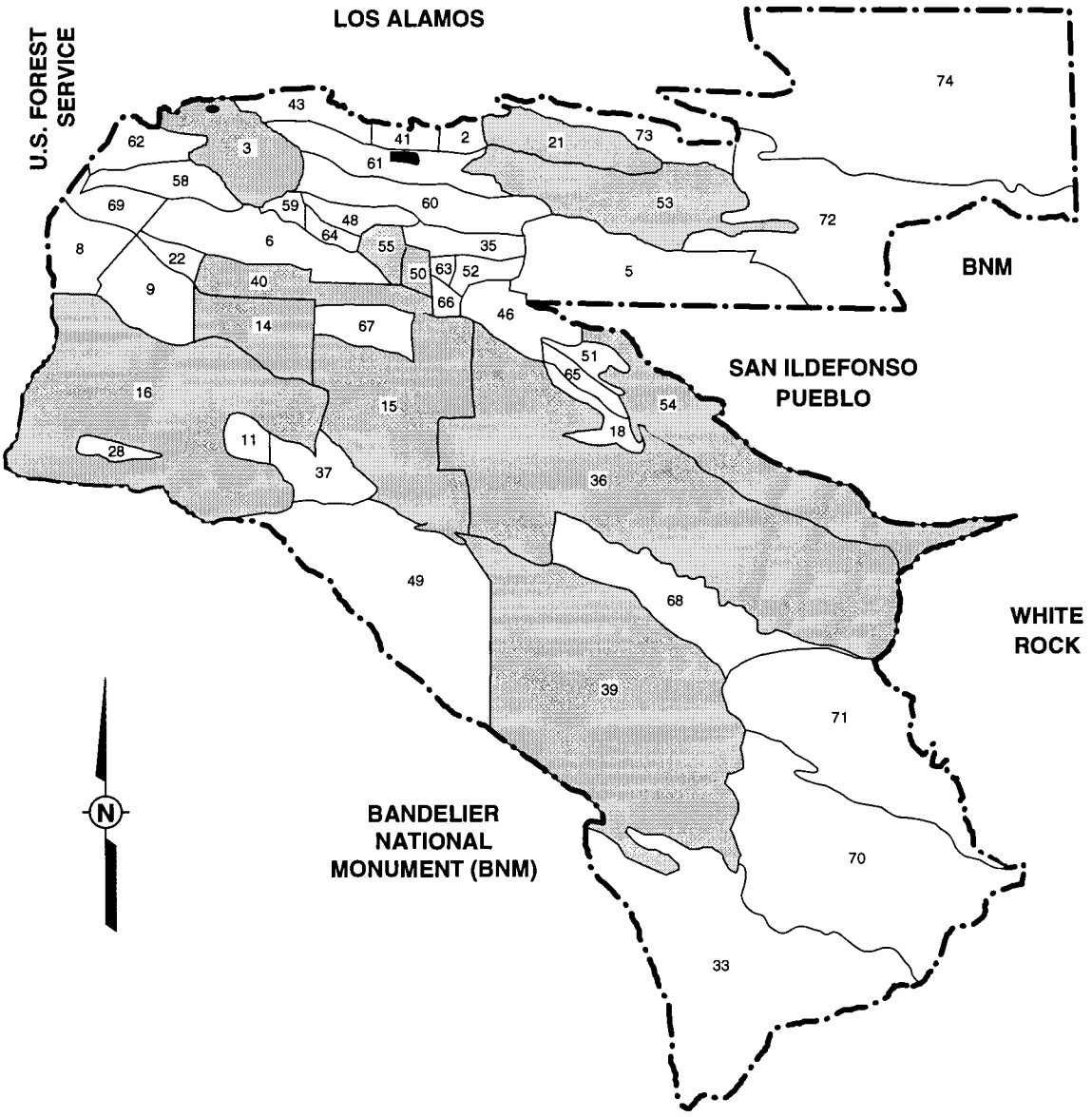
American Association of State Highway Transportation Officials specification HS-20. This specification is intended to accommodate truck loading capacities of 32,000 pounds per axle. Roads within TAs are generally two-lane roads with asphaltic concrete surfaces.



Modified from: "Environmental Surveillance at Los Alamos During 1992," 1994, LA-12764-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure 2-1

Regional Location Map of Los Alamos National Laboratory and Surrounding Land Use



Shading indicates technical areas in which hazardous waste or mixed waste units are located or planned for construction.

Not LANL property.

4800 0 4800
Scale in Feet

Note: Technical Area 57, the Fenton Hill Geothermal Site, is not shown on this figure.

Figure 2-2
Location Map of Los Alamos National Laboratory (LANL) Technical Areas

761157\TA-55 PT-B A25

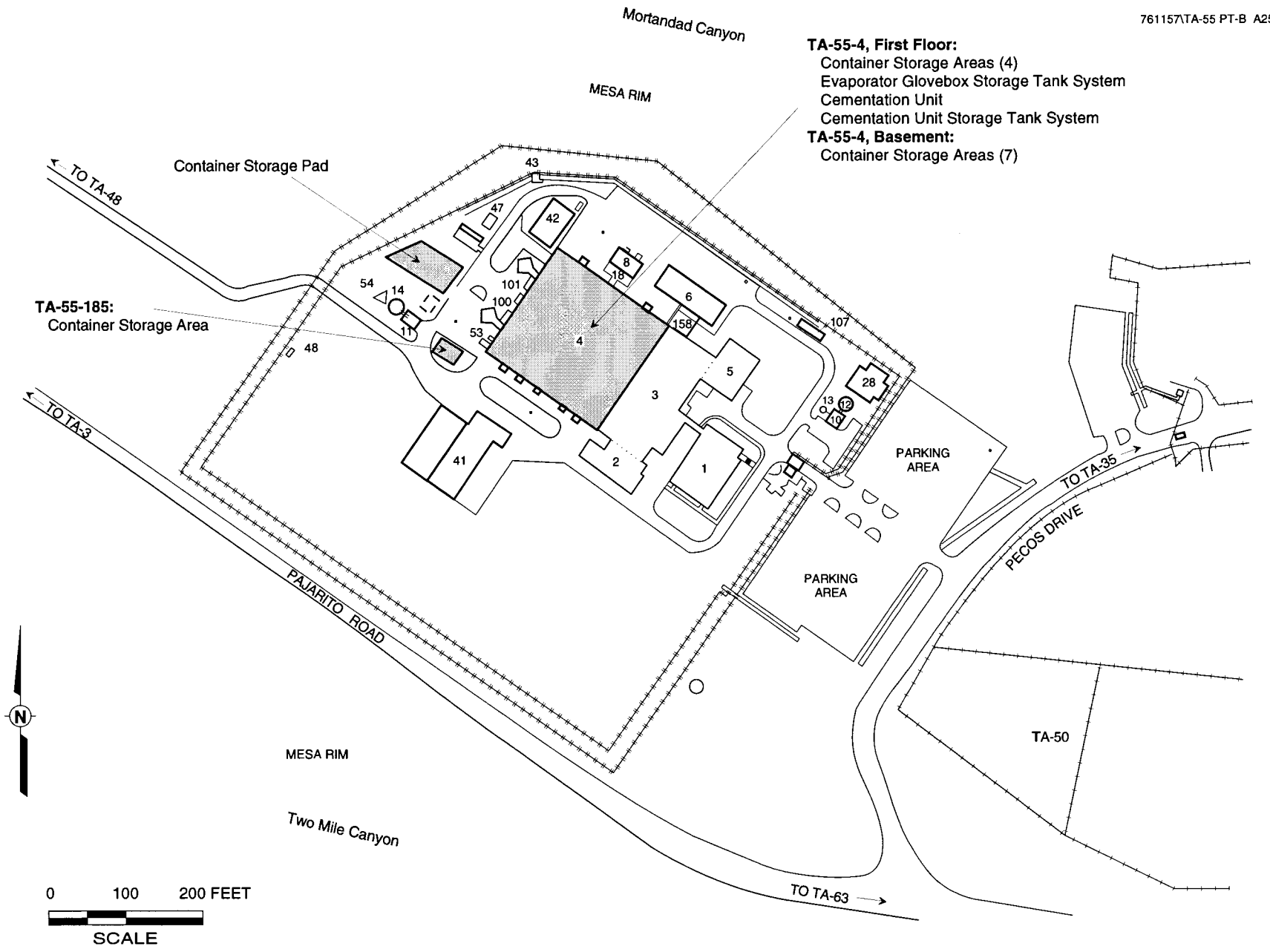
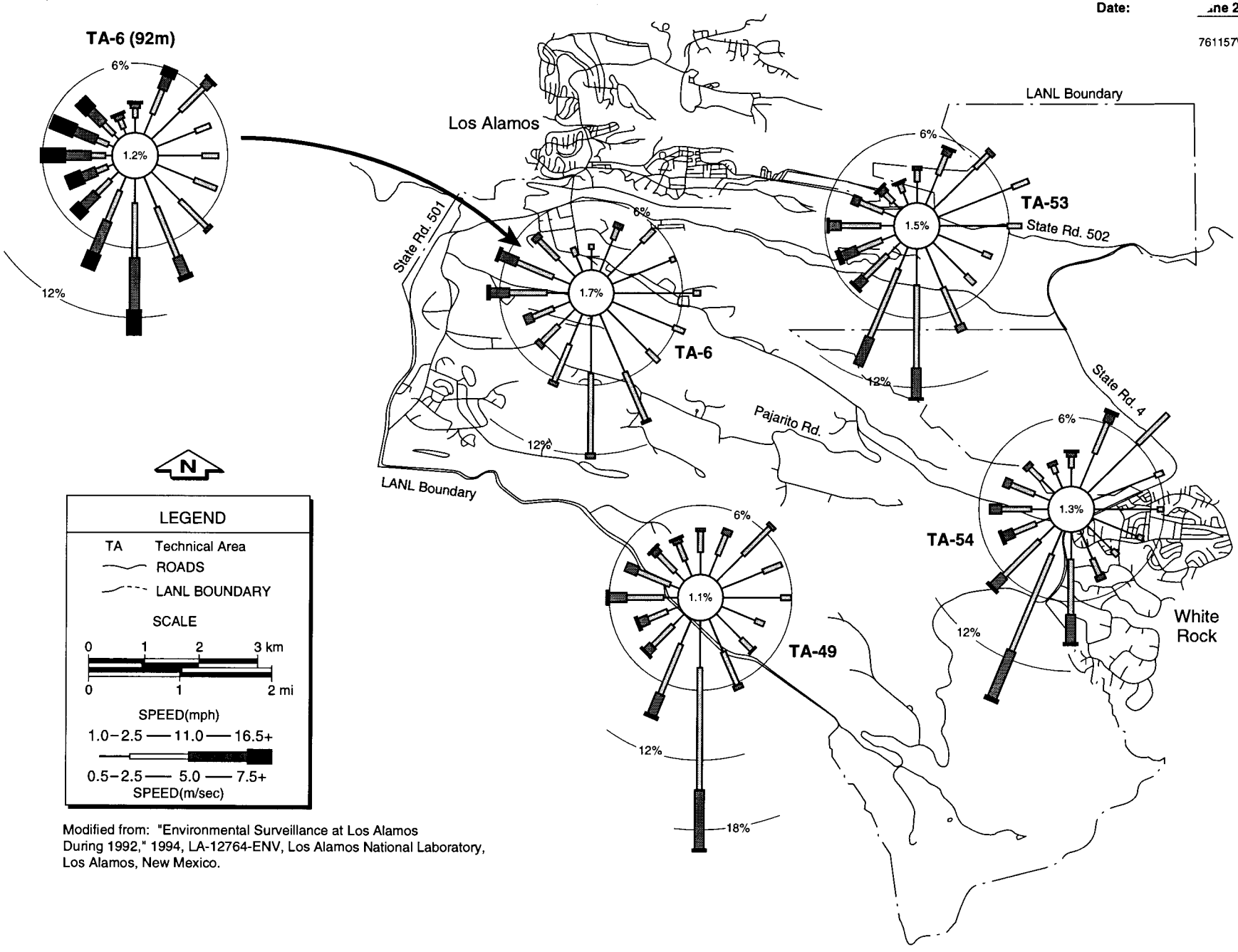
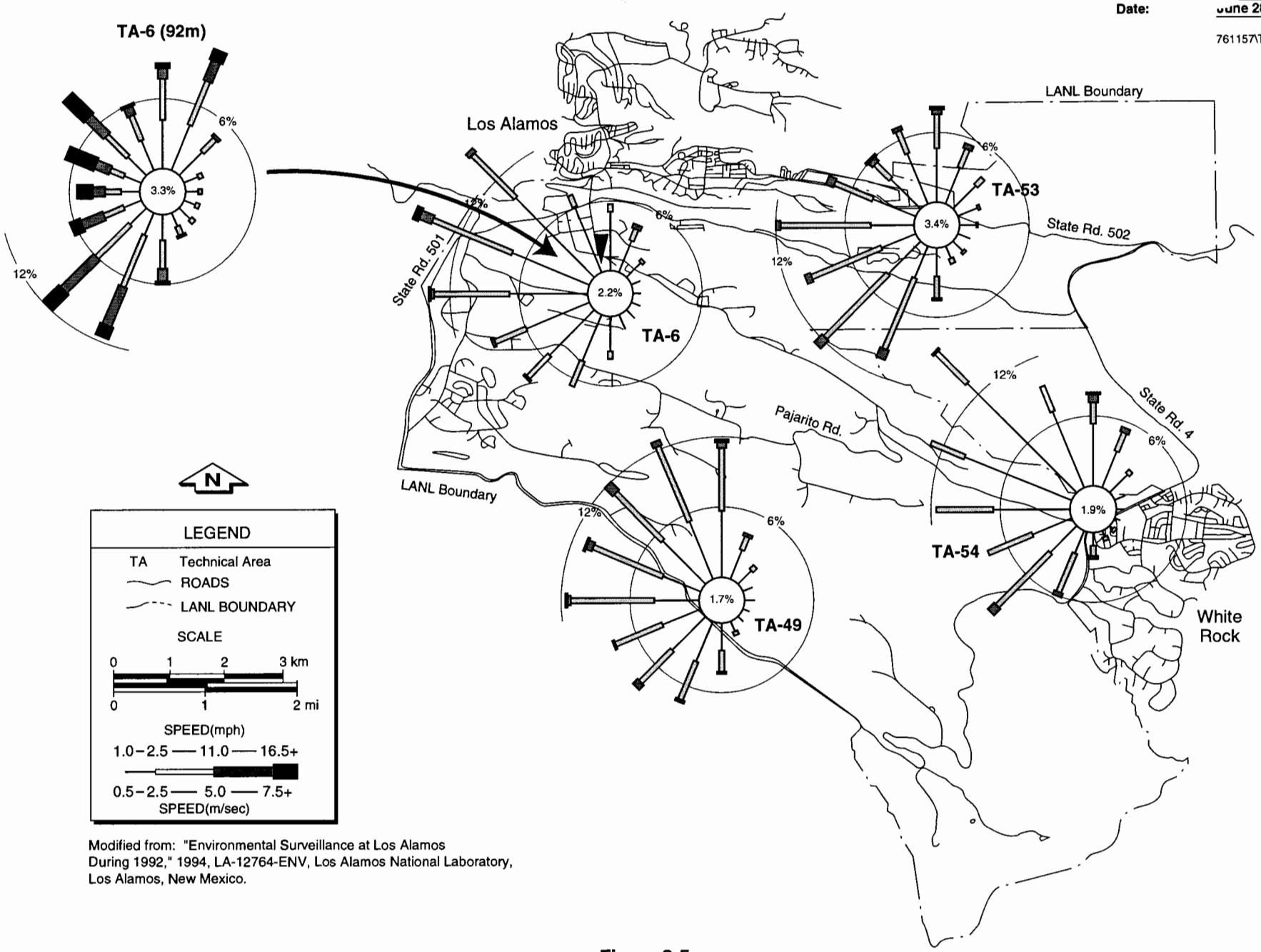


Figure 2-3
Locations of Waste Management Units at Technical Area (TA) 55



Modified from: "Environmental Surveillance at Los Alamos During 1992," 1994, LA-12764-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure 2-4
Annual Wind Roses for Los Alamos National Laboratory (LANL)—Day



Modified from: "Environmental Surveillance at Los Alamos During 1992," 1994, LA-12764-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure 2-5

Annual Wind Roses for Los Alamos National Laboratory (LANL)—Night

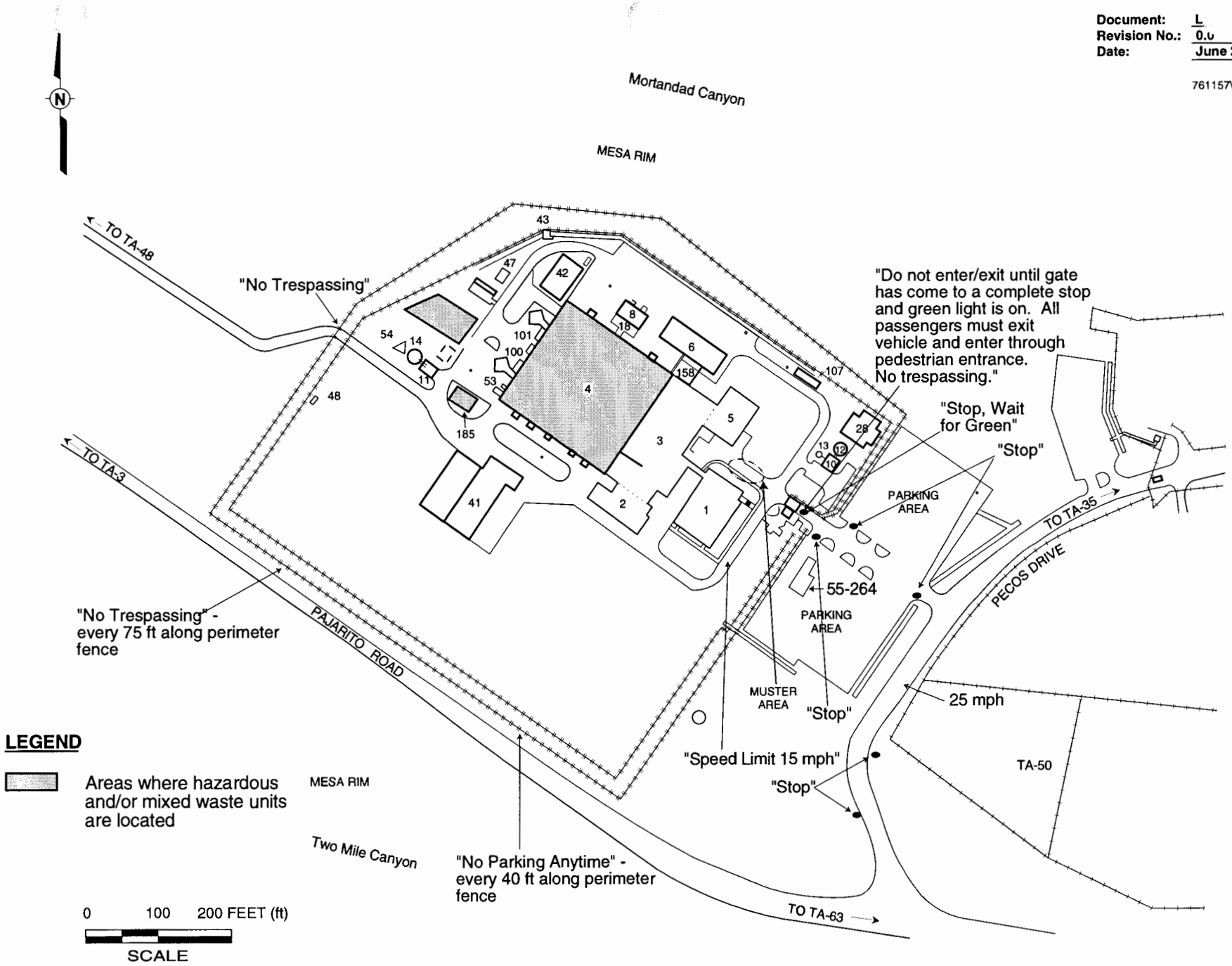
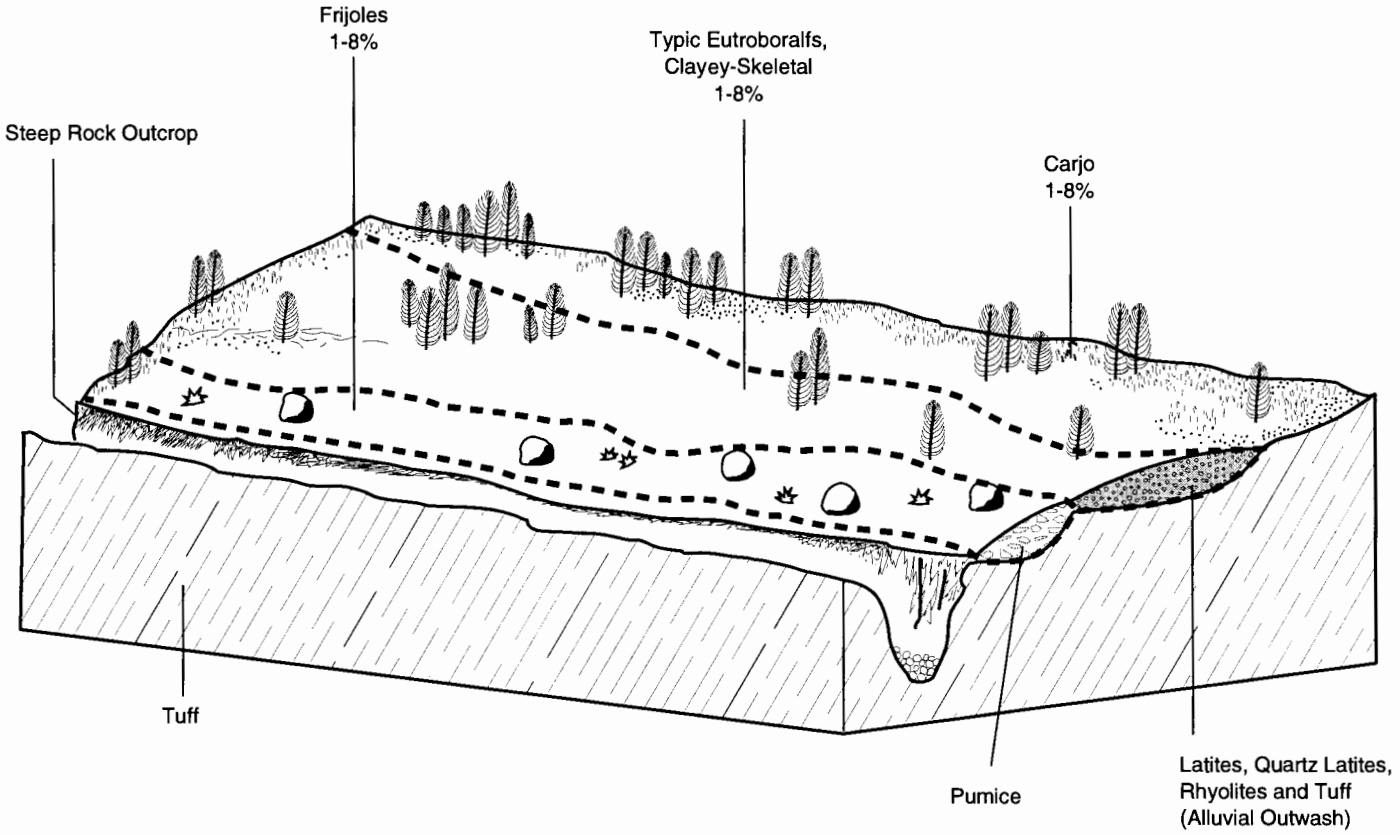
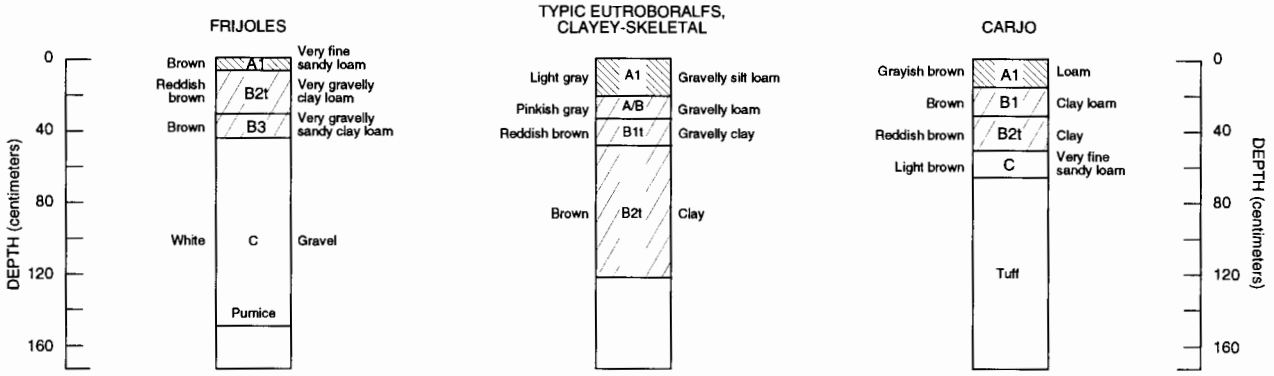


Figure 2-6

Location Map of Access Roads and Traffic Control Signs in the Vicinity of Technical Area (TA) 55

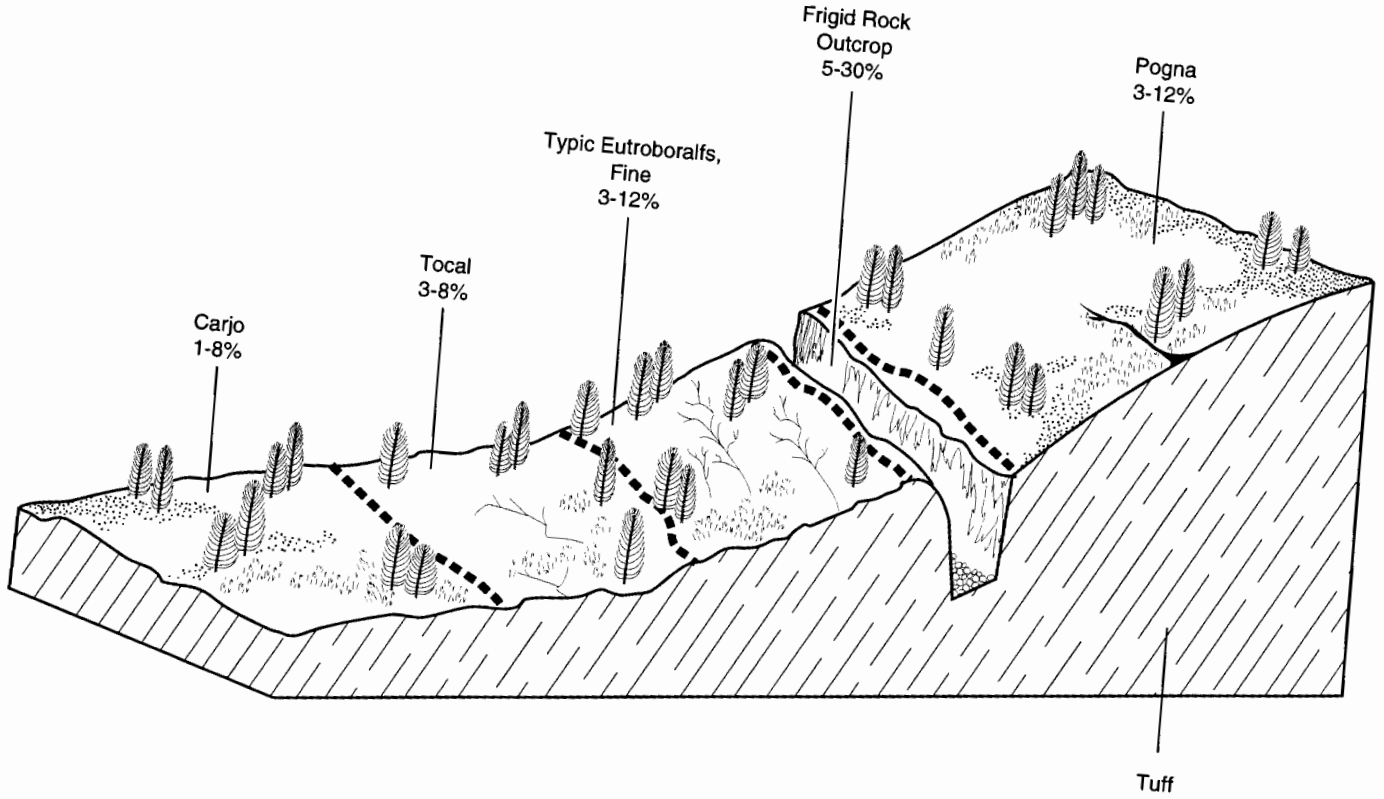


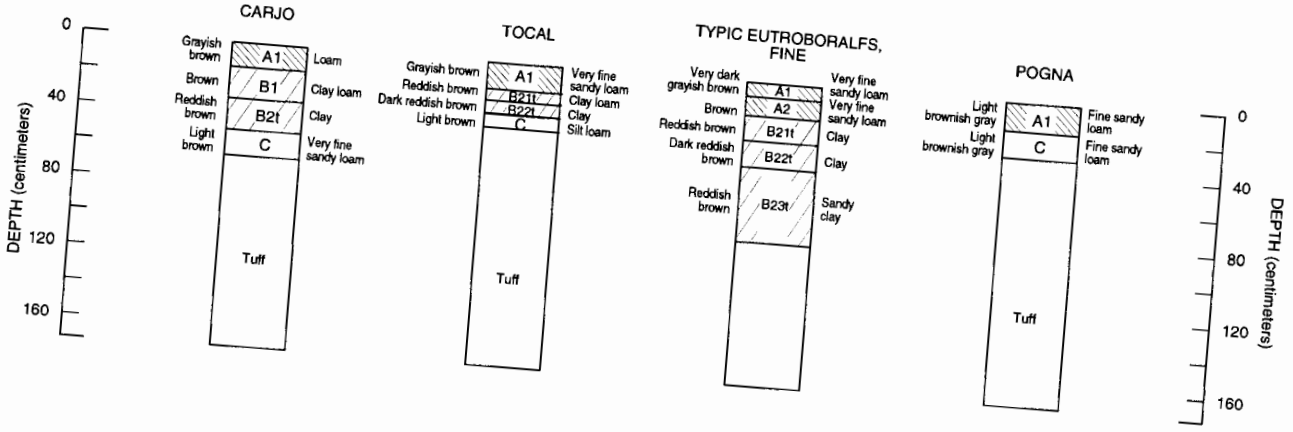


Reference: Nyhan et al., 1978, "Soil Survey of Los Alamos County, New Mexico," LA-6779-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure 2-7

Relationship of Slope, Vegetation, and Parent Material to Frijoles, Typic Eutroboralfs, Clayey-Skeletal, and Carjo Soils





Reference: Nyhan et al., 1978, "Soil Survey of Los Alamos County, New Mexico," LA-6779-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure 2-8
Relationship of Slope and Parent Material
to Carjo, Tocal, Typic Eutroboralfs, Fine, and Pogna Soils

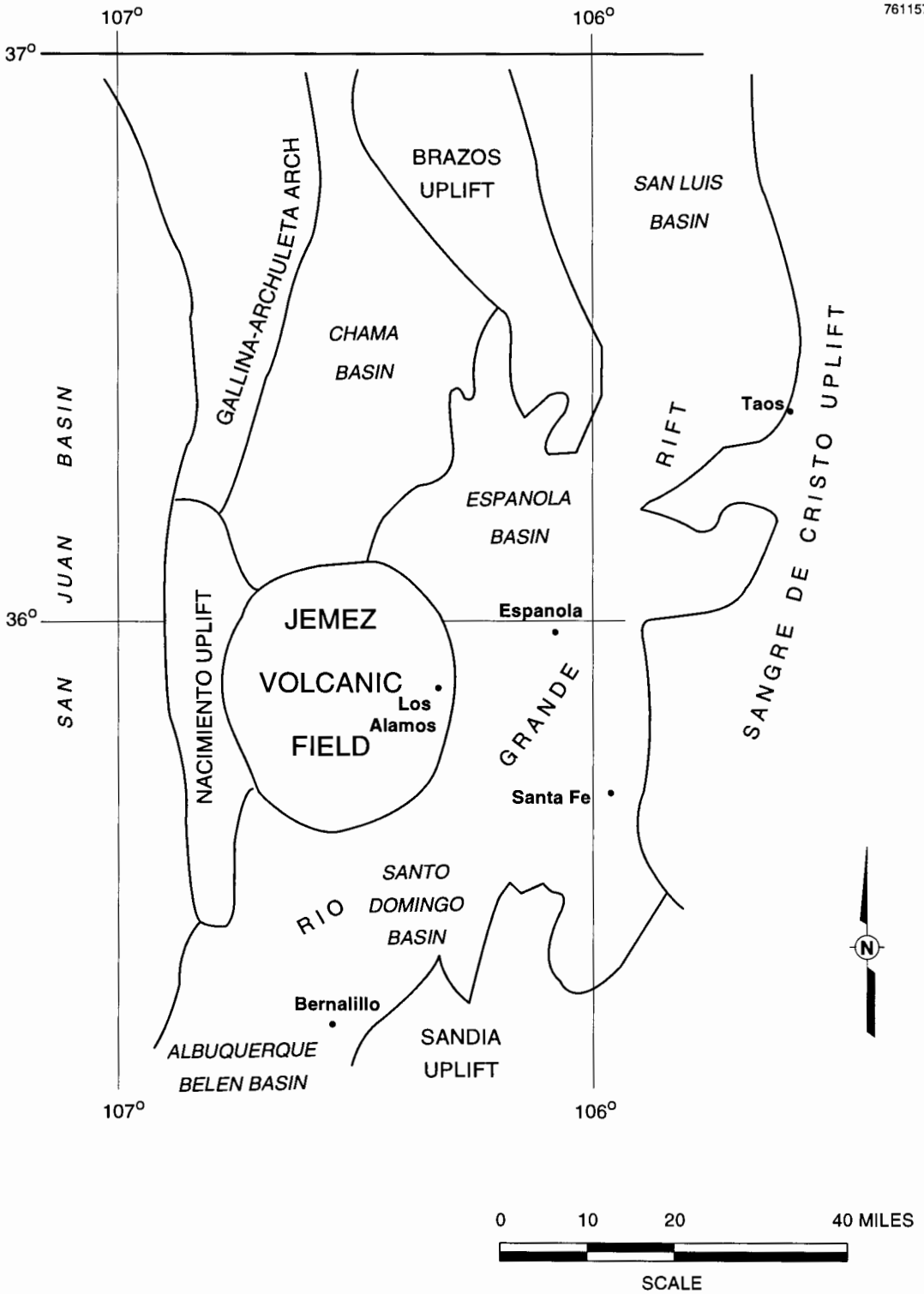
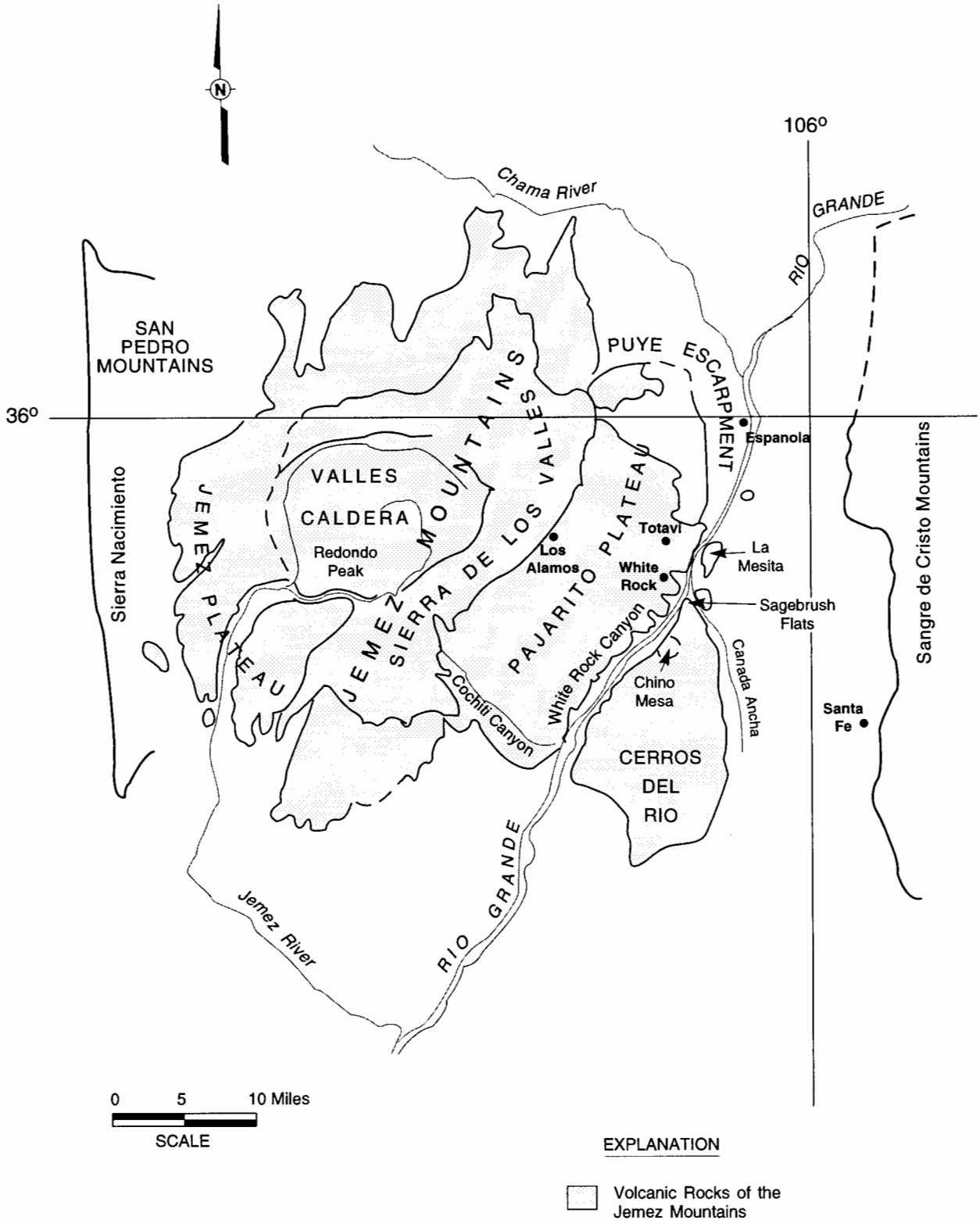
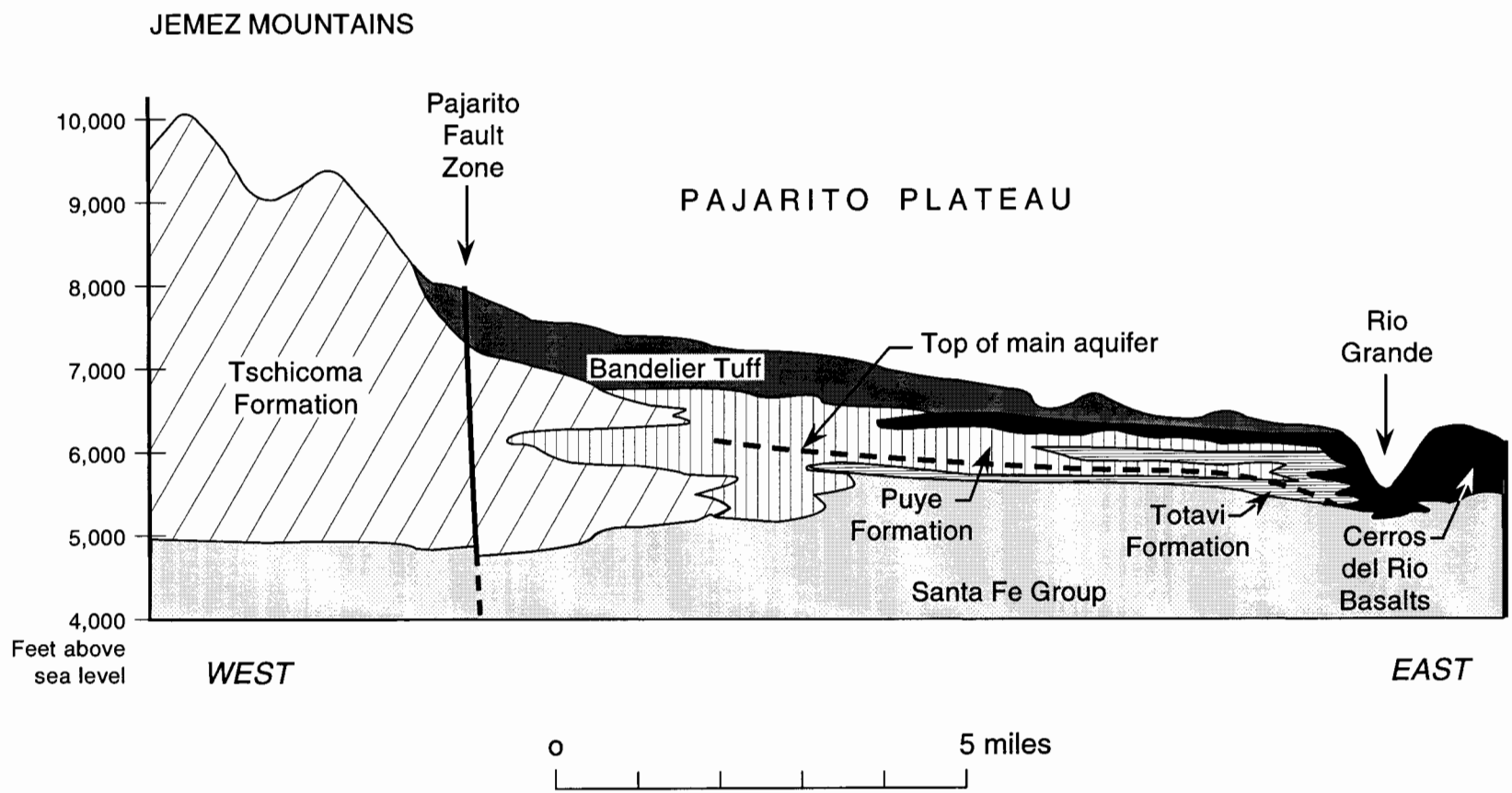


Figure 2-9
Index Map Showing Major Tectonic Elements of North-Central New Mexico



Reference: Griggs and Hem, 1964, "Geology and Ground-Water Resources of the Los Alamos Area, New Mexico," U.S. Geological Survey Water Supply Paper 1753, Albuquerque, New Mexico.

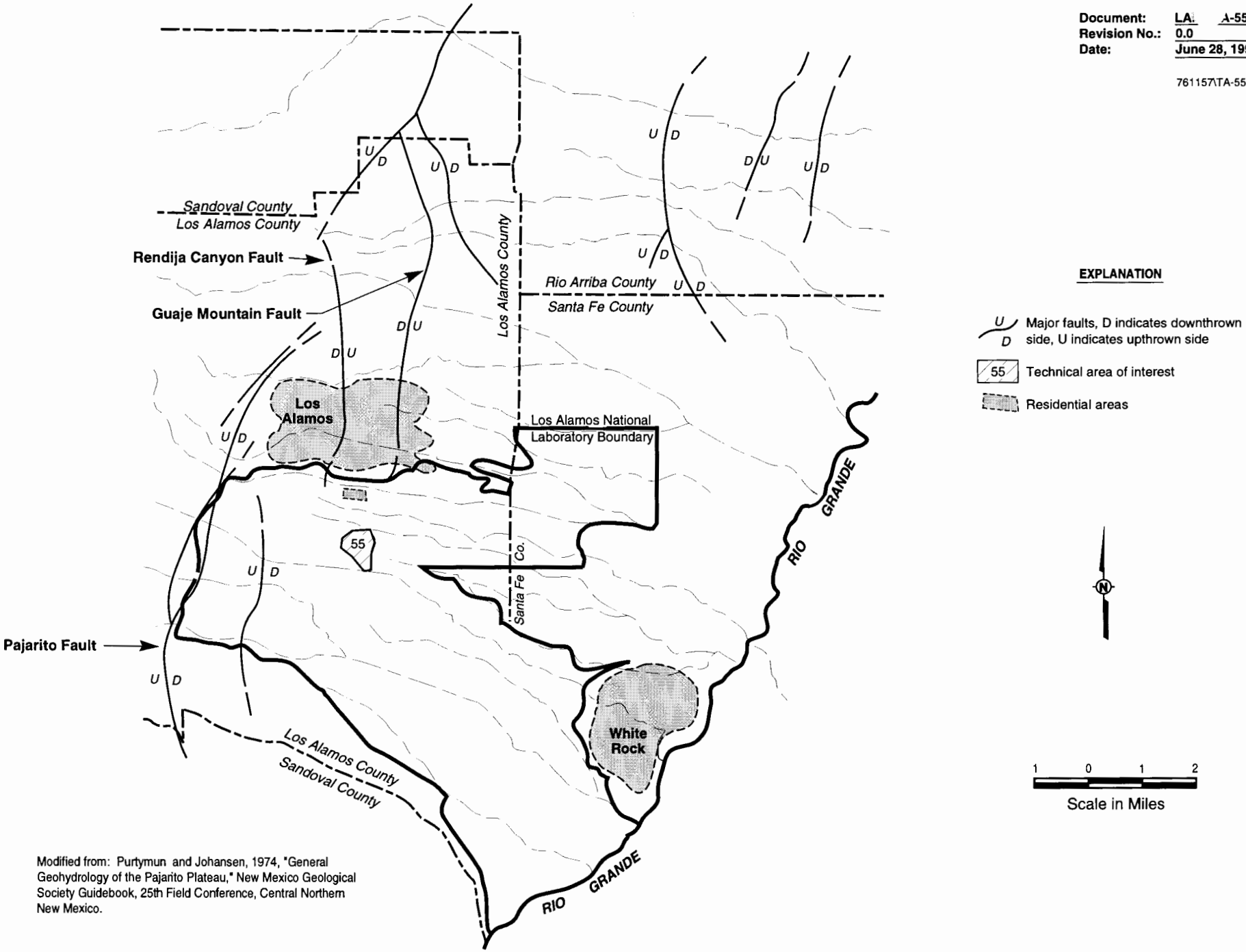
Figure 2-10
Physiographic Features of the Jemez Mountains



Reference: Los Alamos National Laboratory, 1993, "Installation Work Plan for Environmental Restoration," Rev. 3, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure 2-11

East-West Geologic Section Showing Stratigraphy and Structure from the Sierra de Los Valles across the Pajarito Plateau to the Rio Grande



Modified from: Purtymun and Johansen, 1974, "General Geohydrology of the Pajarito Plateau," New Mexico Geological Society Guidebook, 25th Field Conference, Central Northern New Mexico.

Figure 2-12

Location Map of Los Alamos National Laboratory Facilities Relative to Nearby Active or Potentially Active Fault Traces

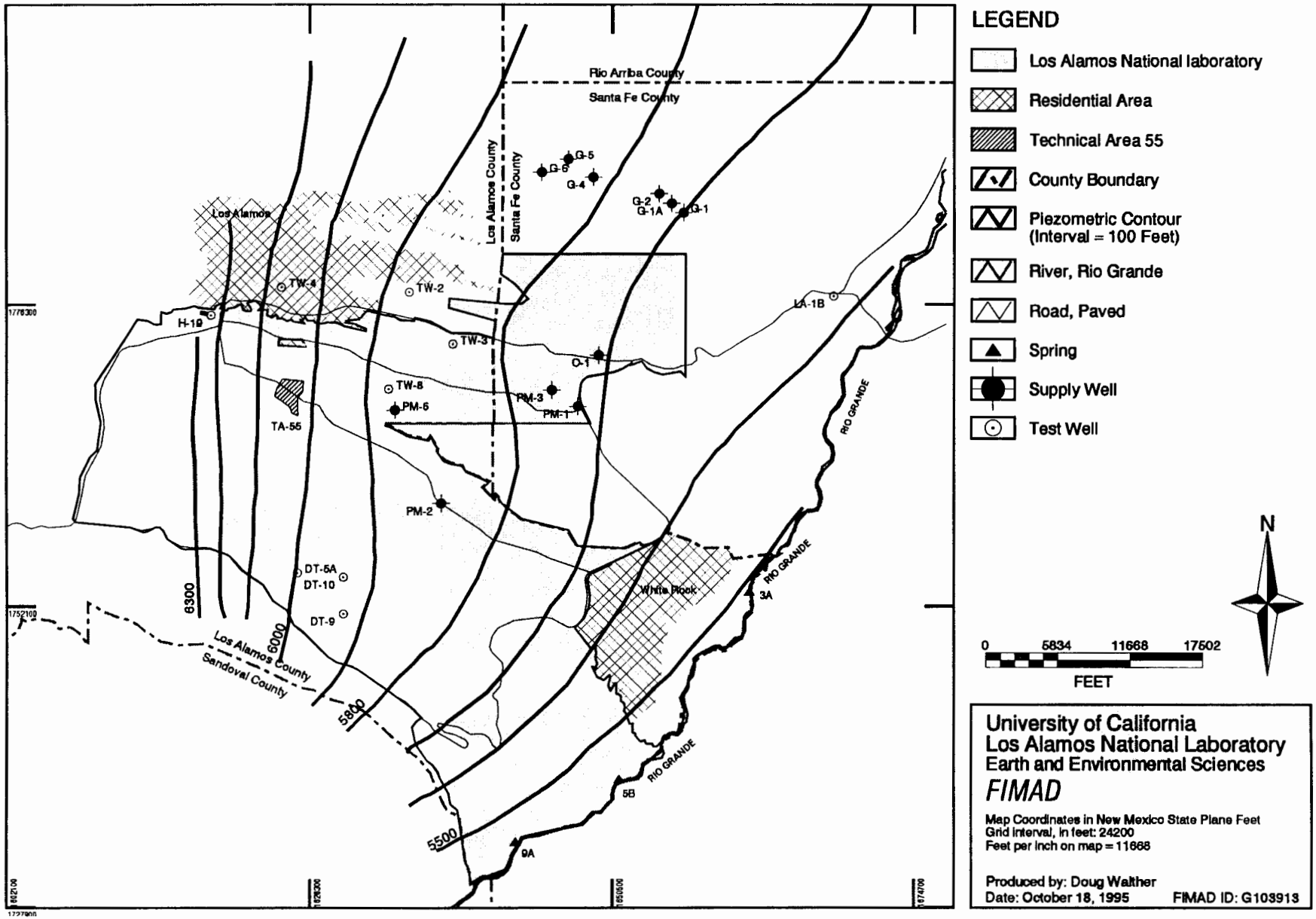


Figure 2-13
Generalized Piezometric Surface of Main Aquifer

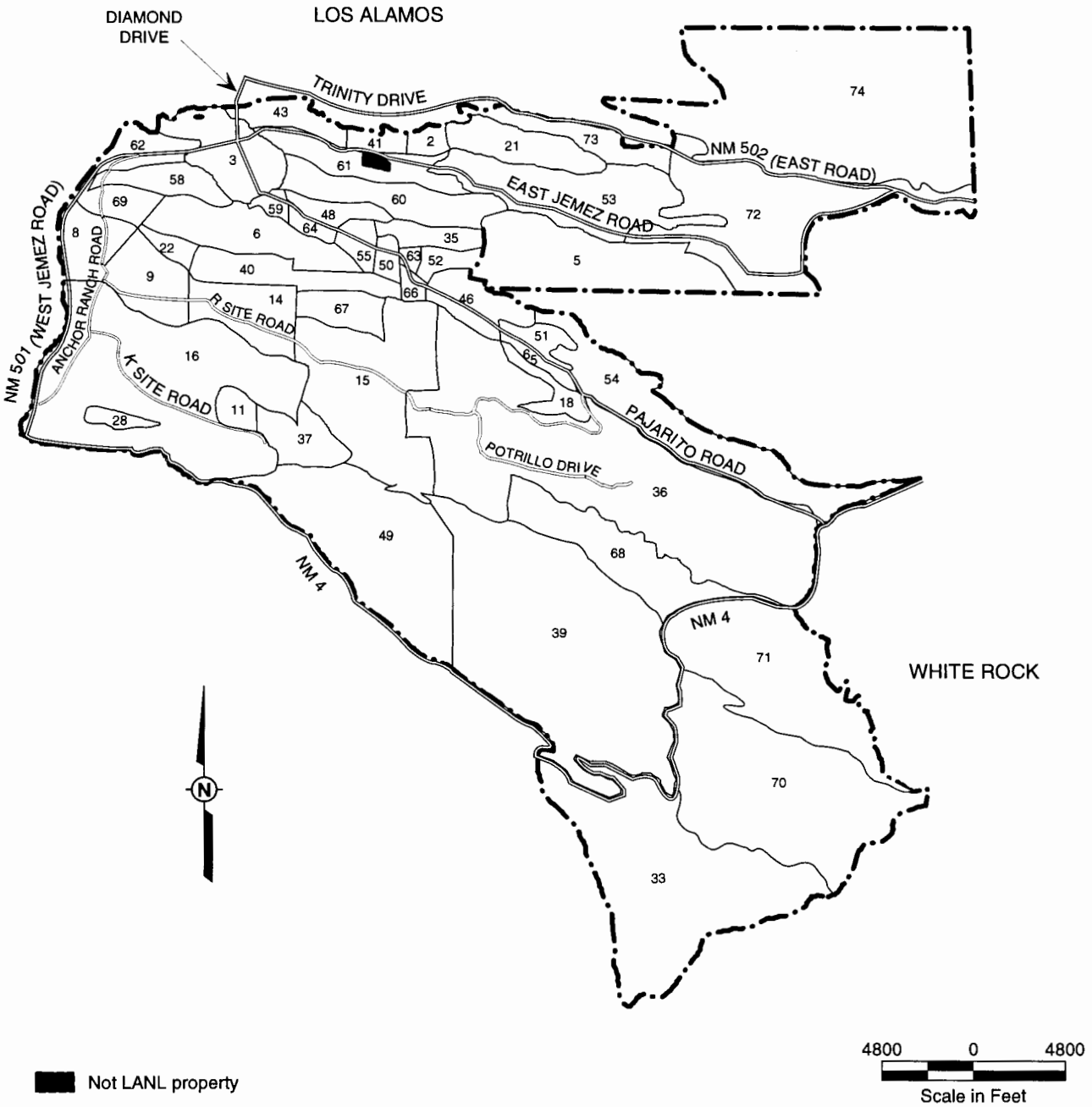


Figure 2-14
Major Roads and Primary Traffic Routes at Los Alamos National Laboratory (LANL)

Note to Reviewers:

This waste analysis plan (WAP) is similar to the "Los Alamos National Laboratory RCRA Waste Analysis Plan," Rev. 0.0 (LANL, 1995a), submitted to the New Mexico Environment Department in March 1995. Changes to this WAP will be made to be consistent with responses and resolutions to the Notice of Deficiency for the 1995 WAP, when available.

LIST OF DEFINITIONS

Acceptable knowledge - A term broadly defined to include process knowledge, supplemental waste analysis data, and/or facility records of analysis.

Existing (or currently generated) transuranic (TRU) mixed waste - TRU mixed waste streams characterized using Los Alamos National Laboratory's (LANL) Waste Profile Form (WPF) (the WPF has been used since May 1991).

Future TRU mixed waste - TRU mixed waste streams that will be characterized through the use of both LANL's WPF and a radioactive and mixed waste certification program.

Hazardous waste - The criteria for establishing a waste as a hazardous waste are provided in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart II, revised November 1, 1995. A waste is considered hazardous if it meets the definition of a solid waste described in 20 NMAC 4.1, Subpart II, Part 261.2, revised November 1, 1995; is not exempt from regulation; and exhibits one or more of the characteristics described in 20 NMAC 4.1, Subpart II, Part 261, Subpart C, revised November 1, 1995, or is listed in 20 NMAC 4.1, Subpart II, Part 261, Subpart D, revised November 1, 1995.

Heterogeneous waste - Waste that is of dissimilar or diverse composition.

Homogeneous waste - Waste that is of uniform composition.

Liquid waste - Any waste stream in a liquid physical form.

Low-level liquid mixed waste - Liquid waste that has both a hazardous waste component (see definition) and a low-level waste component (see definition).

Low-level solid mixed waste - Solid waste that has both a hazardous waste component and a low-level waste component.

LIST OF DEFINITIONS
(Continued)

Low-level waste - Low-level waste is defined in U.S. Department of Energy (DOE) Order 5820.2A (DOE, 1988) as "waste that contains radioactivity and is not classified as high-level waste, transuranic waste, spent nuclear fuel, or 11(e)(2) by-product material as defined by this Order. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level, provided that the concentration of transuranics is less than 100 nanocuries per gram of waste." By-product material, as defined in Section 11(e)(2) of the Atomic Energy Act of 1954, as amended, consists of uranium and thorium mill tailings. Section 11(e)(2) by-product material is not generated at LANL.

Mixed waste - Waste that has both a hazardous waste component (see definition) and a radioactive waste component.

Process knowledge - Described in 20 NMAC 4.1, Subpart V, 264.13(a)(2), revised November 1, 1995, as data developed under Subpart II and existing published or documented data on a specific hazardous waste or hazardous waste generated from similar processes.

Solid physical form waste - Any waste stream in a solid physical form. In this document, use of the generic term "solid physical form waste" has no additional regulatory meaning.

Solid waste - Any waste stream that meets the definition of a "solid waste" as specified in 20 NMAC 4.1, Subpart II, 261.2, revised November 1, 1995.

TRU mixed waste - Waste that has both a hazardous waste component (see definition) and a TRU waste component (see definition).

TRUPACT-II Content (TRUCON) Code - A waste identification system developed by DOE to provide a consistent waste description for TRU and TRU mixed waste generated throughout all of DOE's facilities. These codes are intended to assist DOE in establishing the characteristics of TRU and TRU mixed waste to be certified for transportation to the Waste Isolation Pilot Plant.

LIST OF DEFINITIONS
(Continued)

TRU waste - Waste defined as follows: "Without regard to source or form, waste that is contaminated with alpha-emitting transuranic radionuclides with half-lives greater than 20 years and concentrations greater than 100 nanocuries per gram at the time of assay and has atomic numbers greater than 92. Heads of Field Elements can determine that other alpha contaminated waste, peculiar to a specific site, must be managed as TRU waste" (DOE, 1988).

Waste Profile Form - A form used by hazardous/mixed waste generators to document waste characterization information for each waste stream. Specific information documented on this form may include process knowledge, information from Material Safety Data Sheets, results of chemical/physical analysis, and/or any additional information used for acceptable knowledge.

LIST OF REGULATORY REFERENCES AND CORRESPONDING WASTE ANALYSIS PLAN LOCATION

Regulatory Reference 20 NMAC 4.1[a], Subparts V, VIII, and IX	Description of Requirement	Location in the Waste Analysis Plan
264.13(a)(1)	Analysis information adequate to meet 20 NMAC 4.1, Subparts V and VIII, revised November 1, 1995, storage requirements	3.2.2, 3.2.3, 3.3.2, 3.3.3, 3.4.2, 3.4.3, 3.5.2, and 3.5.3
264.13(a)(2)	Waste analysis data	3.2.3.2, 3.3.3.1, 3.4.3.1, and 3.5.3.1
264.13(a)(3)	Repeat analysis	3.2.3.1, 3.2.4, 3.3.4, 3.4.4, 3.5.3.1, and 3.5.4
264.13(a)(4)	Inspection and analysis after each movement of hazardous waste received from off-site	Not applicable (NA)
264.13(b)	Written waste analysis plan	Entire plan
264.13(b)(1)	Parameters and rationale for selection	3.2.2.1, 3.2.2.2, 3.3.2.1, 3.3.2.2, 3.4.2.1, 3.4.2.2, 3.5.2.1, 3.5.2.2, and Tables 3-2, 3-3, and 3-4
264.13(b)(2)	Test methods	3.1.4, 3.2.3, 3.2.3.3, 3.2.3.3.1, 3.3.3, 3.3.3.2, 3.4.3, 3.4.3.2, 3.5.3, 3.5.3.2, and Tables 3-2, 3-3, and 3-4
264.13(b)(3)	Representative sample collection method	3.2.3.3, 3.2.3.3.2, 3.3.3.2.1, 3.3.3.2.2, 3.4.3.2, and 3.5.3.2
264.13(b)(4)	Frequency for review or repeat of initial analysis	3.2.3.1, 3.4.3.2, 3.5.3.1, 3.5.3.2, and 3.5.4
264.13(b)(5)	Waste analysis information agreed upon for waste sent to off-site facilities	3.2.3.1, 3.2.3.2, 3.3.3.1, 3.4.3.1, 3.5.3.1, and Figure 3-2
264.13(b)(6)	Additional waste analysis requirements	3.1.5
264.13(b)(7)	Surface impoundments exempted under 20 NMAC 4.1, Subpart VIII, 268.4(a), revised November 1, 1995	NA
264.13(c)	Inspection and analysis procedures for off-site facilities	NA
264.13(c)(1)	Procedures for identification of each movement of waste at off-site facilities	NA

Refer to footnote at end of table.

LIST OF REGULATORY REFERENCES AND CORRESPONDING WASTE ANALYSIS PLAN LOCATION (Continued)

Regulatory Reference 20 NMAC 4.1[a], Subparts V, VIII, and IX	Description of Requirement	Location in the Waste Analysis Plan
264.13(c)(2)	Sampling method for the waste to be identified at off-site facilities	NA
264.13(c)(3)	For off-site landfills: procedures to determine whether a biodegradable sorbent has been added to containers	NA
268.7(a)	Determination of whether waste is restricted from land disposal	3.1.5.3
268.7(b)	Testing requirements for treatment facilities	3.1.5.3, 3.3.3, 3.3.3.2.1, 3.3.3.2.2, and 3.3.4
268.7(b)(1)	Testing of treatment residues or extract of the waste having concentration-based treatment standards specified in 20 NMAC 4.1, Subpart VIII, 268.41, revised November 1, 1995	3.1.5.3
268.7(b)(2)	Testing of treatment residues pursuant to 20 NMAC 4.1, Subpart VIII, 268.32, revised November 1, 1995	NA
268.7(b)(3)	Testing of treatment residues of waste with concentration-based treatment standards specified in 20 NMAC 4.1, Subpart VIII, 268.43, revised November 1, 1995	3.1.5.3
268.7(b)(4)	Notice requirements	3.1.5.3 and Figure 3-1
268.7(b)(5)	Certification of compliance with 20 NMAC 4.1, Subpart VIII, revised November 1, 1995	3.1.5.3
268.7(b)(6)	Notice and certification requirements for treatment facilities that ship treatment residues to a different treatment, storage, or disposal facility	3.1.5.3
268.7(b)(7)	Notice requirement for recycling facilities using materials in a manner constituting disposal	NA
268.7(c)(1)	Record-keeping requirements for land disposal facilities	NA
268.7(c)(2)	Testing requirements for land disposal facilities	NA

Refer to footnote at end of table.

LIST OF REGULATORY REFERENCES AND CORRESPONDING WASTE ANALYSIS PLAN LOCATION (Continued)

Regulatory Reference 20 NMAC 4.1[a], Subparts V, VIII, and IX	Description of Requirement	Location in the Waste Analysis Plan
268.7(d)(1)	Notification requirements for excluded debris (i.e., pursuant to 20 NMAC 4.1, Subpart II, 261.3, revised November 1, 1995)	NA
268.7(d)(2)	Updated notification requirements for debris	NA
268.7(d)(3)	Documentation and certification requirements for debris excluded under 20 NMAC 4.1, Subpart II, 261.3(e)(1), revised November 1, 1995	NA
270.14(b)(2)	Chemical and physical analyses	3.2.2.1, 3.2.3, 3.2.3.1, 3.2.3.2, 3.2.3.3, 3.2.3.3.1, 3.3.2.1, 3.3.3, 3.3.3.1, 3.3.3.2, 3.4.2.1, 3.4.3, 3.4.3.1, 3.4.3.2, 3.5.2.1, 3.5.3, 3.5.3.1, 3.5.3.2, Figure 3-2, and Tables 3-2, 3-3, and 3-4
270.14(b)(3)	Waste analysis plan	Entire plan

[a] New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), revised November 1, 1995, which adopts, with a few limited exceptions, Title 40 of the Code of Federal Regulations (40 CFR), Parts 260–266, Part 268, and Part 270 (1995). 20 NMAC 4.1, Subparts V, VIII, and IX, revised November 1, 1995, contain regulations equivalent to 40 CFR Parts 264, 268, and 270, respectively.

3.0 WASTE ANALYSIS PLAN FOR HAZARDOUS AND MIXED WASTE STORAGE AND TREATMENT AT TECHNICAL AREA 55

This waste analysis plan (WAP) presents information on the chemical and physical nature of hazardous and mixed waste generated and general waste characterization methods used at Los Alamos National Laboratory's (LANL) Technical Area (TA) 55. The waste analysis information contained within this WAP is specific to storage and treatment requirements for hazardous and mixed waste. Waste analysis requirements are specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart IX, 270.14(b)(2), revised November 1, 1995; in 20 NMAC 4.1, Subpart V, 264.13, revised November 1, 1995, "General Waste Analysis"; and in 20 NMAC 4.1, Subpart VIII, 268.7, revised November 1, 1995, "Waste Analysis and Recordkeeping." The "List of Regulatory References and Corresponding Waste Analysis Plan Location" is provided at the front of this section. The content of this WAP generally follows the guidance provided in "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes - A Guidance Manual" (U.S. Environmental Protection Agency [EPA], 1994b).

Hazardous waste is defined and regulated by 20 NMAC 4.1, revised November 1, 1995. Mixed waste contains both a hazardous waste component and a radioactive waste component. This WAP addresses *hazardous waste, transuranic (TRU) mixed waste, and low-level solid and liquid mixed waste* (as provided in the List of Definitions) identified as wastewaters and nonwastewaters pursuant to land disposal restriction (LDR) regulations specified in 20 NMAC 4.1, Subpart VIII, Part 268, revised November 1, 1995.

This WAP is organized as follows. Section 3.1 addresses general waste analysis requirements including a description of the facility and the waste management units; sample handling, preservation, and storage requirements; analytical laboratory selection and analytical methods; and special procedural requirements (e.g., for ignitable, reactive, and incompatible wastes and for compliance with LDR requirements). Sections 3.2, 3.3, 3.4, and 3.5 address specific waste analysis requirements for TRU mixed waste storage, TRU mixed waste treatment, low-level mixed waste storage, and hazardous waste storage, respectively. Specific waste analysis requirements include the following:

- Waste-generating processes and activities
- Identification of hazardous or mixed waste managed
- Waste parameters
- Waste characterization
- Hazardous or mixed waste verification analysis.

3.1 GENERAL WASTE ANALYSIS REQUIREMENTS

General waste analysis requirements applicable to hazardous, TRU mixed, and low-level mixed waste types managed at TA-55's storage and treatment units to be permitted are described in the following sections.

3.1.1 Facility Description

LANL is located in Los Alamos County in north-central New Mexico. It is approximately 60 miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe. LANL, which is divided into 49 TAs, and the associated residential and commercial areas of Los Alamos County are situated on the Pajarito Plateau. The principal missions of LANL include the research, design, development, and analysis of weapons components for the nation's nuclear arsenal; supporting research programs; energy research and environmental missions; and environmental management programs. LANL is owned by the U.S. Department of Energy (DOE) and is operated jointly by DOE and the University of California, DOE's management and operating contractor.

TA-55 is a world leader in plutonium processing technology and is the only facility in the United States capable of processing numerous actinides in their pure and impure forms as well as materials bearing plutonium and other special nuclear materials. Consequently, TA-55's mission is to maintain core capabilities and to develop new technologies, as necessary, for the processing of nuclear materials, which may include the treatment of TRU mixed wastes currently inventoried at other sites within the DOE complex. TA-55's expertise in these areas may be required for future mixed wastes to be generated at other DOE sites (from activities such as environmental restoration and decontamination and decommissioning [D&D]). Waste streams that may require either treatability studies or treatment at TA-55 include, but are not limited to, those wastes described in DOE's annual "Mixed Waste Inventory Report." It is anticipated that this permit application may be modified in the future as treatment processes are developed for TRU mixed wastes generated at LANL or at other DOE facilities.

3.1.2 Description of Hazardous and Mixed Waste Management Units

The hazardous/mixed waste management units addressed herein are described fully in Sections 2.0 and 4.0 of this Part B permit application and in Revision 1.0 of the Technical Area 55 Part A Permit Application (LANL, 1996), and include the following:

- Container storage areas for hazardous waste, TRU mixed waste, and low-level mixed waste (TA-55, Building 4 [TA-55-4], Basement; Areas 1 through 5)
- A container storage area for TRU mixed waste (TA-55-4, Basement; Area 6)
- A container storage area for hazardous waste, TRU mixed waste, and low-level mixed waste (TA-55-4, north end of Basement; Area 7)
- Container storage areas for TRU mixed waste and low-level mixed waste (TA-55-4, Room 401 [TA-55-4-401], Areas 8 and 9)
- A container storage area for TRU mixed waste and low-level mixed waste (TA-55-4-433, Area 10)
- A container storage area for TRU mixed waste (TA-55-4-432, Area 11)
- A container storage pad for hazardous waste, TRU mixed waste, and low-level mixed waste near TA-55-4
- A container storage area for hazardous waste, TRU mixed waste, and low-level mixed waste (TA-55-185)
- A storage tank system consisting of glovebox GB-438 and associated ancillary equipment, collectively referred to as the "evaporator glovebox storage tank system" (TA-55-4-401)
- A storage tank system, consisting of five storage tanks and associated ancillary equipment, collectively referred to as the "cementation unit storage tank system" (TA-55-4-401)
- A cementation unit (TA-55-4-401) in glovebox GB-454.

3.1.3 Sample Handling, Preservation, and Storage

Table 3-1 presents requirements regarding sample containers, preservation techniques, and holding times associated with sample collection, as specified in the EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846) (EPA, 1994c). Adherence to these requirements will ensure that sampling and analysis meet quality objectives for data.

3.1.4 Analytical Laboratory Selection and Analytical Methods [20 NMAC 4.1, Subpart V, 264.13(b)(2)]

Analytical laboratories at LANL and/or approved subcontractor laboratories will perform the qualitative and quantitative chemical analyses specified in Tables 3-2, 3-3, and 3-4 of this WAP. These laboratories must have:

- The capability of handling hazardous waste and/or radioactive material/waste
- A documented comprehensive quality assurance (QA)/quality control (QC) program
- Technical analytical expertise
- A document control/records management plan
- The capability to perform data reduction, validation, and reporting.

The selection and development of analytical testing methods for hazardous and mixed waste streams were based on the following considerations:

- The physical form of the waste
- Analytes of interest
- Required detection limits (e.g., regulatory thresholds)
- Information requirements (e.g., verify compliance with LDR treatment standards and waste classification).

Collectively, these factors contributed to the selection of the analytical methods specified in Tables 3-2, 3-3, and 3-4. Qualified analytical laboratories at LANL or approved subcontractor laboratories that meet the above criteria will analyze hazardous and mixed waste samples for Resource Conservation and Recovery Act (RCRA)-regulated hazardous constituents (i.e., volatile organic compounds [VOC], semivolatile organic compounds [SVOC], and metals) and characteristics[1], according to SW-846, or documented equivalent methods.

[1]Use of the terms "RCRA-regulated hazardous constituents and characteristics," "RCRA-regulated metals," "RCRA-regulated VOCs," "RCRA-regulated SVOCs," "RCRA F-listed and/or K-listed waste," and "RCRA P-listed and U-listed waste" refers to hazardous waste or hazardous constituents as defined in 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995.

3.1.5 Special Procedural Requirements [20 NMAC 4.1, Subpart V, 264.13(b)(6)]

Additional waste management requirements specific to ignitable, reactive, and incompatible wastes, as well as for compliance with LDR, are described below.

3.1.5.1 Procedures for Ignitable and Reactive Wastes

Specific waste management methods for ignitable and reactive hazardous and mixed wastes are implemented pursuant to 20 NMAC 4.1, Subpart V, 264.17, revised November 1, 1995. These waste management methods vary depending on the physical form and type of waste managed. TRU mixed waste in Area 6 is stored by mass of radionuclides due to the "as low as reasonably achievable" (ALARA) principle, established by the Atomic Energy Act, and because of criticality concerns. Some container storage areas only contain wastes in a solid physical form that minimizes the potential for commingling to occur. To ensure that ignitable and reactive wastes are managed safely and properly, their characteristics are identified and documented, the wastes are labeled appropriately, and the waste types are physically segregated within each container storage area. Currently, the mixed waste storage tank systems and the cementation unit do not manage ignitable or reactive mixed waste.

3.1.5.2 Procedures for Incompatible Wastes

Pursuant to 20 NMAC 4.1 Subpart V, 264.17, revised November 1, 1995, specific waste management procedures for incompatible wastes are described as follows. By utilizing the information provided by the generator, incompatible wastes are identified, segregated, and separated by distance or by secondary containment where appropriate. Containers storing hazardous and mixed wastes are segregated according to the following compatibility group scheme: (1) flammables/ignitables; (2) oxidizers; (3) corrosive acids; (4) reactives (those reactive with water); (5) corrosive bases; (6) other reactives; and (7) other wastes. TRU mixed waste in Area 6 is stored by mass of radionuclides due to the ALARA principle and because of criticality concerns. Waste contained within the mixed waste storage tank systems is generated from a single administratively-controlled process and thereby is not expected to be incompatible. This same waste stream (i.e., evaporator bottoms solutions) is the only mixed waste stream routinely treated in the cementation unit, which is also administratively-controlled. These procedures ensure that incompatible wastes will not mix in the event of a release while in storage or will not commingle during other waste management activities.

3.1.5.3 Procedures to Ensure Compliance with LDR Requirements [20 NMAC 4.1, Subpart VIII, 268.7(a), 268.7(b)(1), (3), (4), and (5) and 268.9(b), (c), and (d)]

In accordance with LDR requirements, waste shipped off site may need to be analyzed to determine whether it meets the applicable LDR treatment standards in 20 NMAC 4.1, Subpart VIII, Part 268, Subpart D, revised November 1, 1995. Treatment standards are expressed in two ways:

- As constituent concentrations in the waste (from either an extract of the waste, as determined by the toxicity characteristic leaching procedure (TCLP), or from the total volume of the waste referred to as total waste analysis)
- As specified treatment technologies.

If, (1) it is known whether the waste meets applicable LDR treatment standards based on acceptable knowledge, or (2) the waste is transported to a permitted hazardous waste management facility operating in conformance with a no-migration determination pursuant to 20 NMAC 4.1, Subpart VIII, 268.6, revised November 1, 1995, then sampling and analysis to certify LDR compliance are not necessary for the affected waste. Sampling and analysis are conducted in accordance with 20 NMAC 4.1, Subpart VIII, Part 268, revised November 1, 1995, only to certify that the waste meets LDR treatment standards. Each waste for which a treatment standard has been established is evaluated for the applicable parameters in 20 NMAC 4.1, Subpart VIII, Part 268, Subpart D, revised November 1, 1995. All analytical results completed in support of LDR requirements are retained within TA-55's operating record. Hazardous wastes and low-level mixed wastes that do not meet the applicable treatment standards may be sent to a permitted off-site treatment facility. LDR notifications, with information required under 20 NMAC 4.1, Subpart VIII, 268.7 and 268.9, revised November 1, 1995, are supplied for every shipment of waste sent to an off-site treatment facility. Additional data for the waste stream (e.g., Waste Profile Form [WPF], analytical data) may be required by the designated treatment facility in addition to the LDR notification. LDR determinations are documented on LANL's Land Disposal Restrictions Notification Form (Figure 3-1), or a similar form if this form is revised.

3.2 WASTE ANALYSIS REQUIREMENTS FOR THE STORAGE OF TRU MIXED WASTE

Specific waste analysis requirements for the storage of TRU mixed waste are provided in the following sections.

3.2.1 Facility Waste-Generating Processes, Activities, and Identification of TRU Mixed Wastes Stored

TRU mixed waste currently in storage at TA-55 is generated primarily during research and development (R&D) activities, processing and recovery operations, D&D projects, and general facility operations. Additional information on TRU mixed waste-generating processes is provided in Section 3.2.1.1.

For waste characterization purposes, TRU mixed waste at LANL has been subdivided into groups based on the timeframe for generation of the waste: *existing (or currently generated)* and *future*. These groups are defined in the List of Definitions. In addition to grouping TRU mixed waste based on the time of generation, TRU mixed waste streams at TA-55 are divided into two broad categories referred to as *matrix parameter codes*, which are used to define waste characterization groupings for the Federal Facilities Compliance Act. These matrix parameter codes are based upon the physical and chemical forms of the waste and are identified as follows:

- Matrix Parameter Code S3000 - homogeneous solids
- Matrix Parameter Code S5000 - debris wastes.

Matrix parameter code descriptions are provided in "DOE Waste Treatability Group Guidance" (DOE, 1995a). Sampling and analytical procedures, discussed in Section 3.2.3.3, are based on the physical characteristics of these broad categories.

Matrix parameter codes are applied to TRU mixed waste streams as a general categorization scheme to distinguish waste types. An additional waste identification system is used for supplementary purposes as part of waste management operations for TRU mixed waste generated at TA-55. Table 3-5 cross references the matrix parameter codes with the waste identification system, known as the TRUPACT-II Content (TRUCON) Code system, described below.

TRUCON codes were developed by DOE to provide a consistent waste description for TRU and TRU mixed waste generated throughout all of DOE's facilities. The TRUCON codes are intended to assist DOE in establishing the characteristics of TRU and TRU mixed waste to be certified for transportation to the Waste Isolation Pilot Plant (WIPP). LANL TRUCON codes consist of a three-digit number preceded by the letters "LA" and are followed by a letter that further defines the

waste packaging, source, or waste type. Proposed TRUCON codes for TRU mixed waste generated at TA-55 are provided in Section 3.2.1.1. These TRUCON codes are provided for informational purposes only and are updated periodically to reflect the most current characteristics of the waste package (e.g., packaging layers). However, these updates do not reflect a change in waste stream generation.

Each matrix parameter code includes a number of TRUCON codes. TRUCON codes currently generated at TA-55 and listed in LANL's TRU mixed waste inventory are described below. The basis for hazardous waste classification for each TRUCON code is provided in Table 3-6. Because TRUCON codes were not developed to provide hazardous waste characterization information, potential EPA Hazardous Waste Numbers (as referenced by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995) and hazardous constituents shown in Table 3-6 represent a conservative approach used to identify potential hazardous constituents for existing TRU mixed waste streams. Waste characterization, as discussed in Section 3.2.3, is used to confirm hazardous constituents present in individual waste streams. The potential EPA Hazardous Waste Numbers and potential hazardous constituents shown in Table 3-6 are the result of the most recent iteration of this process and may be updated upon further evaluation.

3.2.1.1 LANL TRUCON Codes

This section provides a brief description of the TRUCON-coded TRU mixed waste streams currently stored at TA-55. All existing (i.e., currently generated) TRU mixed waste at TA-55 is assigned a TRUCON code.

TRUCON Code LA 114

TRUCON code LA 114 consists of solidified inorganic process solids and liquids. At TA-55, this waste is generated as a result of plutonium-processing operations. This waste stream includes process residue from evaporator bottoms and other compatible discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines. These process solids are solidified with cement in the cementation unit at TA-55-4 to form a noncorrosive solid matrix.

TRUCON Code LA 116

TRUCON code LA 116 is comprised of combustible waste. These combustible solids consist primarily of paper, rags, plastic, and rubber. A small fraction of noncombustible solids, such as scrap metals, may also be contained in this waste form.

TRUCON Code LA 117

TRUCON code LA 117 is comprised of noncombustible metal waste. Metal waste consists of motors, pumps, tools, process equipment, and glass with a small fraction of combustible waste, such as plastics (mainly packaging).

TRUCON Code LA 118

TRUCON code LA 118 consists of glass waste generated from plutonium-processing activities at TA-55. This glass waste consists of discarded laboratory glassware, windows, bottles, and metal with a small fraction of combustible waste, such as plastic (mainly packaging).

TRUCON Code LA 123

TRUCON code LA 123 is comprised of leaded gloves with a small fraction of noncombustible waste such as motors and tools generated from plutonium-processing activities at TA-55.

TRUCON Code LA 125

TRUCON code LA 125 is comprised of mixtures of combustible and noncombustible waste. These solids include paper, rags, plastic, rubber, leaded glovebox gloves, glass, motors, pumps, tools, and miscellaneous metal waste.

TRUCON Code LA 126

TRUCON code LA 126 consists of solidified organic process solids and liquids. At TA-55, this waste is generated as a result of plutonium-processing operations and includes inorganic and organic process solids and liquids which, together with plastic packaging, result in >5% and normally ≤10% organics. Solidified process solids may include process residue from evaporator bottoms and other compatible discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines. These process solids are solidified with cement in the cementation unit at TA-55-4 to form a noncorrosive solid matrix.

3.2.2 Waste Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)]

Characterization is performed prior to storing TRU mixed waste to meet the requirements of 20 NMAC 4.1, Subpart V, 264.13, revised November 1, 1995. Waste parameters are selected to ensure that this characterization contains all necessary information to properly store waste in accordance with general facility standards and LDR requirements.

3.2.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)]

Proposed analytical parameters and characterization methods for TRU mixed waste stored at TA-55 are summarized in Table 3-2. Some or all of the parameters listed below may be used to determine the regulatory status of TRU mixed waste.

- Physical waste form characterization through visual examination to verify waste container contents
- Hazardous constituent sampling to determine the presence and concentrations of:
  - RCRA-regulated metals
  - RCRA-regulated VOCs
  - RCRA-regulated SVOCs[2]
- Sampling to determine the presence of characteristic hazardous waste
  - ignitability
  - corrosivity

3.2.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)]

Waste analysis parameters are selected to characterize TRU mixed waste in conformance with 20 NMAC 4.1, Subpart II, revised November 1, 1995, and to ensure that all criteria for disposition at WIPP will be met. Waste characterization procedures for WIPP are specified in the "TRU Waste Characterization Quality Assurance Program Plan" (QAPP) (DOE, 1995b) and are based on knowledge of raw materials and physical/chemical processes of waste-generating activities and may be supported by analytical data. The analytical parameters and the rationale for these parameters are identified in Table 3-7.

[2]Refer to Footnote 1.

3.2.3 Characterization of TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)]

All TRU mixed waste stored at TA-55 is characterized using acceptable knowledge, which in certain instances is supported by sampling and analysis. As provided in the List of Definitions, *existing (or currently generated)* TRU mixed waste is characterized using LANL's WPF (i.e., waste generated since May 1991). *Future* TRU mixed waste will be characterized using both LANL's WPF (see Section 3.2.3.1) and a radioactive and mixed waste certification program.

The TRU mixed waste types described include homogeneous solids and debris wastes. As discussed in Section 3.2.1, these types are categorized by *matrix parameter codes* based on the physical and chemical form of the waste. The homogeneous solids waste streams stored at TA-55 (Matrix Parameter Code S3000) may contain RCRA-regulated metals[3] (see Table 3-2). These homogeneous waste streams are periodically sampled and analyzed for the toxicity characteristic (TC) metal contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995. Analysis for total concentration of TC contaminants may be performed on samples in a screening step. If total concentrations are used in the waste characterization process, analytical data is compared to the TC regulatory levels expressed as total values. These total values are considered the regulatory threshold limit (RTL) values for the determination of whether a particular solid waste exhibits a TC. RTL values are obtained by calculating the weight/weight concentration (in the solid) of a TC contaminant that would give the regulatory weight/volume concentration in the TCLP extract.

Debris waste streams stored at TA-55 (Matrix Parameter Code S5000) consist of heterogeneous materials. As such, it is difficult to obtain representative samples, and the waste type is best characterized through examination of the original materials from which the waste was generated. Therefore, debris waste is characterized for the presence of hazardous constituents (i.e., VOCs, SVOCs, and metals) using process knowledge and visual inspection, which support acceptable knowledge as defined on page 3-ii. TRU heterogeneous debris wastes are visually inspected by Nuclear Materials Technology (NMT) Division waste management personnel prior to placement in a waste container.

---

[3]Refer to Footnote 1.

Determinations of hazardous constituents present in each waste stream are based on process knowledge, with waste sampling and analysis performed as necessary to obtain qualitative and quantitative data for hazardous constituents (i.e., VOCs, SVOCs, and metals). Table 3-7 summarizes characterization methods by matrix parameter code. Waste characterization techniques for specific hazardous parameters are presented in Table 3-2. The following discussion presents the approach to characterization used for each of these waste groups, integrating the time of generation and the physical form of the waste.

Existing TRU mixed waste stored at TA-55 is characterized using process knowledge provided by individual waste generators on LANL's WPF. (For a detailed description of the WPF, refer to Section 3.2.3.1.) Further characterization of existing TRU mixed waste will be performed at other appropriate LANL facilities (LANL, 1995a). This additional characterization of homogeneous existing waste will use statistically-based sampling and analysis and may consist of headspace gas analysis, real-time radiography (RTR), and visual examination. Heterogeneous existing TRU mixed waste is characterized using process knowledge, which may be supplemented with headspace gas sampling, RTR, and visual examination performed at other appropriate LANL facilities (LANL, 1995a).

Future homogeneous TRU mixed waste will be characterized through the use of LANL's WPF and a radioactive and mixed waste certification program. Sampling and analysis will be conducted for characterization only when required to fully document or verify the waste stream. Documented and auditable acceptable knowledge will be used to determine whether the waste stream is hazardous, as defined by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995. If available information regarding acceptable knowledge is insufficient for waste characterization, additional information will be obtained using the sampling procedures identified in Section 3.2.3.3. Heterogeneous waste will be characterized using acceptable knowledge, which may be supported by some waste analysis data.

For future TRU mixed waste, knowledge of the waste-generating process will be strictly controlled by a QA/QC program that addresses management of specific waste streams. This approach will provide a rigid definition for the acceptable knowledge applicable to specific waste streams. For example, the QA/QC program may include procedures for controlling chemical inputs to the waste-generating process as well as procedures for confirming the types of waste placed in

different waste containers. These measures will provide knowledge of the types and concentrations of chemical constituents in individual waste streams.

3.2.3.1 Waste Profiling System [20 NMAC 4.1, Subpart V, 264.13(a)(3), 264.13(b)(4) and (5), and Subpart IX, 270.14(b)(2)]

In an effort to maintain detailed and accurate waste characterization information, TA-55 uses a generator waste-profiling program for existing (i.e., currently generated) waste. The waste-profiling effort requires each waste generator to provide a detailed written description of the waste on a standardized WPF, Form 1346 (Figure 3-2) or a similar form if this form is revised. The waste description can be based on generator process knowledge, the use of appropriate Material Safety Data Sheets (MSDS), results of a chemical/physical analysis of the specific waste, and/or any additional information for acceptable knowledge. By completing the WPF, waste generators supply information that allows for the proper storage or treatment (if applicable) of hazardous or mixed waste at TA-55. A generator may initiate a request for the sampling and analysis of unknown or incompletely characterized waste streams by marking the designated box on the WPF. Specific information that is requested on the WPF includes:

- Point of generation
- Method of characterization
- Waste categories
- Waste description
- Waste origination
- Classification of radioactivity (if applicable)
- Presence of toxic metals and an estimate of concentration
- Presence of organic compounds and an estimate of concentration (if applicable)
- Identification of hazardous constituents
- Identification of hazardous characteristics
- Identification of the radiological characteristics of the waste (if applicable).

A WPF contains sufficient information to allow NMT to classify the waste type, class, category, source, matrix, and matrix type (Figure 3-2). The accuracy of information provided on the WPF as well as the resulting waste characterization is reviewed by waste management personnel. Ultimately, the waste profile is used by NMT in conjunction with other required TRU waste documentation to determine the proper procedures for managing the waste.

All waste generators must certify, based on their knowledge of the waste, that the information on the WPF is complete and accurate. Knowingly providing false information can result in

administrative action by LANL. Additionally, the owner and/or operators of LANL could be subject to potential significant civil or criminal penalties by a state or federal regulatory agency.

Waste generators must provide new profiles when a significant process change results in a change in waste composition or when a new waste is generated; otherwise, WPFs are reevaluated annually. This annual reevaluation complies with the characterization frequency requirement in 20 NMAC 4.1, Subpart V, 264.13(b)(4), revised November 1, 1995.

3.2.3.2 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2), 264.13(b)(5), and Subpart IX, 270.14(b)(2)]

Acceptable knowledge is relied upon to characterize TRU mixed waste forms for storage at TA-55 because all TRU mixed wastes are generated by administratively-controlled processes. Health and safety risks to personnel from exposure to radioactive materials during sampling and analysis of certain TRU mixed waste forms and the limited number of analytical laboratories make the collection and analysis of TRU mixed waste samples difficult. For generation of future TRU mixed waste, LANL is in the process of implementing a radioactive and mixed waste certification program to ensure that information used for mixed waste characterization is documented and auditable.

According to EPA guidance, *acceptable knowledge* is broadly defined to include process knowledge, supplemental waste analysis data, and/or facility records of analysis (EPA, 1994b). *Process knowledge* is described in 20 NMAC 4.1, Subpart V, 264.13(a)(2), revised November 1, 1995, as data developed under 20 NMAC 4.1, Subpart II, revised November 1, 1995, and existing published or documented data on a specific hazardous waste or hazardous waste generated from similar processes. *Supplemental waste analysis data* may provide concentration(s) of regulated hazardous constituents and/or results of tests for hazardous characteristics. These data are used to determine if wastes are regulated and to determine their LDR status. EPA guidance suggests that acceptable knowledge may be appropriate for wastes meeting the following descriptions.

- Wastes containing hazardous constituents from specific processes that are well documented, such as RCRA F-listed and/or K-listed waste[4] code descriptions.

[4]Refer to Footnote 1.

- Wastes consisting of discarded unused commercial chemical products, reagents or chemicals containing known physical, and chemical constituents. Several of these wastes fall into the RCRA P-listed and U-listed waste[5] code descriptions.

- Waste (e.g., radioactive mixed waste) containing levels of radioactivity such that health and safety risks to personnel do not justify sampling and analysis due to quantified and documented radiological concerns.

- Wastes containing heterogeneous materials, where the physical nature of the waste does not lend itself to taking a representative sample (e.g., laboratory trash and construction debris with surface contamination) (EPA, 1994b).

At LANL, waste generators will obtain, assemble, and prepare the acceptable knowledge documentation available for each waste stream in a separate auditable file or maintain a waste stream reference file that identifies the acceptable knowledge documents and their locations. The acceptable knowledge documentation will be explicitly relevant and traceable to a waste type and must not be merely a list of information sources for a particular operation or waste. There are many sources of applicable documentation at LANL that may be used to substantiate acceptable knowledge for a specific waste stream. This documentation includes the following:

- Process design documents (e.g., Title II Design).

- Final safety analysis reports (SAR), unreviewed safety question determinations (USQD), and technical safety requirements (TSR).

- Standard operating procedures and detailed operating procedures that list raw materials or reagents, describe the process/experiment that uses the materials, and describe how the waste streams are generated and handled.

- Waste packaging logs completed when controlled wastes are placed in containers.

- Test plans or research project reports that describe the reagents and other raw materials used in an experiment.

- Notebooks, process logs, and run sheets that detail the research processes and raw materials used in an experiment.

- Site databases (e.g., chemical inventory database for Superfund Amendments and Reauthorization Act Title III requirements).

- Documented site personnel interview information.

---

[5]Refer to Footnote 1.

- Standard industry practice documents (e.g., vendor information).
- Available studies that contain analytical data can be used to identify constituents of a specific "similar" process waste stream and to determine the regulatory status of the waste stream for common industrial or LANL processes. Such reports on a similar process should have a clear and documented connection to the waste stream being characterized.
- Previous analytical data relevant to the waste stream, such as fingerprint analysis, spot-check procedures, or routine waste verification sampling and analysis data.
- MSDSs, product labels, and other product package information.
- Documented visual inspections that can be used to identify or confirm the physical characteristics and packaging of a waste.

Sampling surrogate wastes (e.g., equivalent nonradioactive or low-level radioactive materials) may also be a means of obtaining acceptable knowledge for characterizing mixed wastes. In some cases, a low-level mixed waste stream may be chemically equivalent to a TRU mixed waste stream. Because data for a low-level mixed waste stream may be more readily attainable, it may be useful for characterizing the TRU mixed waste stream. Sampling nonradioactive inputs or outputs from processes may also provide data that are useful for characterizing a similar TRU mixed waste stream.

The physical nature of some heterogeneous TRU mixed waste forms (e.g., debris) makes the collection of representative samples difficult. These difficulties include:

- Waste streams that contain disparate elements
- Disparate elements may need to be segregated into similar forms
- Large objects cannot be made to fill standard size sample containers
- Laboratories may not have the capability to sample large objects (EPA, 1992).

Because of these limitations, debris wastes may exhibit highly variable concentrations of hazardous constituents, even for segregated materials. Consequently, analytical data generated from sampling debris waste may be unreliable. Therefore, acceptable knowledge is a reasonable approach to characterizing debris waste.

The acceptable knowledge approach to characterizing TRU mixed debris waste is supported by EPA guidance (EPA, 1994b). A conservative approach is used to determine if a waste is a

regulated hazardous/mixed waste. Process inputs (e.g., chemicals) are identified, and if the waste stream generated may contain hazardous constituents derived from process inputs, the waste is managed as a regulated hazardous/mixed waste. This type of process knowledge is used to characterize TRU mixed debris waste. Knowledge of the materials and operations that generate specific waste streams in the debris category is used to determine if these types of items are present in the waste and if the waste stream contains RCRA-regulated metals[6].

3.2.3.3 Sampling and Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2) and (3), and Subpart IX, 270.14(b)(2)]

This section discusses proposed sampling and analytical procedures and frequency of sampling applicable to TRU mixed wastes. The approach described for characterizing TRU mixed waste streams is based on radiological, physical/chemical, and hazardous properties of the waste. The sampling and analysis strategies presented here will be used to evaluate whether TRU mixed waste exhibits the characteristic of toxicity for metals, as described in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995. Determinations of whether a TRU mixed waste exhibits other characteristics (i.e., ignitability, corrosivity, or reactivity) or is listed will be made by applying acceptable knowledge, as described in Section 3.2.3.2. Homogeneous waste sampling and analysis (e.g., for VOCs, SVOCs, and metals) will be used to obtain the physical and chemical data necessary for TRU mixed waste characterization. Additionally, further characterization such as RTR, visual examination, and headspace gas sampling will be performed at other appropriate LANL facilities as confirmational sampling and analysis procedures (LANL, 1995a). These procedures, coupled with documented, auditable process knowledge, will result in accurate, defensible waste characterization of TRU mixed waste. Specific waste sampling methods and sample handling procedures are described below.

3.2.3.3.1 Visual Examination [20 NMAC 4.1, Subpart V, 264.13(b)(2), and Subpart IX, 270.14(b)(2)]

The contents of all TRU mixed waste containers are visually examined by NMT waste management personnel and certified (as part of a radioactive and mixed waste certification program) prior to storage.

[6]Refer to Footnote 1.

3.2.3.3.2 TRU Solid Mixed Waste Sampling and Analysis [20 NMAC 4.1, Subpart V, 264.13(b)(3)]

Sampling and analysis will be performed when a homogeneous solid TRU mixed waste lacks sufficient process information to adequately characterize the waste based on acceptable knowledge. Sampling and analysis can be initiated by the generator or waste management group through the WPF. To ensure that proper procedures and considerations for sample collection, preservation, and shipping; QA/QC; and occupational safety and health are followed, personnel involved in sampling and analysis of TRU solid mixed waste will comply with LANL-specific protocol consistent with SW-846 (EPA, 1994c). Sampling is conducted according to LANL sampling procedures to ensure that a representative sample is collected. Specific information relative to sampling, parameters, and analytical methods is outlined in Tables 3-1 and 3-2.

For purposes of collecting a representative sample of TRU solid mixed waste, the sample will be collected and handled by means that will preserve its original physical form and composition and will prevent contamination or changes in concentration of the parameters to be analyzed (EPA, 1994c). The two major approaches used to collect a representative sample are authoritative and random sampling as defined in SW-846.

3.2.4 Verification Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3)]

Verification analysis may be performed for one or more of the following reasons: to verify the accuracy of the initial waste characterization; to verify that applicable treatment standards have been met; when there is a significant change in a waste-generating process; when the generator requests a review; or when analytical results indicate a change in a waste stream. Verification analysis for TRU mixed waste will be conducted at LANL's or an approved subcontractor's laboratory facilities. All verification analyses will be conducted in conformance with appropriate methods.

LANL homogeneous TRU mixed waste streams will undergo verification sampling and analysis at a frequency of at least 1 percent of the waste streams per year. This verification will be used to support waste characterization information provided on the WPF and the radioactive and mixed waste certification information. Analytical results that show regulated constituents present at concentrations outside the ranges specified on the existing WPF are cause for rejection of the existing WPF and will require additional characterization (i.e., a new WPF will be generated and

submitted to waste management personnel prior to acceptance of a routinely generated waste stream in question). The recharacterization will include sampling and analysis sufficient to establish the range of regulated constituents potentially present in the waste stream (to the extent possible).

3.3 WASTE ANALYSIS REQUIREMENTS FOR THE TREATMENT OF TRU MIXED WASTE

Specific waste analysis requirements for the treatment of TRU mixed waste are provided in the following sections.

3.3.1 Facility Waste-Generating Processes, Activities, and Identification of TRU Mixed Wastes Managed

TRU mixed waste treated in the cementation unit by solidification is generated primarily from R&D activities and processing and recovery operations. Specifically, TRU mixed waste that may be treated by solidification at TA-55 consists of liquids (i.e., evaporator bottoms solutions) and inorganic and organic process solids. Once these wastes are treated, they are classified as homogeneous solids (Matrix Parameter Code S3000).

3.3.1.1 TRUCON Codes

The TRUCON-coded TRU mixed waste streams generated and subsequently treated at TA-55 are LA 114 and LA 126. These TRUCON codes are fully described in Section 3.2.1.1. The EPA Hazardous Waste Numbers that potentially apply to these TRUCON-coded wastes are listed in Table 3-6.

3.3.2 Waste Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)]

Characterization is performed prior to treating TRU mixed waste, as required by 20 NMAC 4.1, revised November 1, 1995. Waste parameters are selected to ensure that this characterization contains all necessary information to properly treat the waste in accordance with general facility standards.

3.3.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)]

Proposed analytical parameters for characterization of TRU mixed waste and for verification of effective treatment (i.e., to confirm the physical form of the waste) include the parameters previously mentioned in Section 3.2.2.1 and are summarized in Table 3-2.

3.3.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)]

Waste analysis parameters are selected to characterize TRU mixed waste in conformance with 20 NMAC 4.1, revised November 1, 1995; to ensure that all criteria for disposition at WIPP will be met; and to verify treatment effectiveness (i.e., solidification). The analytical parameters and the rationale for the selected parameters are identified in Table 3-7.

3.3.3 Characterization of Treated TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)]

Chemical and physical characterization is performed prior to treatment of TRU mixed waste at TA-55, in accordance with 20 NMAC 4.1, Subpart V, 264.13, revised November 1, 1995. Characterization of TRU mixed waste is accomplished by applying process knowledge and by obtaining chemical analytical data from representative samples of TRU liquid waste (i.e., evaporator bottoms solutions) to be treated by solidification. Preliminary TRU mixed waste characterizations are developed using process knowledge and through the use of a radioactive and mixed waste certification program. Documented and auditable acceptable knowledge, as described in Section 3.3.3.1, is used to determine whether the waste stream is regulated as a hazardous waste. If a homogeneous TRU mixed waste cannot be adequately characterized because of insufficient process information, sampling and analysis are performed.

Homogeneous solids and liquids are the only TRU mixed waste types treated at TA-55. Waste streams generated at TA-55 in the homogeneous solids (Matrix Parameter Code S3000) category may contain RCRA-regulated metals[7] (see Table 3-2). These homogeneous waste streams are periodically sampled and analyzed for the TC metal contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995, as previously discussed in Section 3.2.3. For liquids (i.e., evaporator bottoms solutions), the total values are directly correlated to the maximum concentration of contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995.

Initial predictions of hazardous constituents present in each treated waste stream will be based on process knowledge, with waste sampling and analysis performed as necessary to obtain qualitative and quantitative data for hazardous constituents (i.e., metals). Table 3-7 summarizes

[7]Refer to Footnote 1.

characterization methods by matrix parameter code. Parameters and analytical methods for specific hazardous constituents are presented in Table 3-2.

Sampling of TRU mixed waste treated at TA-55 may be performed at other appropriate LANL facilities. For this additional sampling effort, LANL will use statistically-based sampling and analysis, along with RTR, visual examination, and headspace gas analysis (LANL, 1995a).

For future TRU mixed waste, knowledge of the waste-generating process will be strictly controlled by a QA/QC program that will address management of specific waste streams. This program is briefly described in Section 3.2.3.

3.3.3.1 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2), 264.13(b)(5), and Subpart IX, 270.14(b)(2)]

TRU mixed waste currently generated and treated at TA-55 is characterized primarily by using acceptable knowledge because TRU mixed wastes treated at TA-55 are generated by administratively-controlled processes. Health and safety risks to personnel from exposure to radioactive materials during sampling and analysis of certain TRU mixed waste forms and the limited number of analytical laboratories capable of accepting and analyzing TRU mixed waste makes the collection and analysis of TRU mixed waste samples difficult. For additional information regarding the use and sources of acceptable knowledge, refer to Section 3.2.3.2.

3.3.3.2 Sampling and Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2) and (3), and Subpart IX, 270.14(b)(2)]

This section discusses proposed sampling and analytical procedures applicable to TRU mixed wastes. The approach described for characterizing TRU mixed waste streams is based on radiological, physical/chemical, and hazardous properties of the waste. The sampling and analysis strategies presented here will be used to evaluate whether TRU mixed waste exhibits the characteristic of toxicity for metals, as described in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995. Determinations of whether a TRU mixed waste exhibits other characteristics (i.e., ignitability, corrosivity, or reactivity) or is listed are made by applying acceptable knowledge, as described in Section 3.3.3.1. Homogeneous waste sampling and analysis for metals is used to obtain the physical and chemical data necessary for TRU mixed waste characterization prior to treatment.

3.3.3.2.1 TRU Solid Mixed Waste Sampling and Analysis [20 NMAC 4.1, Subpart V, 264.13(b)(3)]

Sampling and analysis will be performed when a homogeneous solid TRU mixed waste lacks sufficient process information to adequately characterize the waste based on acceptable knowledge. Sampling and analysis can be initiated by the generator or waste management group through the WPF. Waste sampling methods and sample handling procedures are described in Section 3.2.3.3.2.

3.3.3.2.2 TRU Liquid Mixed Waste Sampling and Analysis

TRU liquid mixed waste (i.e., evaporator bottoms solutions) is routinely sampled and analyzed for total metal content. Additionally, the evaporator bottoms solutions will be periodically sampled for VOCs and SVOCs. To ensure that proper procedures and considerations for sample collection and preservation, QA/QC, and occupational safety and health are followed, personnel involved in sampling and analysis of the evaporator bottoms solutions comply with LANL-specific protocol consistent with SW-846 (EPA, 1994c). For purposes of collecting a representative sample of evaporator bottoms solutions, the sample will be collected and handled in a manner that preserves its original physical form and composition and prevents contamination or changes in concentration of the parameters to be analyzed (EPA, 1994c). Sampling of evaporator bottoms solutions is conducted according to the sampling procedure described in NMT's procedure number 485-REC. Specific information relative to sampling, parameters, and analytical methods is outlined in Tables 3-1 and 3-2.

3.3.4 Verification Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3)]

Analysis may be performed to verify the accuracy of the initial waste characterization, to verify that applicable treatment standards have been met, when there is a significant change in a waste-generating process, when the generator requests a review, or when analytical results indicate a change in a waste stream. Verification analysis for TRU mixed waste will be conducted at LANL's or an approved subcontractor's laboratory facilities. All verification analyses will be conducted in conformance with appropriate methods.

At LANL, homogeneous TRU mixed waste streams will undergo verification sampling and analysis at a frequency of at least 1 percent of the waste streams per year. This verification will be used

to support waste characterization information provided on the WPF and the radioactive and mixed waste certification information.

3.4 WASTE ANALYSIS REQUIREMENTS FOR THE STORAGE OF LOW-LEVEL MIXED WASTE

Specific waste analysis requirements for the storage of low-level mixed waste are provided in the following sections.

3.4.1 Facility Waste-Generating Processes, Activities, and Identification of Low-Level Mixed Wastes Managed

Low-level mixed waste generated and stored at TA-55 is primarily from R&D activities, processing and recovery operations, general facility operations, and D&D activities conducted in radiological areas. Table 3-8 provides information on potential low-level mixed waste streams generated and stored at TA-55 including brief waste descriptions and waste-generating processes. The characterization basis for hazardous waste designation (i.e., acceptable knowledge and/or sampling and analysis), potential EPA Hazardous Waste Number(s), potential hazardous constituents in and/or characteristics of the waste, and regulatory limits are also listed in Table 3-8. Descriptions of the low-level mixed wastes and their waste-generating processes are provided below. These descriptions were extracted primarily from LANL's "Report for the Characterization Review of Low-Level Mixed Waste, Final Draft," (LANL, 1995b) and supplemented with information from NMT's WPF database.

3.4.1.1 Homogeneous Low-Level Solid Mixed Wastes

The homogeneous (i.e., uniform composition) low-level solid mixed waste stream generated and subsequently stored at TA-55 is described generally in the following paragraph.

Unused Solid Reagent Chemicals

Many different types of discarded off-specification unused reagent powders and crystalline materials generated at TA-55 comprise this waste stream. Most of these items are in the original manufacturer's containers. Many of these containers are unopened but are suspected to have radioactive surface contamination.

3.4.1.2 Heterogeneous Low-Level Solid Mixed Wastes

Heterogeneous (i.e., dissimilar or diverse composition) low-level solid mixed waste streams generated and subsequently stored at TA-55 are described generally in the following paragraphs.

Contaminated Bulk Lead Shielding and Scrap

Contaminated bulk lead shielding, metal debris, and contaminated scrap metals generated at TA-55 consist of radiation shielding used during laser applications, and D&D materials including, but not limited to, metal fittings, piping, and tools.

Discarded Bricks

Discarded bricks are generated at TA-55 and consist of lead bricks from radiation shielding and debris from D&D projects.

Organic-Contaminated Noncombustible Solids

This waste stream typically includes absorbed oils, laboratory debris, and discarded equipment. Absorbed oil waste is comprised of bulk drums containing rags or Kimwipes™ and vermiculite or corncob fractions used to absorb many different types of oil from spills, routine maintenance operations, and off-normal waste[8]. The oil generally originates from vacuum pumps and may be contaminated with mercury, lead, or cadmium. Absorbent is routinely added to those waste oils as required by standard operating procedures. The laboratory debris includes reagent bottles, broken glassware, and discarded disposable materials (e.g., drying dishes). Residual liquids or powders may have remained on some of the disposed material. Discarded equipment with heavy metals and solvents primarily includes equipment and broken glassware that may have contained residual solvents.

Mercury Waste

The mercury waste stream generated at TA-55 consists of free elemental mercury, mercuric compounds, gels containing mercuric compounds, and discarded instruments or broken equipment containing liquid mercury. The instruments and equipment include broken

[8]Off-normal waste is any non-routinely generated waste and may include spill residues, D&D waste, and waste generated during environmental remediation/restoration activities.

thermometers, vacuum tubes from electronic applications, vacuum pumps with residual mercury, fluorescent light bulbs, and mercury absorbed into a paper or solid matrix.

Batteries

Battery wastes generated at TA-55 include discarded lead-acid, mercury, and rechargeable batteries from decommissioned equipment or routine maintenance operations. Some batteries may contain residual liquids. Many of the batteries were used as backup power supplies at locations where they were potentially subject to long-term radiological contamination.

3.4.1.3 Low-Level Liquid Mixed Wastes

Low-level liquid mixed waste streams generated and subsequently stored at TA-55 are described generally in the following paragraphs.

Spent Solvents and Contaminated Solvent Mixtures

This waste stream is comprised of spent solvents and spent solvent mixtures that may be contaminated with organic or inorganic compounds, heavy metals, oils, and other contaminants. Waste-generating activities at TA-55 include a wide variety of R&D and processing operations such as extraction operations, bench-scale experimental inorganic chemistry, environmental analysis, and radiochemistry.

Corrosive Liquid Wastes

Corrosive liquid wastes generated at TA-55 consist of acidic or alkaline solutions which may be contaminated with organics, inorganics, metals, oils, or other contaminants. Waste-generating activities at TA-55 include radiochemistry research, plutonium processing, and analytical chemistry.

Nonaqueous, Noncorrosive Liquids Contaminated with Heavy Metals

This waste stream consists of nonaqueous, noncorrosive solutions generated at TA-55 that are contaminated with heavy metals. Waste-generating activities at TA-55 include metal polishing operations and radiochemistry research.

Oil Wastes

Oil wastes are generated at TA-55 primarily during equipment maintenance operations. Possible contaminants include heavy metals and solvents.

Unused Liquid Reagent Chemicals

Many different types of discarded off-specification unused liquid reagent chemicals generated at TA-55 comprise this waste stream. Most of these items are in their original containers.

Photographic Processing and Photocopier Wastes

Photographic-processing wastes include spent or excess film developers, fixer solutions, and photo bleach solutions that may be contaminated with heavy metals. Photocopier wastes include kerosene-based toners and dispersants. Waste-generating activities at TA-55 include photographic film-processing and photocopier operations.

3.4.2 Waste Analysis Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)]

Chemical and physical characterization is performed prior to managing low-level mixed waste, as required by 20 NMAC 4.1, revised November 1, 1995. Waste analysis parameters are selected to ensure that the characterization contains all necessary information to properly store waste in accordance with general facility standards and LDR requirements. Characterization is performed by utilizing the procedures described in Section 3.4.3.

3.4.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)]

Proposed analytical parameters, characterization methods, and test methods for the storage of low-level mixed waste are summarized in Tables 3-3 and 3-9. The analytical parameters listed in Table 3-9 for the waste streams described in Section 3.4.1 were selected based on acceptable knowledge, as described in Section 3.4.3.1.

Documentation supporting acceptable knowledge for each waste stream is reviewed to identify the analytical parameters for potential hazardous constituents in the waste and any compatibility concerns associated with the waste. Table 3-3 indicates the proposed test methods for generating the data, pursuant to 20 NMAC 4.1, Subpart V, 264.13(b)(2), revised November 1, 1995.

3.4.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)]

Waste analysis parameters are selected to characterize low-level mixed waste in conformance with 20 NMAC 4.1, revised November 1, 1995. These parameters are based on knowledge of raw materials and the physical/chemical processes of waste-generating activities, and may be supported by analytical data. The rationale for the selected parameters are identified in Tables 3-3 and 3-9.

3.4.3 Characterization of Low-Level Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)]

Chemical and physical characterization is performed prior to storing any low-level mixed waste at TA-55, in accordance with 20 NMAC 4.1, Subpart V, 264.13, revised November 1, 1995. Characterization of low-level mixed waste is accomplished by applying process knowledge or obtaining chemical or physical analytical data from representative samples of the waste. Preliminary low-level mixed waste characterizations are developed using process knowledge, which is provided by waste generators. A secondary distinction between heterogeneous and homogeneous waste is then made to determine the availability and appropriateness of sampling procedures. If a homogeneous low-level mixed waste cannot be adequately characterized because of insufficient process information, sampling and analysis will be performed.

Characterization procedures are constrained by the physical nature of the waste stream (i.e., homogeneous or heterogeneous). Homogeneous low-level mixed waste may be characterized for the presence of hazardous constituents (i.e., VOCs, SVOCs, and metals) on the basis of process knowledge and/or sampling and analysis. Homogeneous waste streams may be sampled and analyzed for the TC contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995, as previously described in Section 3.2.3. For low-level liquid mixed waste, the total values are directly correlated to the maximum concentration of contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995. Because of the difficulty in obtaining representative samples and the lack of appropriate sampling methodology, heterogeneous low-level mixed waste will be characterized largely on the basis of process knowledge.

For waste streams characterized by process knowledge, LANL will implement a documented QA/QC program that will address management of these specific waste streams. This program is briefly described in Section 3.2.3 in the discussion of future TRU mixed waste.

3.4.3.1 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2), 264.13(b)(5), and Subpart IX, 270.14(b)(2)]

Low-level mixed wastes generated and stored at TA-55 are characterized primarily by using acceptable knowledge because many wastes stored at TA-55 are generated by well-defined and administratively-controlled processes. Health and safety risks to personnel from exposure to radioactive material during sampling and analysis activities and the limited number of analytical laboratories make the collection and analysis of low-level mixed waste samples difficult. In addition, the physical nature of some low-level mixed waste forms (e.g., debris, equipment, and instruments) makes the collection of representative samples difficult. These difficulties include:

- Waste streams which contain disparate elements
- Disparate elements may need to be segregated into similar forms
- Large objects cannot be made to fill standard-size sample containers
- Laboratories may not have the capability to sample large objects (EPA, 1992).

Obtaining a representative sample of debris waste, as required by 20 NMAC 4.1, Subpart V, 264.13(b)(3), revised November 1, 1995, is difficult. Because problems arise in collecting representative samples from irregularly shaped and indurated waste items, debris waste is expected to exhibit highly variable concentrations of hazardous constituents, even for segregated materials. This may potentially diminish the reliability of sampling and analytical data. Information collected as part of the radioactive and mixed waste certification program may support acceptable knowledge used for waste characterization. For additional information regarding the use and sources of acceptable knowledge, refer to Section 3.2.3.2.

3.4.3.2 Sampling and Analysis for Low-Level Solid Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3), 264.13(b)(2), (3), and (4), and Subpart IX, 270.14(b)(2)]

Sampling and analysis will be performed when a homogeneous low-level solid mixed waste lacks sufficient process information to adequately characterize the waste based on acceptable knowledge. Sampling and analysis can be initiated by the generator or waste management group through the WPF. To ensure that proper procedures and considerations for sample collection, preservation, and shipping; QA/QC; and occupational safety and health are followed, personnel

involved in sampling and analysis of low-level solid mixed waste comply with LANL-specific protocol consistent with SW-846 (EPA, 1994c). Sampling is conducted according to LANL sampling procedures to ensure that a representative sample is collected. Specific information relative to sampling, parameters, and analytical methods is outlined in Tables 3-1 and 3-3.

For purposes of collecting a representative sample of low-level solid mixed waste, the sample will be collected and handled by means that will preserve its original physical form and composition and will prevent contamination or changes in concentration of the parameters to be analyzed (EPA, 1994c). The two major approaches used to collect a representative sample are authoritative and random sampling as defined in SW-846. The following sampling equipment may be used for collection of homogeneous low-level solid mixed waste:

- A spade, scoop, or trowel for surface soil or drummed soil
- A hand auger and thin-walled tube sampler for subsurface soil or drummed soil
- A scoop for sludge or sediment samples
- A grain thief, trier, or scoop for bulk material.

Further characterization of low-level solid mixed waste will be performed at other appropriate LANL facilities and may consist of RTR and visual examination (LANL, 1995a).

Visual examination is used to verify process knowledge for those waste streams amenable to visual confirmation. This visual examination may include comparing waste stream information against container type, weight, and labeling. These examinations are performed by trained NMT waste management personnel. If a visual examination indicates a discrepancy between the waste and its WPF, additional characterization of the waste will be performed. Verification analysis is discussed in detail in Section 3.4.4.

Significant changes in waste-generating processes will be verified through an annual recharacterization evaluation of WPFs. In addition, if a newly generated waste is of different composition than the stored waste or if waste verification inspections indicate a discrepancy between the waste and its WPF, additional characterization will be performed. Both homogeneous and heterogeneous wastes will undergo reevaluation through review of documentation supporting waste characterization activities.

3.4.3.3 Sampling and Analysis for Low-Level Liquid Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2), (3), and (4), and Subpart IX, 270.14(b)(2)]

Sampling and analysis will be performed when a low-level liquid mixed waste lacks sufficient process information to adequately characterize the waste based on acceptable knowledge. Sampling and analysis can be initiated by the generator or waste management group through the WPF. A glass tube or a composite liquid waste sampler (COLIWASA) may be used to collect a sample of low-level liquid mixed waste. Additional waste sampling methods and sample handling procedures are described in Section 3.4.3.2.

3.4.4 Verification Analysis for Low-Level Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3)]

Verification analyses are performed for one or more of the following reasons: to verify the accuracy of the initial waste characterization based on acceptable knowledge; to verify that applicable treatment standards have been met; when there is a significant change in a waste-generating process; when the generator or waste management group requests an analysis; or when analytical results indicate a change in the composition of a waste stream. Verification analyses for low-level mixed waste are conducted at LANL's or an approved subcontractor's laboratory facilities. All verification analyses are conducted in conformance with appropriate EPA-approved methods. The type of verification analysis performed to obtain waste characterization information depends upon the physical form of the waste (i.e., homogeneous solids, heterogeneous solids, or liquids). Verification analysis methodologies for these different types of waste are presented below.

Homogeneous low-level mixed waste streams that have been characterized using LANL's WPF and a radioactive and mixed waste certification program will undergo verification sampling and analysis at a frequency of at least 1 percent of the waste streams per year. Waste streams are randomly selected for verification analysis. Factory-sealed containers and original containers of unused chemicals will not be included in this analysis. Lab-packed chemicals in original containers that have been accepted by an off-site disposal or treatment facility need not be verified unless rejected by the off-site facility. Verification information will be used to support waste characterization information based on acceptable knowledge for the waste stream.

Process knowledge documentation applicable to heterogeneous low-level mixed waste streams are qualitatively verified through visual examination of the contents of all waste containers and by reviewing supporting documentation.

Analytical results showing regulated hazardous constituents present at concentrations outside of the ranges specified on the WPF are cause for rejection of the existing WPF and will require additional characterization (i.e., a new WPF will be generated and submitted to waste management personnel prior to acceptance of a routinely generated waste stream in question). The recharacterization will include sampling and analysis sufficient to establish the range of regulated hazardous constituents potentially present in the waste stream. In addition, any time a significant process change occurs affecting a waste stream, verification analysis will be repeated to determine the regulatory status of the waste stream.

Low-level liquid mixed waste streams will undergo additional qualitative verification through review of documentation as part of the radioactive and mixed waste certification program.

3.5 WASTE ANALYSIS REQUIREMENTS FOR THE STORAGE OF HAZARDOUS WASTE

Specific waste analysis requirements for the storage of hazardous waste at TA-55 are provided in the following sections.

3.5.1 Facility Waste-Generating Processes, Activities, and Identification of Hazardous Wastes Managed

Hazardous waste is generated at TA-55 primarily from R&D activities, general facility operations, and D&D projects.

TA-55's R&D activities generate a variety of hazardous wastes, most in relatively small quantities. The composition of each R&D waste stream is unique to the activity, but typically consists of laboratory reagents, solvents, test samples, analytical wastes, and laboratory containers and equipment (e.g., glass, ceramic, plastic, and metal) contaminated with these wastes. Other hazardous wastes, consisting of small quantities of acids, bases, organics, inorganics, and miscellaneous chemicals, are also generated.

Table 3-10 provides information on hazardous waste streams generated and stored at TA-55 including brief waste descriptions and waste-generating processes. The characterization basis for hazardous waste designation (i.e., acceptable knowledge and/or sampling and analysis), potential EPA Hazardous Waste Number(s), potential hazardous constituents in and characteristics of the waste, and regulatory limits are also listed in Table 3-10. Descriptions of the hazardous wastes and their waste-generating processes at TA-55 are provided below. These descriptions are based primarily on information from NMT's WPF database, which contains process and waste information that has been reviewed for quality and accuracy.

3.5.1.1 Hazardous Wastes Managed

Hazardous waste streams generated and stored at TA-55 are described generally in the following paragraphs.

Spent Solvents and Contaminated Solvent Mixtures

This waste stream consists of liquid spent solvents and spent solvent mixtures that may be contaminated with organic or inorganic compounds, heavy metals, oils, and other contaminants. Waste-generating activities at TA-55 include R&D activities, laser research, organic and inorganic chemical research, cleaning, and degreasing.

Contaminated Solid Wastes

Contaminated solid wastes are typically heterogeneous mixtures of rags, spill cleanup materials, Kimwipes™, gloves, filters, plastic and paper products, personal protective equipment, and disposable equipment contaminated with organic or inorganic compounds, heavy metals, oils, and other contaminants. Waste-generating activities at TA-55 include machining operations, chemical research, D&D projects, metal finishing operations, and general maintenance operations.

Paint and Paint-Related Wastes

Paint and paint-related wastes consist of excess paint, aerosol paints, paint strippers/thinners, and sludges of paints and thinners, etc. Possible contaminants include heavy metals used as paint pigments and solvents contained in thinners and lacquers. Waste-generating activities at TA-55 include painting and finishing operations and general facility maintenance. The waste matrices may be homogeneous or heterogeneous depending on the specific waste-generating process.

Photographic Processing and Photocopier Wastes

Photographic-processing wastes include spent or excess film developers, fixer solutions, and photo bleach solutions that may be contaminated with heavy metals. Photocopier wastes include kerosene-based toners and dispersants. Waste-generating activities at TA-55 include photographic film-processing and photocopier operations.

Corrosive Liquid Wastes

Corrosive liquid wastes consist of acidic or alkaline solutions contaminated with organics, inorganics, metals, oils, and other contaminants. Waste-generating activities at TA-55 include analytical chemistry research, electroetching, and electropolishing.

Solid Metals and Metallic Compounds

This waste stream consists of homogeneous wastes including metal chips and turnings from machining and cutting operations; metal powders; metal salts; metal sheets; reactive metals used in synthesis reactions; solders from electronic manufacturing, repair, and brazing operations; and grinding operations at TA-55.

Contaminated Noncorrosive, Aqueous and Nonaqueous Solutions and Sludges, Including Oils

This waste stream consists of noncorrosive, aqueous and nonaqueous solutions and sludges that are contaminated with hazardous constituents. These wastes are typically homogeneous. Waste-generating activities at TA-55 include vacuum pump maintenance, analytical spectrometry, equipment cleaning and maintenance, vehicle maintenance, synthesis reactions, metal-polishing operations, and chemical research.

Mercury Wastes

Mercury wastes include free elemental mercury, mercuric compounds, articles and instruments containing mercury, fluorescent light fixtures, and gels containing mercuric compounds. Waste-generating activities at TA-55 include lamp replacement, chemical research, mercury spill cleanup, and equipment cleaning and maintenance.

Used Batteries and Battery Fluids

This waste stream consists of used batteries and battery fluids that may be contaminated with heavy metals such as cadmium, lead, mercury, and silver. Waste-generating activities at TA-55 include routine equipment maintenance.

Unused/Off-Specification Commercial Chemical Products

This waste stream consists of discarded solid or liquid chemical reagents generated at TA-55 that are off-specification, unused, or outdated. This waste stream may also include spill residues and empty containers containing original product residues that are unused.

3.5.2 Waste Analysis Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)]

Chemical and physical characterization is performed prior to managing hazardous waste, as required by 20 NMAC 4.1, revised November 1, 1995. Waste analysis parameters are selected to ensure that the characterization contains all necessary information to properly store waste in accordance with general facility standards and LDR requirements. Characterization is performed using the procedures described in Section 3.5.3.

3.5.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)]

Proposed analytical parameters, characterization methods, and test methods for hazardous waste stored at TA-55 are summarized in Tables 3-4 and 3-11. The analytical parameters listed in Table 3-11 for the waste streams described in Section 3.5.1.1 were selected based on acceptable knowledge, as described in Section 3.5.3.1.

Documentation supporting acceptable knowledge for each waste stream is reviewed to identify the analytical parameters for potential hazardous constituents in the waste and any compatibility concerns associated with the waste. Table 3-4 provides the proposed test methods for generating the data, pursuant to 20 NMAC 4.1, Subpart V, 264.13(b)(2), revised November 1, 1995.

3.5.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)]

Waste analysis parameters are selected to characterize hazardous waste in conformance with 20 NMAC 4.1, revised November 1, 1995. These parameters are based on knowledge of raw

materials and the physical/chemical processes of waste-generating activities, and may be supported by analytical data. The rationale for the selected parameters are identified in Tables 3-4 and 3-11.

3.5.3 Characterization of Hazardous Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)]

Chemical and physical characterization is performed prior to storing any hazardous waste at TA-55, in accordance with 20 NMAC 4.1, Subpart V, 264.13, revised November 1, 1995. Characterization of hazardous waste is accomplished primarily by either applying acceptable knowledge or obtaining chemical or physical analytical data from representative samples of the waste. Preliminary hazardous waste characterizations are developed using process knowledge, which is provided by waste generators. A secondary distinction between heterogeneous and homogeneous waste is made to determine the availability and appropriateness of sampling procedures. If a homogeneous hazardous waste cannot be adequately characterized because of insufficient process information, sampling and analysis are performed.

Characterization procedures are constrained by the physical nature of some hazardous waste streams (i.e., debris waste or equipment). Because of the difficulty in obtaining representative samples and the lack of appropriate sampling methodology, heterogeneous hazardous waste will be characterized solely on the basis of acceptable knowledge. Homogeneous hazardous waste may be characterized for the presence of hazardous constituents (e.g., VOC, SVOC, and metals) using acceptable knowledge, sampling and analysis, or both. Homogeneous waste streams may be sampled and analyzed for the TC contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995, as previously discussed in Section 3.2.3. For liquid hazardous waste streams, the total values are directly correlated to the maximum concentration of contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995.

For waste streams characterized by acceptable knowledge, LANL will implement a documented QA/QC program that will address management of specific waste streams. This program is briefly discussed in Section 3.2.3 in the discussion of future TRU mixed waste.

3.5.3.1 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2) and (3), 264.13(b)(4) and (5), and Subpart IX, 270.14(b)(2)]

Hazardous wastes generated and stored at TA-55 are characterized primarily by using acceptable knowledge because many wastes stored at TA-55 are generated by well-defined and administratively-controlled processes. The physical nature of some hazardous solid waste forms (e.g., debris, equipment, and instruments) precludes the collection of representative samples. These difficulties include:

- Waste streams which contain disparate elements
- Disparate elements may need to be segregated into similar forms
- Large objects cannot be made to fill standard-size sample containers
- Laboratories may not have the capability to sample large objects (EPA, 1992).

For additional information regarding the use and sources of acceptable knowledge, refer to Section 3.2.3.2.

3.5.3.2 Sampling and Analysis for Hazardous Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2), (3), and (4), and Subpart IX, 270.14(b)(2)]

Sampling and analysis will be performed when a homogeneous hazardous waste lacks sufficient process information to adequately characterize the waste based on acceptable knowledge. Sampling and analysis can be initiated by the generator or waste management group through the WPF. To ensure that proper procedures and considerations for sample collection, preservation, and shipping; QA/QC; and occupational safety and health are followed, personnel involved in sampling and analysis of hazardous waste will comply with LANL-specific protocol consistent with SW-846 (EPA, 1994c). Sampling is conducted according to LANL sampling procedures to ensure that a representative sample is collected. Specific information relative to sampling, parameters, and analytical methods is outlined in Tables 3-1, 3-4, and 3-11.

For purposes of collecting a representative sample of homogeneous hazardous waste, the sample will be collected and handled in a manner that preserves its original physical form and composition and prevents contamination or changes in concentration of the parameters to be analyzed (EPA, 1994c). The two major approaches used to collect a representative sample are authoritative and random sampling. The following sampling equipment may be used for collection of homogeneous solid hazardous waste samples.

- A spade, scoop, or trowel for surface soil or drummed soil
- A hand auger and thin-walled tube sampler for subsurface soil or drummed soil
- A scoop for sludge or sediment samples
- A grain thief, trier, or scoop for bulk material.

A glass tube or COLIWASA may be used to collect a sample of liquid hazardous waste.

Visual examination may be used to verify acceptable knowledge for those heterogeneous solid hazardous wastes amenable to visual confirmation. If a visual examination indicates a discrepancy between the waste and its WPF, additional characterization of the waste will be performed. Verification analysis is discussed in detail in Section 3.5.4.

Significant changes in waste-generating processes will be verified through an annual recharacterization evaluation. In addition, if the newly generated waste is of different composition than the stored waste or if waste verification inspections indicate a discrepancy between the waste and its WPF, additional characterization will be performed. The recharacterization will include sampling and analysis sufficient to establish the range of regulated constituents potentially present in the waste. Both homogeneous and heterogeneous wastes will undergo reevaluation through review of documentation supporting waste characterization activities.

3.5.4 Verification Analysis for Hazardous Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3) and (b)(4)]

Verification analyses are performed for one or more of the following reasons: to verify the accuracy of the initial waste characterization based on acceptable knowledge; to verify that applicable treatment standards have been met; when there has been a significant change in a waste-generating process; when the generator requests an analysis; or when analytical results indicate a change in the composition of a waste stream. Verification analyses for hazardous waste are conducted at an on-site laboratory or at an approved subcontractor's laboratory facilities. All verification analyses are conducted in conformance with appropriate EPA-approved methods. The type of verification analysis that will be performed to obtain waste characterization information depends upon the physical form of the waste (i.e., homogeneous or heterogeneous). Verification analysis methodologies for these different types of waste are presented below.

Homogeneous waste streams initially characterized using acceptable knowledge will undergo verification sampling and analysis at a frequency of at least 1 percent of the waste streams per year. Waste streams are randomly selected for verification analysis. Factory-sealed containers and original containers of unused chemicals will not be included in this analysis. Lab-packed chemicals in original containers that have been accepted by an off-site disposal or treatment facility need not be verified unless rejected by the off-site facility. Verification information will be used to support waste characterization information based on acceptable knowledge for the waste stream.

Acceptable knowledge documentation applicable to heterogeneous waste streams are qualitatively verified through visual examination of the contents of select waste containers and by reviewing supporting documentation.

Analytical results showing regulated hazardous constituents present at concentrations outside of the ranges specified on the WPF are cause for rejection of the existing WPF and will require additional characterization (i.e., a new WPF will be generated and submitted to waste management personnel prior to acceptance of a routinely generated waste stream in question). The recharacterization will include sampling and analysis sufficient to establish the range of regulated hazardous constituents potentially present in the waste stream. In addition, any time a significant process change occurs affecting a waste stream, verification analysis will be repeated to determine the regulatory status of the waste stream.

Data provided in Tables 3-5, 3-6, 3-8, and 3-10 are subject to change as new information is obtained. The Waste Profile Form and the Land Disposal Restrictions Notification Form are subject to change as Los Alamos National Laboratory procedures are revised.

Table 3-1

Recommended Sample Containers[a], Preservation Techniques, and Holding Times[b]

Analyte Class and Sample Type	Container	Preservative	Holding Time
Volatile Organics			
Concentrated Waste Samples	250-milliliter [ml]) WM[c]-G[d] vial with Teflon™-lined lid	None	14 days
Liquid Samples			
No residual chlorine present	2 x 40-ml G vials with Teflon™-lined septum caps	Cool to 4 degrees Celsius (°C)[e].	14 days
Residual chlorine present	2 x 40-ml G vials with Teflon™-lined septum caps	Collect sample in a 4-oz soil volatile organic analyte (VOA) container that has been pre-preserved with 4 drops of 10 percent sodium thiosulfate. Gently mix sample and transfer to a 40-ml VOA vial. Cool to 4°C.	14 days
Acrolein and Acrylonitrile	2 x 40-ml G vials with Teflon™-lined septum caps	Adjust to pH[f] of 4-5. Cool to 4°C.	14 days
Soil/Sediments and Sludges	125 ml WM-G	Cool to 4°C.	14 days
Semivolatile Organics/Organochlorine Pesticides and Herbicides			
Concentrated Waste Samples	250 ml WM-G vial with Teflon™-lined lid	None	Samples must be extracted within 14 days and analyzed within 40 days following extraction.
Soil/Sediments and Sludges	250 ml WM-G vial with Teflon™-lined lid	Cool to 4°C.	Samples must be extracted within 14 days and analyzed within 40 days following extraction.

Refer to footnotes at end of table.

Table 3-1 (Continued)

Recommended Sample Containers[a], Preservation Techniques, and Holding Times[b]

Analyte Class and Sample Type	Container	Preservative	Holding Time
Liquid Samples			
No Residual Chlorine Present	4 x 1 liter (L) AG[g] container with Teflon™ lined lid	Cool to 4°C.	Samples must be extracted within 7 days and extracts analyzed within 40 days following extraction.
Residual Chlorine Present	4 x 1-L AG with Teflon™ lined lid	Add 3 ml 10% sodium thiosulfate solution per gallon.[h] Cool to 4°C.	Samples must be extracted within 7 days and extracts analyzed within 40 days following extraction.
Metals			
Liquid Samples (except hexavalent chromium and mercury)	1-L P[i] or G	Add nitric acid to pH of less than 2.	180 days
Hexavalent chromium	500-ml P or G	Cool to 4°C.	24 hours
Mercury	500-ml P or G	Add nitric acid to pH of less than 2, Cool to 4°C.	28 days
Soil/sediments and Sludges (except hexavalent chromium and mercury)	500-ml WM-P or G	Cool to 4°C.	180 days
Hexavalent chromium	500-ml WM-P or G	Cool to 4°C.	Not established - analyze as soon as possible.
Mercury	500-ml WM-P or G	Cool to 4°C.	28 days

Refer to footnotes at end of table.

Table 3-1 (Continued)

Recommended Sample Containers[a], Preservation Techniques, and Holding Times[b]

[a] Smaller sample containers may be required due to health and safety concerns associated with potential radiation exposure; transportation requirements; and waste management considerations.
[b] U.S. Environmental Protection Agency, 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.
[c] WM = Wide-mouth
[d] G = Glass
[e] Adjust to pH (see footnote f) of less than 2 with sulfuric acid, hydrochloric acid, or solid sodium bisulfate.
[f] A term used to describe the hydrogen-ion activity of a system.
[g] AG = Amber glass
[h] Pre-preservation may be performed in the laboratory prior to field use.
[i] P = Polyethylene

Table 3-2

Summary of Waste Characterization Techniques for Transuranic Mixed Waste

Parameter	Method Numbers	Test Methods	Rationale
	Storage		
Physical Waste Form		Waste inspection procedures Visual examination Process knowledge	Verify waste container contents
Volatile organic compounds (VOC) in waste matrix: Spent halogenated solvents Spent nonhalogenated solvents	ASTM Method D4547-91[a] U.S. EPA/540/4-91/001[b] SW-846 (1311, 8240B, 8260A)[c] or equivalent methods[d]	Total and/or toxicity characteristic leaching procedure (TCLP) VOC analysis by gas chromatography/mass spectrometry (GC/MS) Process knowledge for debris wastes	Determine the presence or absence of VOC in samples
Semivolatile organic compounds (SVOC) in waste	SW-846 (1311, 8250A, 8270B)[c] or equivalent methods	Total and/or TCLP SVOC analysis by GC/MS Process knowledge for debris waste	Determine the presence or absence of SVOC in samples
Metals in waste: Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	SW-846 (1311, 6010A, 7060A, 7061A)[c] (1311, 6010A, 7080A, 7081)[c] (1311, 6010A, 7130, 7131A)[c] (1311, 6010A, 7190, 7191)[c] (1311, 6010A, 7420, 7421)[c] (1311, 7470A, 7471A)[c] (1311, 6010A, 7740, 7741A, 7742)[c] (1311, 6010A, 7760A, 7761)[c] or equivalent methods	Total and/or TCLP metals analysis Inductively-coupled plasma spectroscopy Atomic absorption spectroscopy Cold vapor atomic absorption spectroscopy Process knowledge for debris wastes	Determine total or TCLP metals concentration in samples
Ignitability	SW-846 (1010 and 1020A)[c] or equivalent methods	Pensky-Martens closed cup Seta Flash closed cup	Determine ignitability
pH	SW-846 (9040B and 9041A)[c] or equivalent methods	pH electrometric measurement pH paper	Determine corrosivity
	Treatment		
Physical Waste Form		Waste inspection procedures Visual examination Process knowledge	Verify waste container contents
Metals in waste: Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	SW-846 (1311, 6010A, 7060A, 7061A)[c] (1311, 6010A, 7080A, 7081)[c] (1311, 6010A, 7130, 7131A)[c] (1311, 6010A, 7190, 7191)[c] (1311, 6010A, 7420, 7421)[c] (1311, 7470A, 7471A)[c] (1311, 6010A, 7740, 7741A, 7742)[c] (1311, 6010A, 7760A, 7761)[c] or equivalent methods	Total and/or TCLP metals analysis Inductively-coupled plasma spectroscopy Atomic absorption spectroscopy Cold vapor atomic absorption spectroscopy	Determine total or TCLP metals concentration in samples

Refer to footnotes at end of table.

Table 3-2 (Continued)

Summary of Waste Characterization Techniques for Transuranic Mixed Waste

Parameter	Method Numbers	Test Methods	Rationale
pH	SW-846 (9040B and 9041A)[c] or equivalent methods	pH electrometric measurement pH paper	Determine corrosivity

[a] American Society for Testing and Materials (ASTM), 1991, "Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds," *ASTM D4547-91*, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, American Society for Testing and Materials.
[b] U.S. Environmental Protection Agency (EPA), 1991, "Soil Sampling and Analysis for Volatile Organic Compounds," *EPA/540/4-91/001*, Office of Research and Development, U.S. Environmental Protection Agency.
[c] U.S. Environmental Protection Agency (EPA), 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.
[d] Equivalent methods, subject to EPA approval, may be substituted.

Table 3-3

Summary of Waste Characterization Techniques for Low-Level Mixed Waste

Parameter	Method Numbers	Test Method	Rationale
	Solid Wastes		
Volatile organic compounds (VOC) in waste matrix: Acetone Methyl ethyl ketone Methyl isobutyl ketone Spent halogenated solvents Spent nonhalogenated solvents 1,1,1-Trichloroethane Xylene	ASTM Method D4547-91[a] U.S. EPA/540/4-91/001[b] SW-846 (1311, 8240B, 8260A)[c] or equivalent methods[d]	Total and/or toxicity characteristic leaching procedure (TCLP) VOC analysis by gas chromatography/mass spectrometry (GC/MS) Process knowledge for heterogeneous wastes	Determine total or TCLP VOC concentration in samples of solid process residues and soils
Semivolatile organic compounds (SVOC) in waste: 1,4-Dichlorobenzene	SW-846 (1311, 8270B)[c] or equivalent methods	Total and/or TCLP SVOC analysis by GC/MS Process knowledge for heterogeneous waste	Determine total or TCLP SVOC concentration in samples of solid process residues and soils
Metals in waste: Arsenic Barium admium Chromium Lead Mercury Selenium Silver	SW-846 (1311, 6010A, 7060A, 7061A)[c] (1311, 6010A, 7080A, 7081)[c] (1311, 6010A, 7130, 7131A)[c] (1311, 6010A, 7190, 7191)[c] (1311, 6010A, 7420, 7421)[c] (1311, 7470A, 7471A)[c] (1311, 6010A, 7740, 7741A, 7742)[c] (1311, 6010A, 7760A, 7761)[c] or equivalent methods	Total and/or TCLP metals analysis Inductively-coupled plasma spectroscopy Atomic absorption spectroscopy Cold vapor atomic absorption spectroscopy Process knowledge for heterogeneous wastes	Determine total or TCLP metals concentration in samples of solid process residues and soils

Refer to footnotes at end of table.

Table 3-3 (Continued)

Summary of Waste Characterization Techniques for Low-Level Mixed Waste

Parameter	Method Numbers	Test Method	Rationale
	Liquid Wastes		
VOCs in waste matrix: Acetone Benzene Carbon disulfide Carbon tetrachloride Chlorobenzene Chloroform 1,4-Dichlorobenzene 1,2-Dichloroethane Ethyl acetate Hexachlorobutadiene Hexachloroethane Isobutanol Methanol Spent halogenated solvents Spent nonhalogenated solvents Methyl ethyl ketone Methylene chloride Nitrobenzene Pyridine Tetrachloroethylene oluene ,1,1-Trichloroethane Trichloroethylene Vinyl Chloride Xylene	ASTM Method D4547-91[a] EPA/540/4-91/001[b] SW-846 (1311, 8240B, 8260A)[c] or equivalent methods	Total and/or TCLP and VOC analysis by GC/MS	Determine total or TCLP VOC concentration in samples of liquid
SVOCs in waste: 2,4-Dinitrotoluene Hexachlorobenzene Hexachlorobutadiene Hexachloroethane 2,4,6-Trichlorophenol	SW-846 (1311, 8250A, 8270B)[c] or equivalent methods	Total and/or TCLP SVOC analysis by GC/MS	Determine total or TCLP SVOC concentration in samples of liquid
Metals in waste: Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	SW-846 (1311, 6010A, 7060A, 7061A)[c] (1311, 6010A, 7080A, 7081)[c] (1311, 6010A, 7130, 7131A)[c] (1311, 6010A, 7190, 7191)[c] (1311, 6010A, 7420, 7421)[c] (1311, 7470A, 7471A)[c] (1311, 6010A, 7740, 7741A, 7742)[c] (1311, 6010A, 7760A, 7761)[c] or equivalent methods	Total and/or TCLP metals analysis Inductively-coupled plasma spectroscopy Atomic absorption spectroscopy Cold vapor atomic absorption spectroscopy	Determine total or TCLP metals concentration in samples of liquid

Refer to footnotes at end of table.

Table 3-3 (Continued)

Summary of Waste Characterization Techniques for Low-Level Mixed Waste

Parameter	Method Numbers	Test Method	Rationale
Liquid Wastes (Continued)			
Ignitability	SW-846 (1010 and 1020A)[c] or equivalent methods	Pensky-Martens closed cup Setaflash closed cup	Determine ignitability
pH	SW-846 (9040B and 9041A)[c] or equivalent methods	pH electrometric measurement pH paper	Determine corrosivity

[a] American Society for Testing and Materials (ASTM), 1991, "Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds," *ASTM D4547-91*, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, American Society for Testing and Materials.
[b] U.S. Environmental Protection Agency (EPA), 1991, "Soil Sampling and Analysis for Volatile Organic Compounds," EPA/540/4-91/001, Office of Research and Development, U.S. Environmental Protection Agency.
[c] U.S. Environmental Protection Agency (EPA), 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C..
[d] Equivalent methods, subject to EPA approval, may be substituted.

Table 3-4

Summary of Waste Characterization Techniques for Hazardous Waste

Parameter[a]	Method Numbers	Test Methods	Rationale
Volatile organic compounds (VOC) in waste matrix: Acetone Benzene Carbon tetrachloride Chlorobenzene Chloroform 1,2-Dichloroethane F-listed solvents Methyl ethyl ketone Methylene chloride 1,1,1-Trichloroethane Trichloroethylene Tetrachloroethylene Xylene	ASTM Method D4547-91[b] U.S. EPA/540/4-91/001[c] SW-846 (1311, 8240B, 8260A)[d] or equivalent methods[e]	Total or toxicity characteristic leaching procedure (TCLP) VOC analysis by gas chromatography/ mass spectrometry (GC/MS) Acceptable knowledge for heterogeneous wastes	Determine total or TCLP VOC concentration in samples of solids or liquids
Semivolatile organic compounds (SVOC) in waste: 2,4-Dinitrotoluene Hexachlorobenzene Hexachlorobutadiene Hexachloroethane 'itrobenzene yridine 2,4,6-Trichlorophenol	SW-846 (1311, 8250A, 8270B)[d] or equivalent methods	Total or TCLP SVOC analysis by GC/MS Acceptable knowledge for heterogeneous wastes	Determine total or TCLP SVOC concentration in samples of solids or liquids
Metals in waste: Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	SW-846 (1311, 6010A, 7060A, 7061A)[d] (1311, 6010A, 7080A, 7081)[d] (1311, 6010A, 7130, 7131A)[d] (1311, 6010A, 7190, 7191)[d] (1311, 6010A, 7420, 7421)[d] (1311, 7470A, 7471A)[d] (1311, 6010A, 7740, 7741A, 7742)[d] (1311, 6010A, 7760A, 7761)[d] or equivalent methods	Total and/or TCLP metals analysis Inductively-coupled plasma spectroscopy Atomic absorption spectroscopy Cold vapor atomic absorption spectroscopy Acceptable knowledge for heterogeneous wastes	Determine total or TCLP metals concentration in samples of solids or liquids
Reactive Sulfide	SW-846, Test Method to Determine Hydrogen Sulfide Released from Wastes[f] SW-846 (9010A, 9012, 9013)[d] or equivalent methods	Colorimetric or titrametric measurement of hydrogen sulfide released from waste following reflux distillation under acidic conditions	Determine concentration of reactive sulfides
Ignitability	SW-846 (1010 and 1020A)[d] or equivalent methods	Pensky-Martens closed cup Setaflash closed cup	Determine ignitablity
pH	SW-846 (9040B and 9041A)[d] or equivalent methods	pH electrometric measurement pH paper	Determine corrosivity

[a] Information contained in this column is from the Los Alamos National Laboratory Chemical Science and Technology Division Waste Profile Form database.
[b] American Society for Testing and Materials (ASTM), 1991, "Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds," *ASTM D4547-91*, Annual Book of ASTM Standards, Philadelphia, Pennsylvania.

Table 3-4 (Continued)

Summary of Waste Characterization Techniques for Hazardous Waste

[c] U.S. Environmental Protection Agency (EPA), 1991, "Soil Sampling and Analysis for Volatile Organic Compounds," *EPA/540/4-9/001*, Office of Research and Development.

[d] U.S. Environmental Protection Agency (EPA), 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.

[e] Equivalent methods subject to EPA approval may be substituted.

[f] SW-846, Sections 7.3.3.2 and 7.3.4.2 contain specialized methods to determine if a cyanide- or sulfide-containing waste exhibits the reactivity characteristic.

Table 3-5

Cross Reference of Matrix Parameter Codes and TRUPACT-II Content Codes

Matrix Parameter[a] Code/ Description	TRUPACT-II Content (TRUCON) Codes	Waste Descriptions
S3000-Homogeneous Solids	LA 114	Solidified inorganic process solids and liquids
	LA 126	Solidified organic process solids and liquids
S5000-Debris Wastes	LA 116	Combustible waste
	LA 117	Noncombustible metal waste
	LA 118	Glass waste
	LA 123	Leaded gloves
	LA 125	Mixed combustible/noncombustible waste

[a] Information in this column was extracted from the U.S. Department of Energy (DOE), 1995, "TRU Waste Characterization Quality Assurance Program Plan," *CAO-94-1010*, Rev. 0, Carlsbad Area Office, Carlsbad, New Mexico.

Table 3-6

Transuranic Mixed Waste Characterization Matrix for Currently Generated Waste at Technical Area 55

Waste Description	TRUPACT-II Content (TRUCON) Codes	Process Generating the Waste	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[b] (milligrams per liter)
Solidified inorganic process solids and liquids	LA 114	Inorganic process solids and liquids may include process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines, generated as a result of plutonium (Pu) processing operations, that are solidified in cement.	Knowledge[c]/ Testing[d]	D007	Chromium	5.0
Combustible waste	LA 116	Combustible solids (e.g., paper, rags, plastic, rubber) and a small fraction of non-combustibles (e.g., metal scrap) generated from Pu processing activities.	Knowledge/ Testing	D004 D005 D006 D007 D008 D009 D010 D011 F001 F002 F003 F005	Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver Spent halogenated solvents	5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0 NA[e]
Noncombustible metal waste	LA 117	Noncombustible metal waste (e.g., motors, pumps, tools, process equipment) and glass with a small fraction of combustible waste (e.g., plastics) generated from Pu processing activities.	Knowledge/ Testing	D005 D006 D008 D009 D011	Barium Cadmium Lead Mercury Silver	100.0 1.0 5.0 0.2 5.0
Glass waste	LA 118	Glass waste (e.g., discarded laboratory glassware, windows, bottles), and metal with a small fraction of combustibles (e.g., plastics) generated from Pu processing activities.	Knowledge/ Testing	D008 D009	Lead Mercury	5.0 0.2
Leaded glove waste	LA 123	Leaded gloves discarded with a small fraction of noncombustible waste (e.g., motors, tools) generated from Pu processing activities.	Knowledge/ Testing	D008	Lead	5.0

Refer to footnotes at end of table.

Table 3-6 (Continued)

Transuranic Mixed Waste Characterization Matrix for Currently Generated Waste at Technical Area 55

Waste Description	TRUPACT-II Content (TRUCON) Codes	Process Generating the Waste	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[b] (milligrams per liter)
Mixed combustible/ noncombustible waste	LA 125	Mixtures of combustible and noncombustible waste including paper, rags, plastic, rubber, leaded glovebox gloves, glass, motors, pumps, tools, and miscellaneous metal waste generated from Pu processing activities.	Knowledge/ Testing	D004	Arsenic	5.0
				D005	Barium	100.0
				D006	Cadmium	1.0
				D007	Chromium	5.0
				D008	Lead	5.0
				D009	Mercury	0.2
				D010	Selenium	1.0
				D011	Silver	5.0
				F002	Spent halogenated solvents	NA
Solidified organic process solids and liquids	LA 126	Solidified organic process solids and liquids which, together with plastic packaging, result in >5% and normally ≤10% organics. These process solids may include process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines, generated as a result of Pu processing operations, that are solidified in cement.	Knowledge	D007	Chromium	5.0

[a] U.S. Environmental Protection Agency.
[b] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, Part 261, Subpart D, revised November 1, 1995.
[c] Knowledge indicates process knowledge used as the basis for hazardous waste designation.
[d] Testing: In reference to the basis for hazardous waste classification, indicates that sampling and analysis has been performed, but either (1) the documentation is not available or (2) the data exist but are not verifiable.
[e] Not applicable: Refers to the absence of regulatory limits for F-listed wastes.

Table 3-7

Parameters, Characterization Methods, and Rationale for Transuranic Mixed Waste Stored and Treated at Technical Area 55

Matrix Parameter[a] Code/Description	Waste Description	Analytical Parameters	Characterization Methods	Rationale
Storage				
S3000—Homogeneous Solids	– Solidified inorganic process solids and liquids – Solidified organic process solids and liquids	– Physical form of the waste	– Visual examination – Acceptable knowledge[b]	– Verify physical waste form
		– RCRA[c]–regulated metals	– Sampling and analysis	– Determine toxicity characteristic – Determine concentration of metals
		– Volatile organic compounds (VOC) and semivolatile organic compounds (SVOC)	– Gas chromatography/ mass spectrometry – Acceptable knowledge	– Determine toxicity characteristic – Determine concentration of organics
S5000—Debris Waste	– Combustible waste – Noncombustible metal waste – Glass waste – Leaded glove waste – Mixed combustible/ noncombustible waste	– Physical form of the waste	– Visual examination – Acceptable knowledge	– Verify physical waste form
		– RCRA-regulated metals	– Acceptable knowledge	– Determine compliance with land disposal restriction (LDR) treatment standards, if applicable
		– VOCs and SVOCs	– Acceptable knowledge	– Determine compliance with LDR treatment standards, if applicable
Treatment				
S3000—Homogeneous Solids	– Solidified inorganic process solids and liquids – Solidified organic process solids and liquids	– Physical form of the waste	– Visual examination – Acceptable knowledge	– Verify physical waste form
		– RCRA–regulated metals	– Sampling and analysis	– Determine toxicity characteristic – Determine concentration of metals

[a] Information in this column was extracted from the U.S. Department of Energy (DOE), 1995, "TRU Waste Characterization Quality Assurance Program Plan," *CAO-94-1010*, Rev. 0, Carlsbad Area Office, Carlsbad, New Mexico.

[b] Acceptable knowledge is broadly defined as process knowledge, waste analysis data (e.g., sampling and analysis) and/or facility records of analysis in U.S. Environmental Protection Agency (EPA), 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

[c] Resource Conservation and Recovery Act. Use of the term "RCRA-regulated metals" refers to toxicity characteristic hazardous waste metals as defined in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261.24, revised November 1, 1995.

Table 3-8

Descriptions of Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Basis for Characterization	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Homogeneous Solid Wastes					
Unused solid reagent chemicals	Discarded off-specification unused reagent powders and crystalline materials.	Knowledge[c]	D001 D002 D003 D004 D005 D006 D007 D008 D009 D011 All P- or U-listed waste codes	Ignitability Corrosivity Reactivity Arsenic Barium Cadmium Chromium Lead Mercury Silver	NA[d] NA NA 5.0 100.0 1.0 5.0 5.0 0.2 5.0 NA
Heterogeneous Solid Wastes					
Contaminated bulk lead shielding and scrap	Radiation shielding in laser applications and materials from demolition and decommissioning of research laboratories containing metal fittings, piping, and tools, with Uranium-238 contamination and/or heavy metal materials.	Knowledge	D006 D007 D008	Cadmium Chromium Lead	1.0 5.0 5.0
Discarded bricks	Lead bricks from radiation shielding and debris from decontamination and decommissioning projects.	Knowledge	D006 D008	Cadmium Lead	1.0 5.0

Refer to footnotes at end of table.

Table 3-8 (Continued)

Descriptions of Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Basis for Characterization	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
		Heterogeneous Solid Wastes (Continued)			
Organic-contaminated noncombustible solids	Absorbed oils, laboratory debris, and discarded equipment.	Knowledge	D004	Arsenic	5.0
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D010	Selenium	1.0
			D011	Silver	5.0
			D027	1,4-Dichlorobenzene	7.5
			D030	2,4-Dinitrotoluene	0.13[e]
			D032	Hexachlorobenzene	0.13[e]
			D033	Hexachlorobutadiene	0.5
			D034	Hexachloroethane	3.0
			D042	2,4,6-Trichlorophenol	2.0
			F001	1,1,1-Trichloroethane, Trichloroethylene[f]	NA
			F002	Chlorobenzene[f], Methylene chloride, Tetrachloroethylene[f], Trichloroethylene[f]	NA
			F004	Cresol[f], Nitrobenzene[f]	NA
			F005	Toluene, Methyl ethyl ketone[f], Benzene[f]	NA
Mercury waste	Free elemental mercury, mercuric compounds, gels containing mercuric compounds, old thermometers, hygrometers, vacuum tubes, fluorescent light bulbs, and other instruments and equipment containing unrecovered mercury.	Knowledge	D009	Mercury	0.2
			U151	Mercury	NA

Refer to footnotes at end of table.

Table 3-8 (Continued)

Descriptions of Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Basis for Characterization	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Heterogeneous Solid Wastes (Continued)					
Batteries	Discarded battery cores (with potential residual liquid), including lead-acid, rechargeable nickel-cadmium, and mercury.	Knowledge	D001	Ignitability	NA
			D002	Corrosivity	NA
			D003	Reactivity	NA
			D004	Arsenic	5.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
Liquid Wastes					
Spent solvents and contaminated solvent mixtures	Extraction operations, bench-scale experimental inorganic chemistry, environmental analysis, and radiochemistry.	Knowledge	D001	Ignitability	NA
			D002	Corrosivity	NA
			D004	Arsenic	5.0
			D005	Barium	100.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D010	Selenium	1.0
			D011	Silver	5.0
			D018	Benzene	0.5
			D019	Carbon tetrachloride	0.5
			D021	Chlorobenzene	100.0
			D022	Chloroform	6.0
			D027	1,4-Dichlorobenzene	7.5
			D028	1,2-Dichloroethane	0.5
			D030	2,4-Dinitrotoluene	0.13[c]
			D032	Hexachlorobenzene	0.13[c]
			D033	Hexachlorobutadiene	0.5
			D034	Hexachloroethane	3.0
			D036	Nitrobenzene	2.0

Refer to footnotes at end of table.

Table 3-8 (Continued)

Descriptions of Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Basis for Characterization	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
		Liquid Wastes (Continued)			
Spent solvents and contaminated solvent mixtures (Continued)	Extraction operations, bench-scale experimental inorganic chemistry, environmental analysis, and radiochemistry.	Knowledge	D042	2,4,6-Trichlorophenol	2.0
			D043	Vinyl chloride	0.2
			F001	Tetrachloroethylene[f], Trichloroethylene[f], Methylene chloride, 1,1,1-Trichloroethane, Carbon tetrachloride, Chlorinated fluorocarbons	NA
			F002	Tetrachloroethylene[f], Trichloroethylene[f], 1,1,1-Trichloroethane, 1,1,2-Trichloro-1,2,2-trifluoroethane	NA
			F003	Xylene, Acetone, Ethyl acetate, Ethyl ether, Methyl isobutyl ketone, n-Butyl alcohol, Methanol	NA
			F005	Toluene, Methyl ethyl ketone[f], Carbon disulfide, Isobutanol, Pyridine[f], Benzene	NA
Corrosive liquid wastes	Radiochemistry research, plutonium-processing operations, and analytical chemistry.	Knowledge	D001	Ignitability	NA
			D002	Corrosivity	NA
			D007	Chromium	5.0
			D009	Mercury	0.2
			D010	Selenium	1.0
			D011	Silver	5.0
			D036	Nitrobenzene	2.0

Refer to footnotes at end of table.

Table 3-8 (Continued)

Descriptions of Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Basis for Characterization	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Liquid Wastes (Continued)					
Nonaqueous, noncorrosive liquids contaminated with heavy metals	Metal polishing operations, and radiochemistry research.	Knowledge Sampling and analysis[g]	D001 D004 D005 D006 D007 D008 D009 D010 D011	Ignitability Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	NA 5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0
Oil wastes	Equipment maintenance operations.	Knowledge	D004 D005 D006 D007 D008 D009 D010 D028 F001 F002	Arsenic Barium Cadmium Chromium Lead Mercury Selenium 1,2-Dichloroethane Tetrachloroethylene[f], Trichloroethylene[f], Methylene chloride, 1,1,1-Trichloroethane, Carbon tetrachloride[f], Chlorinated fluorocarbons Tetrachloroethylene[f], Trichloroethylene[f], 1,1,1-Trichloroethane, 1,1,2-Trichloro-1,2,2-trifluoroethane	5.0 100.0 1.0 5.0 5.0 0.2 1.0 0.5 NA NA

Refer to footnotes at end of table.

Table 3-8 (Continued)

Descriptions of Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Basis for Characterization	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Liquid Wastes (Continued)					
Oil wastes (Continued)	Equipment maintenance operations.	Knowledge	F003	Xylene, Acetone, Ethyl acetate, Ethyl ether, Methyl isobutyl ketone, n-Butyl alcohol, Methanol	NA
			F005	Toluene, Methyl ethyl ketone[f], Carbon disulfide, Isobutanol, Pyridine[f], Benzene[f]	NA
Unused liquid reagent chemicals	Discarded off-specification unused liquid reagent chemicals.	Knowledge	D001	Ignitability	NA
			D002	Corrosivity	NA
			All P- and U-listed waste codes	Discarded commercial chemical products and off-specification species	NA
Photographic processing and photocopier wastes	Photographic film processing and photocopying operations.	Knowledge Sampling and analysis	D001	Ignitability	NA
			D002	Corrosivity	NA
			D007	Chromium	5.0
			D008	Lead	5.0
			D011	Silver	5.0

[a] U.S. Environmental Protection Agency.
[b] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart II, 261, Subpart D, revised November 1, 1995.
[c] Indicates process knowledge may be used as the basis for hazardous waste designation.
[d] Not applicable: Refers to the absence of regulatory limits for ignitable, corrosive, and reactive characteristic wastes and F-, P-, and U-listed wastes.
[e] The quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level (20 NMAC 4.1, Subpart II, 261.24, Table 1, revised November 1, 1995).
[f] Process knowledge provided information that these constituents may have been used as solvents. Toxicity Characteristic (TC) regulatory levels may also apply and will be evaluated.
[g] Indicates that sampling and analysis may be used to characterize the waste stream.

Table 3-9

Parameters, Characterization Methods, and Rationale for Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Analytical Parameter[a]	Characterization Method	Rationale
Homogeneous Solid Wastes			
Unused solid reagent chemicals	– RCRA[b]-regulated metals	– Acceptable knowledge[c] – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, reactivity, and toxicity – Determine presence of P- and/or U-listed unused commercial chemical products
Heterogeneous Solid Wastes			
Contaminated bulk lead shielding and scrap	– RCRA-regulated metals	– Acceptable knowledge	– Determine toxicity characteristic
Discarded bricks	– RCRA-regulated metals	– Acceptable knowledge	– Determine toxicity characteristic
Organic-contaminated noncombustible solids	– RCRA-regulated metals – Volatile organic compounds (VOC) – Semivolatile organic compounds (SVOC)	– Acceptable knowledge	– Determine toxicity characteristic – Determine the presence of F-listed solvents
Mercury waste	– RCRA-regulated metals	– Acceptable knowledge	– Determine toxicity characteristic – Determine presence of U-listed unused commercial chemical product
Batteries	– RCRA-regulated metals	– Acceptable knowledge	– Determine characteristic for ignitability, corrosivity, reactivity, and toxicity
Liquid Wastes			
– Spent solvents and contaminated solvent mixtures	– Flash point – pH – RCRA-regulated metals – VOCs – SVOCs	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, and toxicity – Determine concentration of F-listed solvents
– Corrosive liquid wastes	– Flash point – pH – RCRA-regulated metals – SVOCs	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, and toxicity – Determine concentration of F-listed solvents
– Nonaqueous, noncorrosive liquids contaminated with heavy metals	– Flash point – RCRA-regulated metals	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability and toxicity
– Oil wastes	– RCRA-regulated metals – VOCs – SVOCs	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for toxicity – Determine concentration of F-listed solvents

Refer to footnotes at end of table.

Table 3-9 (Continued)

Parameters, Characterization Methods, and Rationale for Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Analytical Parameter[a]	Characterization Method	Rationale
Liquid Wastes (Continued)			
– Unused liquid reagent chemicals	– Flash point – pH	– Acceptable knowledge	– Determine characteristic for ignitability and corrosivity – Determine the presence of P- and U-listed unused commercial chemical product
– Photographic processing and photocopier wastes	– Flash point – pH – RCRA-regulated metals	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, and toxicity

[a] Parameter selection is based on acceptable knowledge for each waste stream. Additional parameters may be selected for each waste stream as necessary.

[b] Resource Conservation and Recovery Act. Use of the term "RCRA-regulated metals" refers to hazardous waste as defined in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261.24, revised November 1, 1995.

[c] Acceptable knowledge is broadly defined as process knowledge, waste analysis data (e.g., sampling and analysis), and/or facility records of analysis in U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste - A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

Table 3-10

Descriptions of Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Spent solvents and contaminated solvent mixtures	Research and development activities; laser research; organic and inorganic chemistry research (e.g., solvent extractions, liquid chromatography solvents, polymer synthesis, and distillations); cleaning; and degreasing operations.	Acceptable knowledge[d] Sampling and analysis[e]	D001	Ignitability	NA[f]
			D002	Corrosivity	NA
			D003	Reactivity	NA
			D004	Arsenic	5.0
			D005	Barium	100.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D010	Selenium	1.0
			D011	Silver	5.0
			D018	Benzene	0.5
			D019	Carbon tetrachloride	0.5
			D021	Chlorobenzene	100.0
			D022	Chloroform	6.0
			D028	1,2-Dichloroethane	0.5
			D030	2,4-Dinitrotoluene	0.13[g]
			D032	Hexachlorobenzene	0.13[g]
			D035	Methyl ethyl ketone	200.0
			D036	Nitrobenzene	2.0
			D038	Pyridine	5.0[g]
			D040	Trichloroethylene	0.5
			D043	Vinyl chloride	0.2
			F001	Tetrachloroethylene, Trichloroethylene, Methylene chloride, 1,1,1- Trichloroethane, Carbon tetrachloride, Chlorofluorocarbons	NA
			F002	Tetrachloroethylene, Trichloroethylene, 1,1,1-Trichloroethane, 1,1,2-Trichloro-1,2,2-trifluoroethane	NA

Refer to footnotes at end of table.

Table 3-10 (Continued)

Descriptions of Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Spent solvents and contaminated solvent mixtures (Continued)	Research and development activities; laser research; organic and inorganic chemistry research (e.g., solvent extractions, liquid chromatography solvents, polymer synthesis, distillations); cleaning; and degreasing operations.	Acceptable knowledge Sampling and analysis	F003	Xylene, Acetone, Ethyl acetate, Ethyl ether, Methanol Methyl isobutyl ketone, n-Butyl alcohol	NA
			F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene	NA
Contaminated solid wastes	Machining operations, chemistry research, decontamination and decommissioning projects, metal finishing operations, and general maintenance operations.	Acceptable knowledge	D001	Ignitability	NA
			D003	Reactivity	NA
			D004	Arsenic	5.0
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D010	Selenium	1.0
			D011	Silver	5.0
			D018	Benzene	0.5
			D022	Chloroform	6.0
			D030	2,4-Dinitrotoluene	0.13[g]
			D032	Hexachlorobenzene	0.13[g]
			D033	Hexachlorobutadiene	0.5
			D034	Hexachloroethane	3.0
			D036	Nitrobenzene	2.0
			D039	Tetrachloroethylene	0.7
			D040	Trichloroethylene	0.5
			D042	2,4,6-Trichlorophenol	2.0

Refer to footnotes at end of table.

Table 3-10 (Continued)

Descriptions of Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Contaminated solid wastes (Continued)	Machining operations, chemistry research, decontamination and decommissioning projects, metal finishing operations, photographic film processing, and general maintenance operations.	Acceptable knowledge	F001	1,1,1-Trichloroethane, Carbon tetrachloride	NA
			F002	1,1,1-Trichloroethane	NA
			F003	Acetone, Methanol	NA
			F005	Toluene, Benzene	NA
Paint and paint-related wastes	Painting and finishing operations, and general facility maintenance.	Acceptable knowledge Sampling and analysis	D001	Ignitability	NA
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D011	Silver	5.0
			F003	Xylene	NA
			F005	Toluene	NA
Photographic processing and photocopier wastes	Photographic film processing and photocopying operations.	Acceptable knowledge Sampling and analysis	D001	Ignitability	NA
			D002	Corrosivity	NA
			D007	Chromium	5.0
			D008	Lead	5.0
			D011	Silver	5.0

Refer to footnotes at end of table.

Table 3-10 (Continued)

Descriptions of Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Corrosive liquid wastes	Analytical research and operations, electroetching, and electropolishing.	Acceptable knowledge Sampling and analysis	D001	Ignitability	NA
			D002	Corrosivity	NA
			D004	Arsenic	5.0
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D010	Selenium	1.0
			D011	Silver	5.0
			D038	Pyridine	5.0[g]
			F002	Tetrachloroethylene, Methylene chloride, Trichloroethylene, 1,1,1-Trichloroethane, Chlorobenzene, 1,1,2-Trichloro-1,2,2-trifluoroethane, Ortho-dichlorobenzene, Trichlorofluoromethane, 1,1,2-Trichloroethane	NA
			F003	Methanol	NA
			F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene, 2-Ethoxyethanol, 2-Nitropropane	NA

Refer to footnotes at end of table.

Table 3-10 (Continued)

Descriptions of Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Solid metals and metallic compounds	Machining and cutting operations; synthesis reactions; solder from electronic manufacturing, repair, and brazing operations; and grinding operations.	Acceptable knowledge Sampling and analysis	D001 D003 D004 D005 D006 D007 D008 D009 D010 D011	Ignitability Reactivity Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	NA NA 5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0
Contaminated noncorrosive, aqueous and nonaqueous solutions and sludges, including oils	Vacuum pump maintenance, spectrometric operations, equipment cleaning and maintenance, synthesis reactions, analytical operations, metal polishing operations, and vehicle maintenance.	Acceptable knowledge Sampling and analysis	D001 D003 D004 D005 D006 D007 D008 D009 D010 D011 D018 D038 D040	Ignitability Reactivity Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver Benzene Pyridine Trichloroethylene	NA NA 5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0 0.5 5.0[g] 0.5

Refer to footnotes at end of table.

Table 3-10 (Continued)

Descriptions of Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Contaminated noncorrosive, aqueous and nonaqueous solutions and sludges, including oils (Continued)	Vacuum pump maintenance, spectrometric operations, equipment cleaning and maintenance, synthesis reactions, analytical operations, metal polishing operations, and equipment maintenance.	Acceptable knowledge Sampling and analysis	F002	Tetrachloroethylene, Methylene chloride, Trichloroethylene, 1,1,1-Trichloroethane, Chlorobenzene, 1,1,2-Trichloro-1,2,2-trifluoroethane, Ortho-dichlorobenzene, Trichlorofluoromethane, 1,1,2-Trichloroethane	NA
			F003	Xylene, Acetone, Ethyl acetate, Ethyl benzene, Ethyl ether, Methyl isobutyl ketone, n-Butyl Alcohol, Cyclohexanone, Methanol	NA
			F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene, 2-Ethoxyethanol, 2-Nitropropane	NA
Mercury wastes	Lamp replacement, laboratory operations, mercury spill clean-up, and equipment cleaning and maintenance.	Acceptable knowledge Sampling and analysis	D009 U151	Mercury Mercury	0.2 NA
Used batteries and battery fluids	Equipment maintenance.	Acceptable knowledge	D002 D006 D007 D008 D009 D011	Corrosivity Cadmium Chromium Lead Mercury Silver	NA 1.0 5.0 5.0 0.2 5.0

Refer to footnotes at end of table.

Table 3-10 (Continued)

Descriptions of Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Unused/off-specification commercial chemical products	Laboratory research and spill residues.	Acceptable knowledge Sampling and analysis	D001 D002 D003 D004 through D043	Ignitability Corrosivity Reactivity Toxicity characteristic leaching procedure wastes	NA NA NA -[c]
			All P- and U-listed waste codes	Discarded commercial chemical products and off-specification species	NA

[a] Denotes information from the Los Alamos National Laboratory Chemical Science and Technology Division Waste Profile Form database.
[b] U.S. Environmental Protection Agency.
[c] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed (D004-D043) at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart II, Part 261, Subpart D, revised November 1, 1995.
[d] Indicates that acceptable knowledge may be used as the basis for the hazardous waste designation.
[e] Indicates that sampling and analysis may be used to characterize the waste stream.
[f] Not applicable: Refers to the absence of regulatory limits for ignitable, corrosive, and reactive characteristic wastes and F-, P-, and U-listed wastes.
[g] The quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level (20 NMAC 4.1, Subpart II, 261.24, Table 1, revised November 1, 1995).

Table 3-11

Parameters, Characterization Methods, and Rationale for Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Analytical Parameters[b]	Characterization Methods	Rationale
– Spent solvents and contaminated solvent mixtures	– Flash point (for liquid waste) – pH (for liquid waste) – RCRA[c]-regulated metals – Volatile organic compounds (VOC) – Semivolatile organic compounds (SVOC)	– Acceptable knowledge[d] – Sampling and analysis[e]	– Determine characteristic for ignitability, corrosivity, reactivity, and toxicity – Determine concentration of F-listed solvents
– Contaminated solid wastes	– RCRA-regulated metals – VOCs – SVOCs	– Acceptable knowledge	– Determine characteristic for ignitability, reactivity, and toxicity – Determine concentration of F-listed solvents
– Paint and paint-related wastes	– Flash point (for liquid waste) – RCRA-regulated metals – VOCs	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability and toxicity – Determine concentration of F-listed solvents
– Photographic processing and photocopier wastes	– Flash point (for liquid waste) – pH (for liquid waste) – RCRA-regulated metals	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, and toxicity
– Corrosive liquid wastes	– Flash point (for liquid waste) – pH (for liquid waste) – RCRA-regulated metals – VOCs – SVOCs	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, and toxicity – Determine concentration of F-listed solvents
– Solid metals and metallic compounds	– RCRA-regulated metals	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, reactivity, and toxicity
– Contaminated noncorrosive, aqueous and nonaqueous solutions and sludges, including oils	– Flash point – RCRA-regulated metals – VOCs – SVOCs	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, reactivity, and toxicity – Determine concentration of F-listed solvents
– Mercury wastes	– RCRA-regulated metal	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for toxicity – Determine the presence of a U-listed unused commercial chemical product
– Used batteries and battery fluids	– pH (for liquid waste) – RCRA-regulated metals	– Acceptable knowledge	– Determine characteristic for corrosivity and toxicity
– Unused/off-specification commercial chemical products	– Flash point (for liquid waste) – pH (for liquid waste) – RCRA-regulated metals – VOCs – SVOCs	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, reactivity, and toxicity – Determine presence of P-listed or U-listed unused commercial chemical products

Refer to footnotes at end of table.

Table 3-11 (Continued)

Parameters, Characterization Methods, and Rationale for Hazardous Waste Stored at Technical Area 55

[a] Information contained in this column is from the Los Alamos National Laboratory Chemical Science and Technology Division Waste Profile Form database.

[b] Parameter selection is based on acceptable knowledge for each waste stream. Additional parameters may be selected for each waste stream as necessary.

[c] Resource Conservation and Recovery Act. Use of the term "RCRA-regulated metals" refers to hazardous waste as defined in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261.24, revised November 1, 1995.

[d] Acceptable knowledge is broadly defined as process knowledge, waste analysis data (e.g., sampling and analysis), and/or facility records of analysis in U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store and Dispose of Hazardous Waste - A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

• Indicates that sampling and analysis may be used to characterize the waste stream.

Los Alamos
National Laboratory

LAND DISPOSAL RESTRICTIONS NOTIFICATION FORM

A copy of this form must be attached to each Waste Profile Form and to each Uniform Hazardous Waste Manifest required to transport waste within LANL, pursuant to 40 CFR 268.7(a)(1).

Waste Profile Form No.	Chemical Waste/ Waste Disposal Record No.	Uniform Hazardous Waste Manifest No.	Date of Waste Pickup

Check only one.

☐ Non-wastewater
☐ Wastewater [as defined in 40 CFR 268.2(f)]

NOTIFICATION OF CALIFORNIA LIST APPLICABILITY

Check all that apply.

☐ Liquid hazardous waste containing PCBs at a concentration of ≥50 ppm.
☐ A D001 – D017 liquid waste containing ≥134 mg/L of nickel and/or ≥130 mg/L of thallium.
☐ A D001 – D011 waste containing Halogenated Organic Compounds (HOCs) listed in 40 CFR 268, Appendix III, at ≥1000 ppm.

NOTIFICATION OF "D" CHARACTERISTIC EPA WASTE CODES

Check all that apply.

EPA Waste Code	Waste Description and/or Subcategory (as needed)
☐ D001*	Ignitable characteristic wastes [except for the Section 261.21(a)(1) High TOC Subcategory] that are managed in non-CWA/non-CWA-equivalent/non-Class I SDWA systems.
☐ D001	High TOC Ignitable Characteristic Liquids Subcategory based on 40 CFR 261.21(a)(1) - Greater than 10% total organic carbon.
☐ D002*	Corrosive Characteristic Wastes that are managed in non-CWA/non-CWA-equivalent/non-Class I SDWA systems.
☐ D003	Reactive Sulfides Subcategory
☐ D003	Reactive Cyanides Subcategory
☐ D003	Water Reactive Subcategory
☐ D003	Other Reactives Subcategory [based on 261.23(a)(1)]
☐ D004	
☐ D005	
☐ D006	Wastes that exhibit the TC for cadmium
☐ D006	Cadmium Containing Batteries Subcategory
☐ D007	
☐ D008	Wastes that exhibit TC for lead
☐ D008	Lead Acid Batteries Subcategory
☐ D008	Radioactive Lead Solids Subcategory
☐ D009	High Mercury-Organic Subcategory (≥260 mg/kg Hg with organics and not incinerator residues)
☐ D009	High Mercury-Inorganic Subcategory (≥260 mg/kg Hg [with inorganics])
☐ D009	Low Mercury Subcategory (<260 mg/kg Hg)
☐ D009	All D009 wastewaters
☐ D009	Elemental mercury contaminated with radioactive materials.
☐ D009	Hydraulic oil contaminated with Mercury Radioactive Materials Subcategory
☐ D010	
☐ D011	

☐ D012*	☐ D020*	☐ D028*	☐ D036*
☐ D013*	☐ D021*	☐ D029*	☐ D037*
☐ D014*	☐ D022*	☐ D030*	☐ D038*
☐ D015*	☐ D023*	☐ D031*	☐ D039*
☐ D016*	☐ D024*	☐ D032*	☐ D040*
☐ D017*	☐ D025*	☐ D033*	☐ D041*
☐ D018*	☐ D026*	☐ D034*	☐ D042*
☐ D019*	☐ D027*	☐ D035*	☐ D043*

*All applicable Underlying Hazardous Constituents in these characteristic wastes must be checked in Table UTS.

Figure 3-1
Land Disposal Restrictions Notification Form

Los Alamos
National Laboratory

LAND DISPOSAL RESTRICTIONS NOTIFICATION FORM

NOTIFICATION FOR F001 – F005 SPENT SOLVENT WASTES

Check all that apply.

Spent solvent wastes with the following constituents only.

EPA Waste Code	Constituents in the waste	
☐ F001	☐ Acetone	☐ Isobutyl alcohol
☐ F002	☐ Benzene	☐ Methanol
☐ F003	☐ n-Butyl alcohol	☐ Methylene chloride
☐ F004	☐ Carbon disulfide (wastewater only)	☐ Methyl ethyl ketone
☐ F005	☐ Carbon tetrachloride	☐ Methyl isobutyl ketone
	☐ Chlorobenzene	☐ Nitrobenzene
	☐ o-cresol	☐ Pyridine
	☐ m-cresol	☐ Tetrachloroethylene
	☐ p-cresol	☐ Toluene
	☐ Cresol-mixed isomers (Cresylic acid)	☐ 1,1,1-Trichloroethane
	☐ Cyclohexanone (wastewater only)	☐ 1,1,2-Trichloroethane
	☐ o-Dichlorobenzene	☐ 1,1,2-Trichloro – 1,2,2-trifluoroethane
	☐ Ethyl acetate	☐ Trichloroethylene
	☐ Ethyl benzene	☐ Trichloromonofluoromethane
	☐ Ethyl ether	☐ Xylenes – mixed isomers (o-, m-, p-xylene)

Check all that apply.

EPA Waste Codes	Constituents in the waste
☐ F003	☐ Carbon disulfide
☐ F005	☐ Cyclohexanone
	☐ Methanol

Note: Treatment standards for these constituents apply to F001 – F005 wastes which contain only one, two, or all three of these constituents.

Check only one, if applicable.

EPA Waste Code	Constituents in the waste
☐ F005	☐ Containing 2-nitropropane as the only listed F001 – F005 solvent.
	☐ Containing 2-ethoxyethanol as the only listed F001 – F005 solvent.

NOTIFICATION FOR OTHER "F" WASTES

Check only one, if applicable.

- ☐ F006
- ☐ F007
- ☐ F008
- ☐ F009
- ☐ F027

Los Alamos
National Laboratory

LAND DISPOSAL RESTRICTIONS NOTIFICATION FORM

NOTIFICATION FOR "P" AND "U" LISTED WASTE CODES

☐ P001	☐ P057	☐ P115	☐ U041	☐ U092	☐ U144	☐ U194
☐ P002	☐ P058	☐ P116	☐ U042	☐ U093	☐ U145	☐ U196
☐ P003	☐ P059	☐ P118	☐ U043	☐ U094	☐ U146	☐ U197
☐ P004	☐ P060	☐ P119	☐ U044	☐ U095	☐ U147	☐ U200
☐ P005	☐ P062	☐ P120	☐ U045	☐ U096	☐ U148	☐ U201
☐ P006	☐ P063	☐ P121	☐ U046	☐ U097	☐ U149	☐ U202
☐ P007	☐ P064	☐ P122	☐ U047	☐ U098	☐ U150	☐ U203
☐ P008	☐ P065	☐ P123	☐ U048	☐ U099	☐ U151	☐ U204
☐ P009	☐ P066		☐ U049	☐ U101	☐ U152	☐ U205
☐ P010	☐ P067		☐ U050	☐ U102	☐ U153	☐ U206
☐ P011	☐ P068		☐ U051	☐ U103	☐ U154	☐ U207
☐ P012	☐ P069	☐ U001	☐ U052	☐ U105	☐ U155	☐ U208
☐ P013	☐ P070	☐ U002	☐ U053	☐ U106	☐ U156	☐ U209
☐ P014	☐ P071	☐ U003	☐ U055	☐ U107	☐ U157	☐ U210
☐ P015	☐ P072	☐ U004	☐ U056	☐ U108	☐ U158	☐ U211
☐ P016	☐ P073	☐ U005	☐ U057	☐ U109	☐ U159	☐ U213
☐ P017	☐ P074	☐ U006	☐ U058	☐ U110	☐ U160	☐ U214
☐ P018	☐ P075	☐ U007	☐ U059	☐ U111	☐ U161	☐ U215
☐ P020	☐ P076	☐ U008	☐ U060	☐ U112	☐ U162	☐ U216
☐ P021	☐ P077	☐ U009	☐ U061	☐ U113	☐ U163	☐ U217
☐ P022	☐ P078	☐ U010	☐ U062	☐ U114	☐ U164	☐ U218
☐ P023	☐ P081	☐ U011	☐ U063	☐ U115	☐ U165	☐ U219
☐ P024	☐ P082	☐ U012	☐ U064	☐ U116	☐ U166	☐ U220
☐ P026	☐ P084	☐ U014	☐ U066	☐ U117	☐ U167	☐ U221
☐ P027	☐ P085	☐ U015	☐ U067	☐ U118	☐ U168	☐ U222
☐ P028	☐ P087	☐ U016	☐ U068	☐ U119	☐ U169	☐ U223
☐ P029	☐ P088	☐ U017	☐ U069	☐ U120	☐ U170	☐ U225
☐ P030	☐ P089	☐ U018	☐ U070	☐ U121	☐ U171	☐ U226
☐ P031	☐ P092	☐ U019	☐ U071	☐ U122	☐ U172	☐ U227
☐ P033	☐ P093	☐ U020	☐ U072	☐ U123	☐ U173	☐ U228
☐ P034	☐ P094	☐ U021	☐ U073	☐ U124	☐ U174	☐ U234
☐ P036	☐ P095	☐ U022	☐ U074	☐ U125	☐ U176	☐ U235
☐ P037	☐ P096	☐ U023	☐ U075	☐ U126	☐ U177	☐ U236
☐ P038	☐ P097	☐ U024	☐ U076	☐ U127	☐ U178	☐ U237
☐ P039	☐ P098	☐ U025	☐ U077	☐ U128	☐ U179	☐ U238
☐ P040	☐ P099	☐ U026	☐ U078	☐ U129	☐ U180	☐ U239
☐ P041	☐ P101	☐ U027	☐ U079	☐ U130	☐ U181	☐ U240
☐ P042	☐ P102	☐ U028	☐ U080	☐ U131	☐ U182	☐ U243
☐ P043	☐ P103	☐ U029	☐ U081	☐ U132	☐ U183	☐ U244
☐ P044	☐ P104	☐ U030	☐ U082	☐ U133	☐ U184	☐ U246
☐ P045	☐ P105	☐ U031	☐ U083	☐ U134	☐ U185	☐ U247
☐ P046	☐ P106	☐ U032	☐ U084	☐ U135	☐ U186	☐ U248
☐ P047	☐ P108	☐ U033	☐ U085	☐ U136	☐ U187	☐ U249
☐ P048	☐ P109	☐ U034	☐ U086	☐ U137	☐ U188	☐ U328
☐ P049	☐ P110	☐ U035	☐ U087	☐ U138	☐ U189	☐ U353
☐ P050	☐ P111	☐ U036	☐ U088	☐ U140	☐ U190	☐ U359

Figure 3-1 (Continued)
Land Disposal Restrictions Notification Form

TABLE UTS—Universal Treatment Standards
(Check the applicable underlying hazardous constituents for D001, D002, and D012 –D043 characteristic wastes only.)

Regulated constituent—common name

- ☐ Acenaphthylene
- ☐ Acenaphthene
- ☐ Acetone
- ☐ Acetonitrile
- ☐ Acetophenone
- ☐ 2-Acetylaminofluorene
- ☐ Acrolein
- ☐ Acrylamide
- ☐ Acrylonitrile
- ☐ Aldrin
- ☐ 4-Aminobiphenyl
- ☐ Aniline
- ☐ Anthracene
- ☐ Aramite
- ☐ alpha-BHC
- ☐ beta-BHC
- ☐ delta-BHC
- ☐ gamma-BHC
- ☐ Benzene
- ☐ Benz(a)anthracene
- ☐ Benzal chloride
- ☐ Benzo(b)fluoranthene (difficult to distinguish from benzo(k)fluoranthene)
- ☐ Benzo(k)fluoranthene (difficult to distinguish from benzo(b)fluoranthene)
- ☐ Benzo(g,h,i)perylene
- ☐ Benzo(a)pyrene
- ☐ Bromodichloromethane
- ☐ Methyl bromide (Bromomethane)
- ☐ 4-Bromophenyl phenyl ether
- ☐ n-Butyl alcohol
- ☐ Butyl benzyl phthalate
- ☐ 2-sec-Butyl-4,6-dinitrophenol (Dinoseb)
- ☐ Carbon disulfide
- ☐ Carbon tetrachloride
- ☐ Chlordane (alpha and gamma isomers)
- ☐ p-Chloroaniline
- ☐ Chlorobenzene
- ☐ Chlorobenzilate
- ☐ 2-Chloro-1,3-butadiene
- ☐ Chlorodibromomethane
- ☐ Chloroethane
- ☐ bis(2-Chloroethoxy)methane
- ☐ bis(2-Chloroethyl)ether
- ☐ Chloroform
- ☐ bis(2-Chloroisopropyl)ether
- ☐ p-Chloro-m-cresol
- ☐ 2-Chloroethyl vinyl ether
- ☐ Chloromethane (Methyl chloride)
- ☐ 2-Chloronaphthalene
- ☐ 2-Chlorophenol
- ☐ 3-Chloropropylene
- ☐ Chrysene
- ☐ o-Cresol
- ☐ m-Cresol (difficult to distinguish from p-cresol)
- ☐ p-Cresol (difficult to distinguish from m-cresol)
- ☐ Cyclohexanone
- ☐ 1,2-Dibromo-3-chloropropane
- ☐ Ethylene dibromide (1,2-Dibromoethane)
- ☐ Dibromomethane
- ☐ 2,4-D (2,4-Dichlorophenoxyacetic acid)
- ☐ o,p′-DDD
- ☐ p,p′-DDD
- ☐ o,p′-DDE
- ☐ p,p′-DDE
- ☐ o,p′-DDT
- ☐ p,p′-DDT
- ☐ Dibenz(a,h)anthracene
- ☐ Dibenz(a,e)pyrene
- ☐ m-Dichlorobenzene
- ☐ o-Dichlorobenzene
- ☐ p-Dichlorobenzene
- ☐ Dichlorodifluoromethane
- ☐ 1,1-Dichloroethane
- ☐ 1,2-Dichloroethane
- ☐ 1,1-Dichloroethylene
- ☐ trans-1,2-Dichloroethylene
- ☐ 2,4-Dichlorophenol
- ☐ 2,6-Dichlorophenol
- ☐ 1,2-Dichloropropane
- ☐ cis-1,3-Dichloropropylene
- ☐ trans-1,3-Dichloropropylene
- ☐ Dieldrin
- ☐ Diethyl phthalate
- ☐ 2-4,Dimethyl phenol
- ☐ Dimethyl phthalate
- ☐ Di-n-butyl phthalate
- ☐ 1,4-Dinitrobenzene

TABLE UTS—Universal Treatment Standards
(Check the applicable underlying hazardous constituents for D001, D002, and D012 –D043 characteristic wastes only.)

Regulated constituent—common name

- ☐ 4,6-Dinitro-o-cresol
- ☐ 2,4-Dinitrophenol
- ☐ 2,4-Dinitrotoluene
- ☐ 2,6-Dinitrotoluene
- ☐ Di-n-octyl phthalate
- ☐ p-Dimethylaminoazobenzene
- ☐ Di-n-propylnitrosamine
- ☐ 1,4-Dioxane
- ☐ Diphenylamine (difficult to distinguish from diphenylnitrosamine)
- ☐ Diphenylnitrosamine (difficult to distinguish from diphenylamine)
- ☐ 1,2-Diphenylhydrazine
- ☐ Disulfoton
- ☐ Endosulfan I
- ☐ Endosulfan II
- ☐ Endosulfan sulfate
- ☐ Endrin
- ☐ Endrin aldehyde
- ☐ Ethyl acetate
- ☐ Ethyl cyanide (Propanenitrile)
- ☐ Ethyl benzene
- ☐ Ethyl ether
- ☐ bis(2-Ethylhexyl) phthalate
- ☐ Ethyl methacrylate
- ☐ Ethylene oxide
- ☐ Famphur
- ☐ Fluoranthene
- ☐ Fluorene
- ☐ Heptachlor
- ☐ Heptachlor epoxide
- ☐ Hexachlorobenzene
- ☐ Hexachlorobutadiene
- ☐ Hexachlorocyclopentadiene
- ☐ HxCDDs (All Hexachlorodibenzo-p-dioxins)
- ☐ HxCDFs (All Hexachlorodibenzofurans)
- ☐ Hexachloroethane
- ☐ Hexachloropropylene
- ☐ Indeno (1,2,3-c,d) pyrene
- ☐ Iodomethane
- ☐ Isobutyl alcohol
- ☐ Isodrin
- ☐ Isosafrole
- ☐ Kepone
- ☐ Methacrylonitrile
- ☐ Methanol
- ☐ Methapyrilene
- ☐ Methoxychlor
- ☐ 3-Methylcholanthrene
- ☐ 4,4-Methylene bis(2-chloroaniline)
- ☐ Methylene chloride
- ☐ Methyl ethyl ketone
- ☐ Methyl isobutyl ketone
- ☐ Methyl methacrylate
- ☐ Methyl methansulfonate
- ☐ Methyl parathion
- ☐ Naphthalene
- ☐ 2-Naphthylamine
- ☐ o-Nitroaniline
- ☐ p-Nitroaniline
- ☐ Nitrobenzene
- ☐ 5-Nitro-o-toluidine
- ☐ o-Nitrophenol
- ☐ p-Nitrophenol
- ☐ N-Nitrosodiethylamine
- ☐ N-Nitrosodimethylamine
- ☐ N-Nitroso-di-n-butylamine
- ☐ N-Nitrosomethylethylamine
- ☐ N-Nitrosomorpholine
- ☐ N-Nitrosopiperidine
- ☐ N-Nitrosopyrrolidine
- ☐ Parathion
- ☐ Total PCBs (sum of all PCB isomers, or all Aroclors)
- ☐ Pentachlorobenzene
- ☐ PeCDDs (All Pentachlorodibenzo-p-dioxins)
- ☐ PeCDFs (All Pentachlorodibenzofurans)
- ☐ Pentachloroethane
- ☐ Pentachloronitrobenzene
- ☐ Pentachlorophenol
- ☐ Phenacetin
- ☐ Phenanthrene
- ☐ Phenol
- ☐ Phorate
- ☐ Phthalic acid
- ☐ Phthalic anhydride
- ☐ Pronamide
- ☐ Pyrene
- ☐ Pyridine
- ☐ Safrole
- ☐ Silvex (2,4,5-TP)

Los Alamos
National Laboratory

LAND DISPOSAL RESTRICTIONS NOTIFICATION FORM

TABLE UTS—Universal Treatment Standards
(Check the applicable underlying hazardous constituents for D001, D002, and D012 –D043 characteristic wastes only.)

Regulated constituent—common name

- ☐ 2,4,5-T (2,4,5-Trichlorophenoxyacetic acid)
- ☐ 1,2,4,5-Tetrachlorobenzene
- ☐ TCDDs (All Tetrachlorodibenzo-p-dioxins)
- ☐ TCDFs (All Tetrachlorodibenzofurans)
- ☐ 1,1,1,2-Tetrachloroethane
- ☐ 1,1,2,2-Tetrachloroethane
- ☐ Tetrachloroethylene
- ☐ 2,3,4,6-Tetrachlorophenol
- ☐ Toluene
- ☐ Toxaphene
- ☐ Bromoform (Tribromomethane)
- ☐ 1,2,4-Trichlorobenzene
- ☐ 1,1,1-Trichloroethane
- ☐ 1,1,2-Trichloroethane
- ☐ Trichloroethylene
- ☐ Trichloromonofluoromethane
- ☐ 2,4,5-Trichlorophenol
- ☐ 2,4,6-Trichlorophenol
- ☐ 1,2,3-Trichloropropane
- ☐ 1,1,2-Trichloro-1,2,2-trifluoroethane
- ☐ tris-(2,3-Dibromopropyl) phosphate
- ☐ Vinyl chloride
- ☐ Xylenes-mixed isomers (sum of o-, m-, and p-xylene concentrations)
- ☐ Antimony
- ☐ Arsenic
- ☐ Barium
- ☐ Beryllium
- ☐ Cadmium
- ☐ Chromium (Total)
- ☐ Cyanides (Total)[1]
- ☐ Cyanides (Amenable)[1]
- ☐ Fluoride
- ☐ Lead
- ☐ Mercury—Nonwastewater from Retort
- ☐ Mercury—All Others
- ☐ Nickel
- ☐ Selenium
- ☐ Silver
- ☐ Sulfide
- ☐ Thallium
- ☐ Vanadium

[1] Both Cyanides (Total) and Cyanides (Amenable) for nonwastewaters are to be analyzed using Method 9010 or 9012, found in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA Publication SW-846, as incorporated by reference in 40 CFR 260.11, with a sample size of 10 grams and a distillation time of one hour and 15 minutes.

NOTIFICATION OF ADDITIONAL TREATMENT STANDARDS

EPA Waste Code	Waste Description and/or Subcategory (if applicable)

Figure 3-1 (Continued)
Land Disposal Restrictions Notification Form

Los Alamos
National Laboratory

WASTE PROFILE FORM

Account Information		Reference Number
	For rapid processing, complete **all sections** in black or blue ink and mail this form to Waste Services Group at MS J579	

Waste Generator's Name (Print)	Znumber	Waste Management Coordinator's Name (Print)	Znumber

Generator's Group	Generator's Telephone	Generator's Mail Stop	Waste Stream Technical Area	Building	Room

Waste Accumulation
Check as many as apply.

- ☐ Satellite accumulation area --> site no.: _____
- ☐ Less than 90 day accumulation area --> site no.: _____
- ☐ Radioactive Materials Management Area (RMMA) --> site no.: _____
- ☐ None of the above

Method of Characterization
Check as many as apply.

- ☐ Acceptable Knowledge (AK)
- ☐ Analysis attached --> sample/request no. _____
- ☐ MSDS attached
- ☐ Request for analysis

Section 1- Chemical and Physical Characteristics

For help in completing this section of the form, call 5-WAST or 5-4000.

Waste Type
Check only one.

- ☐ Unused/unspent chemical
  Check *Waste Classes* and *Associated Documentation* Only
- ☐ Process waste/spent chemical
  Complete all of Section 1.

Waste Classes
Check as many as apply.

- ☐ On-going generation
- ☐ One-time generation
- ☐ Radioactive (complete Sec. 2)
- ☐ Non-radioactive
- ☐ Wastewater (complete Sec. 3)
- ☐ Classified/Sensitive

Associated Documentation
Check as many as apply.

- ☐ Process SOP --> no.: _____
- ☐ RMMA OP --> no.: _____
- ☐ WM SOP --> no.: _____
- ☐ Other --> _____
- ☐ None --> describe below

Waste Category
Check as many as apply.

- ☐ Solvent
- ☐ Degreaser
- ☐ Dioxin
- ☐ Electroplating
- ☐ Treated hazardous waste residue
- ☐ Explosive process waste
- ☐ Infectious/biological waste
- ☐ Beryllium
- ☐ Asbestos-friable
- ☐ Asbestos-nonfriable
- ☐ Empty containers
- ☐ PCB (<50 ppm)
  - ☐ PCB (50 - 500 ppm)
  - ☐ PCB (> 500 ppm)
  - → id. no. : _____
- ☐ Not applicable --> describe below

Waste Sources
Check as many as apply.

- ☐ Research and development
- ☐ Maintenance
- ☐ Construction
- ☐ Material processing
- ☐ Decon/decom
- ☐ Investigation derived
- ☐ Remediation
- ☐ UST - petroleum
- ☐ UST - non-petroleum
- ☐ Generator treatment
- ☐ Interim/permitted treatment
- ☐ Industrial sludge
- ☐ Sanitary sludge
- ☐ Abatement

Waste Matrix
Check only one.

Gas
- ☐ ≤ 1.5 Atmospheres
- ☐ > 1.5 Atmospheres

Liquid
- ☐ Aqueous
- ☐ Organic
- ☐ Inorganic

Solid
- ☐ Powder/ash
- ☐ Solid
- ☐ Absorbed liquid

Matrix Type
Check only one.

- ☐ Homogeneous
- ☐ Heterogeneous --> describe below

Waste/Process Description

_____
_____
_____
_____
_____
_____
_____

Figure 3-2
Waste Profile Form

Section 1- Chemical and Physical Characteristics (continued)

Ignitability (degrees F.)
Check only one.

- ☐ < 73
- ☐ 73-99
- ☐ 100-139
- ☐ 140-200
- ☐ > 200
- ☐ Ignitable solid
- ☐ DOT oxidizer
- ☐ Not ignitable

Corrosivity (pH)
Check only one.

- ☐ ≤ 2.0
- ☐ 2.1-4.0
- ☐ 4.1-6.0
- ☐ 6.1-9.0
- ☐ 9.1-12.4
- ☐ ≥ 12.5
- ☐ Liquid corrosive to steel
- ☐ Not aqueous

Reactivity
Check as many as apply.

- ☐ Unstable
- ☐ Water reactive
- ☐ Pyrophoric
- ☐ Cyanide bearing
- ☐ Sulfide bearing
- ☐ Shock sensitive
- ☐ Explosive - class _____
- ☐ Non-reactive

Boiling Point (degrees F.)
Check only one.

- ☐ ≤ 95
- ☐ > 95
- ☐ Not applicable

Identify presence of contaminants.			Minimum		Maximum	Unit (ppm or % only)	Analytical method
Toxicity Characteristic Metals							
Arsenic	☐ None	☐ < 5.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Barium	☐ None	☐ < 100.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Cadmium	☐ None	☐ < 1.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Chromium	☐ None	☐ < 5.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Lead	☐ None	☐ < 5.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Mercury	☐ None	☐ < 0.2 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Selenium	☐ None	☐ < 1.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Silver	☐ None	☐ < 5.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Toxicity Characteristic Organic Compounds							
Benzene	☐ None	☐ < 0.5 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Carbon tetrachloride	☐ None	☐ < 0.5 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Chlorobenzene	☐ None	☐ < 100.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Chloroform	☐ None	☐ < 6.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Cresol	☐ None	☐ < 200.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
1,4-dichlorobenzene	☐ None	☐ < 7.5 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
1,2-Dichloroethane	☐ None	☐ < 0.5 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
1,1-Dichloroethylene	☐ None	☐ < 0.7 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
2,4-Dinitrotoluene	☐ None	☐ < 0.13 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Hexachlorobenzene	☐ None	☐ < 0.13 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Hexachlorobutadiene	☐ None	☐ < 0.5 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Hexachloroethane	☐ None	☐ < 3.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Methyl ethyl ketone	☐ None	☐ < 200.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Nitrobenzene	☐ None	☐ < 2.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Pentachlorophenol	☐ None	☐ < 100.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Pyridine	☐ None	☐ < 5.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Perchloroethylene or tetrachloroethylene	☐ None	☐ < 0.7 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Trichloroethylene	☐ None	☐ < 0.5 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
2,4,5-Trichlorophenol	☐ None	☐ < 400.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
2,4,6-Trichlorophenol	☐ None	☐ < 2.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Vinyl chloride	☐ None	☐ < 0.2 ppm	_____	to	_____	_____	☐ TCLP ☐ Total

Additional Chemical Constituents and Contaminants (for hazardous constituents, see AR 10-3, Appendix A)
List all other constituents (including inerts) not identified above and attach any applicable analyses.

Name of constituent	Cas no.(optional)	Minimum		Maximum	Unit (ppm or % only)
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____

Figure 3-2 (Continued)
Waste Profile Form

Section 2- Radiological Characteristics

For help in completing this section of the form, call 5-WAST or 5-4000.

	Range minimum		Range maximum	Unit (Ci/g or Ci/l)
General				
☐ Alpha	_____	to	_____	_____
☐ Beta	_____	to	_____	_____
☐ Gamma	_____	to	_____	_____
TRU radionuclides				
☐ None present				
☐ Am-241	_____	to	_____	_____
☐ Am-243	_____	to	_____	_____
☐ Cf-249	_____	to	_____	_____
☐ Cf-251	_____	to	_____	_____
☐ Cm-243	_____	to	_____	_____
☐ Cm-245	_____	to	_____	_____
☐ Cm-247	_____	to	_____	_____
☐ Pu-238	_____	to	_____	_____
☐ Pu-239	_____	to	_____	_____
☐ Pu-240	_____	to	_____	_____
☐ Pu-242	_____	to	_____	_____
Fission products				
☐ None present				
☐ Ba-140	_____	to	_____	_____
☐ Ce-144	_____	to	_____	_____
☐ Cs-134	_____	to	_____	_____
☐ Cs-137	_____	to	_____	_____
☐ I-129	_____	to	_____	_____
☐ I-133	_____	to	_____	_____
☐ Kr-85	_____	to	_____	_____
☐ Nb-95	_____	to	_____	_____
☐ Ru-106	_____	to	_____	_____
☐ Sb-125	_____	to	_____	_____
☐ Sr-90	_____	to	_____	_____
☐ Tc-99	_____	to	_____	_____
☐ Zr-93	_____	to	_____	_____
☐ Zr-95	_____	to	_____	_____
Activation products				
☐ None present				
☐ As -74	_____	to	_____	_____
☐ Be-7	_____	to	_____	_____
☐ C-14	_____	to	_____	_____
☐ Co-56	_____	to	_____	_____
☐ Co-57	_____	to	_____	_____
☐ Co-58	_____	to	_____	_____
☐ Co-60	_____	to	_____	_____
☐ Cr-51	_____	to	_____	_____
☐ Eu-152	_____	to	_____	_____
☐ Mn-52	_____	to	_____	_____
☐ Mn-54	_____	to	_____	_____
☐ Nb-94	_____	to	_____	_____
☐ Ni-59	_____	to	_____	_____
☐ Ni-63	_____	to	_____	_____
☐ Rb-83	_____	to	_____	_____
☐ Rb-84	_____	to	_____	_____
☐ Se-75	_____	to	_____	_____
☐ Sr-82	_____	to	_____	_____
☐ Sr-85	_____	to	_____	_____
☐ V-48	_____	to	_____	_____
☐ Y-88	_____	to	_____	_____
☐ Zn-65	_____	to	_____	_____
☐ Zr-88	_____	to	_____	_____

	Range minimum		Range maximum	Unit (Ci/g or Ci/l)
Other				
☐ None present				
☐ Am-242	_____	to	_____	_____
☐ Bi-207	_____	to	_____	_____
☐ Bi-210	_____	to	_____	_____
☐ Cf-250	_____	to	_____	_____
☐ Cf-252	_____	to	_____	_____
☐ Cm-244	_____	to	_____	_____
☐ H-3	_____	to	_____	_____
☐ Pa-231	_____	to	_____	_____
☐ Pb-210	_____	to	_____	_____
☐ Po-210	_____	to	_____	_____
☐ Pu-236	_____	to	_____	_____
☐ Pu-241	_____	to	_____	_____
☐ Ra-226	_____	to	_____	_____
☐ Ra-228	_____	to	_____	_____
☐ Th-230	_____	to	_____	_____
☐ Th-232	_____	to	_____	_____
☐ U-232	_____	to	_____	_____
☐ U-233	_____	to	_____	_____
☐ U-234	_____	to	_____	_____
☐ U-235	_____	to	_____	_____
☐ U-236	_____	to	_____	_____
☐ U-238	_____	to	_____	_____
Add'l radionuclides				
☐ No additional radionuclides present				
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____

Contamination Type: *Check as many as apply.*

☐ Volume Contamination

☐ Surface Contamination

Figure 3-2 (Continued)
Waste Profile Form

Section 3 - Wastewater Characteristics

For help in completing this section of the form, call 7-4301.

Identify presence of contaminants			Minimum	Maximum	Unit (ppm or % only)	Analytical method
Aluminum	☐ None	☐ < 5.0 ppm	_____	to _____	_____	☐ TCLP ☐ Total
Boron	☐ None	☐ < 5.0 ppm	_____	to _____	_____	☐ TCLP ☐ Total
Cobalt	☐ None	☐ < 1.0 ppm	_____	to _____	_____	☐ TCLP ☐ Total
Copper	☐ None	☐ < 1.0 ppm	_____	to _____	_____	☐ TCLP ☐ Total
Vanadium	☐ None	☐ < 0.10 ppm	_____	to _____	_____	☐ TCLP ☐ Total
Zinc	☐ None	☐ < 95.4 ppm	_____	to _____	_____	☐ TCLP ☐ Total

Maximum daily flow when discharge occurs: _____ ☐ Gallons ☐ Liters

Average daily flow when discharge occurs: _____ ☐ Gallons ☐ Liters

Estimated number of days per year that discharge will occur: _____

Estimated total volume per year discharged to the Radioactive Liquid Waste Collection System at TA-50-1: _____ ☐ Gallons ☐ Liters

For TA-55 use only. Wastewater will be discharged through one of the following:

☐ Acid line ☐ Caustic line ☐ Industrial waste line

Section 4 - Additional Information

If additional information is available on the chemical, physical, or radiological character of the waste not covered on this form, provide it below:

WASTE GENERATOR CERTIFICATION: *Based on my knowledge of the waste and/or chemical/physical analysis, I certify that the information on this form is correct. I understand that this information will be made available to regulatory agencies and that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.*

Signature	Date

Figure 3-2 (Continued)
Waste Profile Form

Document:	LANL TA-55 Part B
Revision No.:	0.0
Date:	June 28, 1996

Technical Area 55
Part B Permit Application
Volume II

Building 4, Container Storage Areas 1–11
Storage Tank Systems
Cementation Treatment Unit

Container Storage Pad

Building 185, Container Storage Area

Los Alamos National Laboratory
Hazardous and Solid Waste Group (ESH-19)
Los Alamos, New Mexico 87545

June 1996

Notice

There are Unclassified Controlled Nuclear Information (UCNI) Documents included as part of this Part B Permit Application.

Document Security Requirements:

1. Maintain physical control when not in use.
2. Store in a locked drawer
3. Prevent unauthorized access or dissemination

Access:

Any authorized individual (a person who has a need to know the information in connection with the performance of official DOE-authorized activities) may have routine access to UCNI.

These documents are not to be released to civilian population. Violation of the security requirements of UCNI may result in a civil penalty of up to $100,000 Criminal penalties may also apply under section 223 of the Atomic Energy Act.

For access to these documents contact:
Ms. Barbara Hoditschek, RCRA Permits Management Program Manager
Mr. Robert S. (Stu) Dinwiddie, LANL Facility Manager

4.0 DESIGN, OPERATIONS, AND PROCESS INFORMATION

This Part B permit application addresses only those units at Los Alamos National Laboratory (LANL) Technical Area (TA) 55 currently identified as hazardous or mixed waste regulated units. Continuous initiatives are administered to ensure identification of additional units, if any, that may potentially be regulated under the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1). This section presents a brief description of each container storage area, the storage tank systems, and the cementation unit addressed in this permit application as well as an overview of the general operations and process information that are applicable to these hazardous and mixed waste management units. The information provided in this section is submitted to address the following requirements:

- Container storage requirements of 20 NMAC 4.1, Subpart IX, 270.15, revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264, Subpart I, revised November 1, 1995, as applicable;
- Tank system requirements specified in 20 NMAC 4.1, Subpart IX, 270.16, revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264, Subpart J, revised November 1, 1995, as applicable; and
- Miscellaneous unit requirements specified in 20 NMAC 4.1, Subpart IX, 270.23, revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264, Subpart X, revised November 1, 1995, as applicable.

4.1 CONTAINER STORAGE AREAS [20 NMAC 4.1, Subpart IX, 270.15; 20 NMAC 4.1, Subpart V, Part 264, Subpart I]

This section provides descriptions of the container storage areas at TA-55. The container storage areas addressed in this permit application include Areas 1 through 11 located in TA-55, Building 4 (TA-55-4); the container storage pad located west of TA-55-4; and the container storage area located in TA-55-185 (An index to selected buildings/structures at TA-55 is provided as Attachment 4-1.) Each description includes the location, the physical parameters, the materials of construction, the basic design features, the maximum storage capacity, and the types of containers used at the container storage area. In addition, for areas that store wastes that may potentially contain free liquids, information is provided on the design and capacity of the secondary containment system.

Engineering drawings (Figures 4-1 through 4-4) have been provided for the container storage areas included in this permit application; they are, however, provided under separate cover to comply with Unclassified Controlled Nuclear Information (UCNI) procedures.

4.1.1 Container Storage Areas 1, 2, and 3

Areas 1, 2, and 3 are used to store containers of hazardous waste, transuranic (TRU) mixed waste, and low-level mixed waste, any of which may potentially contain liquids. These container storage areas are located in the basement of TA-55-4, as shown on Figure 4-1. TA-55-4 was constructed in 1977. The basement is approximately 265 feet (ft) long by 284 ft wide. The entire basement floor is constructed of 10-inch-(in.-)thick concrete and is coated with a chemical and temperature-resistant epoxy primer and epoxy paint to effectively prevent the migration of any liquids into the concrete (manufacturer's information on the protective coating materials is included as Appendix C of this permit application).

The basement is divided into a north and a south section by a concrete wall. These two sections are further divided, approximately in half, by a combination of concrete, a metal fire wall, and metal sliding fire doors. Passageways exist between all four sections. Areas 1 and 3 are located in the southwest section of the basement as shown on Figure 4-1. Area 1 is L-shaped and is approximately 61.4 ft long by 54.9 ft wide. The total square footage of this area is 2,153.7 square ft. Area 3 is 26 ft long by 10 ft wide and is located just north of Area 1. Area 2 is located in the southeast section of the basement as shown on Figure 4-1. It is approximately 26.6 ft long by 11.3 ft wide. The total maximum storage capacity of the three areas is 27,500 gallons (gal), or the equivalent of 500, 55-gal drums. Waste containers holding mixed waste stored in Areas 1, 2, and 3 may include 30-, 55-, and 85-gal steel drums; large waste boxes; and standard waste boxes (SWB). (Section 4.2.1 and Appendix D of this permit application provide detailed information regarding the different types of waste containers currently used at TA-55. The container specifications may vary between different manufacturers.)

Containers holding mixed waste that may potentially contain or are known to contain free liquids may be stored in Areas 1, 2, and 3; therefore, the requirements of 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are applicable. (Tables 4-1 through 4-5 provide information on wastes that may be stored in Areas 1, 2, and 3.) Containers suspected or known to contain free liquids are stored in containment systems. (Section 4.2.1 provides additional

information on secondary containment units.) The containment units will hold at least 10 percent of the volume of the potential liquid-bearing containers or the volume of the largest potential liquid-bearing container that may be stored in each unit, whichever is greater, pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(3), revised November 1, 1995.

4.1.2 Container Storage Area 4

Area 4 is used to store containers of hazardous waste, TRU mixed waste, and low-level mixed waste, any of which may potentially contain liquids. The container storage area is located in the northwest section of the basement at TA-55-4, as shown on Figure 4-1. Area 4 is 16 ft long by 13 ft wide. The storage capacity of this area is 3,400 gal, or the equivalent of approximately 62, 55-gal drums. The types of waste containers holding hazardous or mixed waste that may be stored in Area 4 include but are not limited to steel cans; 30-, 55-, and 85-gal steel drums; and large waste boxes.

Containers holding hazardous or mixed waste that may potentially contain or are known to contain free liquids may be stored in Area 4; therefore, the requirements of 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are applicable. (Tables 4-1 through 4-5 provide information on wastes that may be stored in Area 4.) Containers suspected or known to contain free liquids are stored in a cabinet equipped with a leakproof sill, on self-containment pallets, or in secondary containment units. (Section 4.2.1 provides additional information on these containment systems.) The containment systems will hold at least 10 percent of the volume of the potential liquid-bearing containers or the volume of the largest potential liquid-bearing container that may be stored therein, whichever is greater, pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(3), revised November 1, 1995.

4.1.3 Container Storage Area 5

Area 5 is used to store hazardous waste, TRU mixed waste, and low-level mixed waste solids. The container storage area is located in the northeast section of the basement at TA-55-4, as shown on Figure 4-1. It is approximately 45.1 ft long by 17.6 ft wide. The storage capacity of this area is 3,400 gal, or the equivalent of approximately 62, 55-gal drums. Waste containers holding mixed waste stored in Area 5 include, but are not limited to, steel cans; 55- and 85-gal steel drums; and SWBs.

Only solids are stored in Area 5. Therefore, the requirements of 20 NMAC 4.1, Subpart IX, 270.15(a), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are not applicable. In accordance with 20 NMAC 4.1, Subpart IX, 270.15(b)(1), revised November 1, 1995, Tables 4-1 through 4-3 provide information to show that the wastes stored in Area 5 consist of solid physical forms only and, by the nature of their physical form, do not contain free liquids.

4.1.4 Container Storage Area 6

Area 6 is used to store containers of TRU mixed waste and non-waste items, some of which may contain liquids. The container storage area is located along the eastern wall of the basement at TA-55-4, as shown on Figure 4-1. The storage area is approximately 79.6 ft long by 50.5 ft wide. The storage capacity of this area is 4,000 gal, or the equivalent of approximately 73, 55-gal drums. The types of waste containers holding mixed waste that may be stored in Area 6 include, but are not limited to, glass or plastic bottles; steel cans; and 30- and 55-gal steel drums.

Containers holding mixed waste that may potentially contain or are known to contain free liquids may be stored in Area 6; therefore, the requirements of 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are applicable. (Table 4-1 provides information on wastes that may be stored in Area 6.) This container storage area has a recessed floor and will provide secondary containment for the liquids stored in Area 6. The floor is constructed of concrete, is free of cracks and gaps, and is coated with a chemical-and temperature-resistant epoxy primer and epoxy paint. This coating is compatible with the wastes stored in Area 6 and will effectively prevent the migration of waste into the concrete. The capacity of the recessed floor is at least 10 percent of the volume of the potential liquid-bearing containers or the volume of the largest potential liquid-bearing container that may be stored in Area 6, whichever is greater, pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(3), revised November 1, 1995.

4.1.5 Container Storage Area 7

Area 7 may be used to store containers of hazardous waste, TRU mixed waste, and low-level mixed waste, any of which may potentially contain liquids. The container storage area is located in the northwest section of the basement at TA-55-4, as shown on Figure 4-1. The area is split with one portion on either side of the basement corridor leading to the outside access ramp. The western portion is approximately 33.3 ft long by 3 ft wide. The eastern portion is approximately

48.7 ft long by 2.2 ft wide. Area 7 has a maximum storage capacity of 4,400 gal, or the equivalent of 80, 55-gal drums. Waste containers holding hazardous or mixed waste stored in Area 7 may include, but are not limited to, steel cans; 30-, 55-, and 85-gal steel drums; and other waste boxes. Occasionally, large waste boxes and/or SWBs are staged temporarily (i.e., less than 24 hours) in Area 7 prior to loading and transport to other locations.

Containers holding hazardous or mixed waste that may potentially contain or are known to contain free liquids may be stored in Area 7; therefore, the requirements of 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are applicable. (Tables 4-1 through 4-5 provide information on wastes that may be stored in Area 7.) Containers suspected or known to contain free liquids are stored in secondary containment units. The containment units will hold at least 10 percent of the volume of the potential liquid-bearing containers or the volume of the largest potential liquid-bearing container that may be stored in each unit, whichever is greater, pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(3), revised November 1, 1995.

4.1.6 Container Storage Areas 8 and 9

Areas 8 and 9 may be used to store containers of TRU mixed waste and low-level mixed waste, any of which may potentially contain liquids. The container storage areas are located in Room 401 of TA-55-4 (TA-55-4-401), as shown on Figure 4-2. Area 8 is 6 ft long by 5.5 ft wide. The storage capacity of this area is 660 gal, or the equivalent of 12, 55-gal drums. Area 9 is 6.25 ft long by 5 ft wide. Its maximum storage capacity is 280 gal, or the equivalent of approximately 5, 55-gal drums. Waste containers holding mixed waste stored in Areas 8 and 9 include, but are not limited to, steel cans and 30-, 55-, and 85-gal steel drums.

Containers holding mixed waste that may potentially contain or are known to contain free liquids may be stored in Areas 8 and 9; therefore, the requirements of 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are applicable. (Tables 4-1, 4-2, and 4-4 provide information on wastes that may be stored in Areas 8 and 9.) TA-55-4-401 has a recessed floor and will provide secondary containment for the liquids stored in Areas 8 and 9. The entire floor is constructed of 10-in.-thick concrete, is free of cracks and gaps, and is coated with a chemical- and temperature-resistant epoxy primer and epoxy paint. This coating is compatible with the wastes stored in Areas 8 and 9 and will effectively prevent the migration of waste into the concrete. The capacity of the recessed floor is at least 10 percent of the volume of the potential

liquid-bearing containers or the volume of the largest potential liquid-bearing container that may be stored in Areas 8 and 9, whichever is greater, pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(3), revised November 1, 1995.

4.1.7 Container Storage Area 10

Area 10 may be used to store containers of TRU mixed waste and low-level mixed waste solids. The container storage area is located in TA-55-4-433, as shown on Figure 4-2. The floor of TA-55-4-433 is constructed of 10-in.-thick concrete and is coated with a chemical- and temperature-resistant epoxy primer and epoxy paint. Area 10 is split into two portions within the room. One portion of the container storage area, located in the northern end of the room, is 4 ft long by 3 ft wide. The other portion of the container storage area, located in the southern end of the room, is 10 ft long by 2 ft wide. Area 10 has a maximum storage capacity of 550 gal, or the equivalent of 10, 55-gal drums. Waste containers holding mixed waste stored in Area 10 include, but are not limited to, steel cans and 30-, 55-, and 85-gal steel drums.

Only solids are stored in Area 10. Therefore, the requirements of 20 NMAC 4.1, Subpart IX, 270.15(a), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are not applicable. In accordance with 20 NMAC 4.1, Subpart IX, 270.15(b)(1), revised November 1, 1995, Tables 4-1 and 4-2 provide information to show that the wastes stored in Area 10 consist of solid physical forms only and, by the nature of their physical form, do not contain free liquids.

4.1.8 Container Storage Area 11

Area 11 may be used to store containers of TRU mixed waste solids. The container storage area is located in TA-55-4-432, as shown on Figure 4-2. The floor of TA-55-4-432 is constructed of 10-in.-thick concrete and is coated with a chemical- and temperature-resistant epoxy primer and epoxy paint. The storage area is approximately 20.3 ft long by 34.2 ft wide. Area 11 has a maximum storage capacity of 4,400 gal, or the equivalent of 80, 55-gal drums. Waste containers holding mixed waste stored in Area 11 include steel cans and 30-, 55-, and 85-gal steel drums.

Only solids are stored in Area 11. Therefore, the requirements of 20 NMAC 4.1, Subpart IX, 270.15(a), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are not applicable. In accordance with 20 NMAC 4.1, Subpart IX,

270.15(b)(1), revised November 1, 1995, Table 4-1 provides information to show that the wastes stored in Area 11 consist of solid physical forms only and, by the nature of their physical form, do not contain free liquids.

4.1.9 Container Storage Pad

A container storage pad, located outside and northwest of TA-55-4, is used to store containers of hazardous waste, TRU mixed waste, and low-level mixed waste, any of which may potentially contain liquids. The pad, laid in the mid-1980s, is constructed of asphalt with a variable thickness of 4 to 6 in. The container storage pad, shown on Figure 4-3, has a trapezoidal shape with the four sides measuring 102 ft, 86 ft, 156 ft, and 105 ft. The pad is sloped and elevated 2 to 4 in. above ground level and has a culvert beneath the pad running north and south to minimize run-on of precipitation. The storage capacity of this area is 135,000 gal, or the equivalent of approximately 2,455 55-gal drums. The types of waste containers holding hazardous or mixed waste that may be stored on the storage pad include 30-, 55-, and 85-gal steel drums; SWBs; large waste boxes; and various small containers.

Containers holding hazardous or mixed waste that may potentially contain or are known to contain free liquids may be stored on the container storage pad; therefore, the requirements of 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are applicable. (Tables 4-1 through 4-5 provide information on wastes that may be stored on the container storage pad.) The containers that may contain or are known to contain free liquids are stored in covered, self-containment units which provide secondary containment. (Section 4.2.1 and Appendix D provide detailed information on the covered, self-containment units.) Because the self-containment units are covered and elevated by design, run-on and/or precipitation will not affect the containment capacity. The capacity of the covered, self-containment units is at least 10 percent of the volume of the potential liquid-bearing containers or the volume of the largest potential liquid-bearing container that may be stored in each covered, self-containment unit, whichever is greater, pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(3), revised November 1, 1995.

4.1.10 Container Storage Area/TA-55-185

The container storage area located in TA-55-185 may be used to store containers of hazardous waste, TRU mixed waste, and low-level mixed waste solids. TA-55-185 is located west of

TA-55-4, as shown on Figure 4-4. The building was constructed in 1991 and consists of a steel frame with fiberglass insulation and a concrete floor. It is approximately 60 ft long by 40 ft wide. The container storage area within the building is approximately 60 ft long by 17.5 ft wide. The storage capacity of this area is 27,500 gal, or the equivalent of 500, 55-gal drums. The types of waste containers holding hazardous or mixed waste that may be stored in the container storage area in TA-55-185 include, but are not limited to, 30-, 55-, and 85-gal steel drums; large waste boxes; and SWBs.

Only solids are stored in the container storage area in TA-55-185. Therefore, the requirements of 20 NMAC 4.1, Subpart IX, 270.15(a), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are not applicable. In accordance with 20 NMAC 4.1, Subpart IX, 270.15(b)(1), revised November 1, 1995, Tables 4-1 through 4-3 provide information to show that the wastes stored in this container storage area consist of solid physical forms only and, by the nature of their physical form, do not contain free liquids.

4.2 WASTE MANAGEMENT PRACTICES APPLICABLE TO THE CONTAINER STORAGE AREAS [20 NMAC 4.1, Subpart V, Part 264, Subpart I]

The following sections provide an overview of the general operations and process information that are applicable to all of the container storage areas addressed in this permit application. This overview includes a discussion of container types; storage configuration; handling and inspection procedures; precautions taken when handling or storing incompatible, ignitable, or reactive wastes; and procedures for removal of liquids. This information is submitted to fulfill the requirements of 20 NMAC 4.1, Subpart V, Part 264, Subpart I, revised November 1, 1995.

4.2.1 Container Types

Containers used to store hazardous waste, low-level mixed waste, and TRU mixed waste at the container storage areas addressed in this permit application include, but are not limited to, steel cans; 30-, 55-, and 85-gal steel drums; SWBs; large waste boxes; and various small containers (Appendix D provides additional information on the types of waste containers used at TA-55). Sections 4.1.1 through 4.1.10 identify the specific types of waste containers in use at each of the container storage areas. All containers holding TRU mixed waste are vented. The vented containers have high-efficiency particulate air (HEPA) filters that allow gases (e.g., hydrogen), if any, to be released but that prevent the release of airborne particulates.

The most common drum used for storage at these container storage areas is the 55-gal drum. The standard drum in use is constructed of 16-gauge steel and has an inner diameter of 22.5 in. and a usable inside height of 33.25 in. The drums may be lined and may have either a removable lid or a prefastened lid with a 2-in. and a 0.75-in. opening. Currently, two sizes of large waste boxes are used for storage of low-level mixed waste solids at TA-55. These large waste boxes are constructed of low-carbon, hot-rolled steel and have continuous welds on all four sides and the bottom. Both sizes of this type of waste box, 45 cubic ft and 90 cubic ft, are designed to be loaded from the top. The lid is designed to be clamped and locked closed. SWBs are used to store TRU mixed waste at TA-55 and are approved by the U.S. Department of Energy (DOE) for use at the Waste Isolation Pilot Plant (WIPP). SWBs are constructed of low-carbon, hot-rolled steel and have continuous welds on all four sides and the bottom. SWBs are designed to be loaded from the top, have a lid that is bolted on, and a capacity of 72 cubic ft.

Overpacks are used to package large equipment items and gloveboxes or may be used when a container's integrity is suspected. Special order waste boxes are used to package gloveboxes. These boxes can be designed to be loaded and unloaded from the top as well as the side and/or the end. SWBs are commonly used to overpack equipment. Eighty-five-gal drums may be used to overpack 55-gal drums. The 85-gal overpacks are constructed of 16-gauge steel, at a minimum.

Covered, self-containment units, self-containment pallets, single-drum containment units, and cabinets (see Appendix D) may be used as a form of secondary containment at any of the container storage areas that may potentially store free liquids. The covered, self-containment units are constructed of molded, chemical-resistant polyethylene and are equipped with a removable polyethylene grating and a hinged two-part cover which is impervious to precipitation. Depending on the size used, the base of the covered, self-containment unit has a 135-gal or a 240-gal capacity. The self-containment pallets consist of a molded high-density polyethylene base and a fiberglass grating that elevates containers above the base. The pallets vary in size depending on the size of the container or containers for which they are providing secondary containment. The single-drum containment unit is an 85-gal container made of heavy-duty polyethylene. This containment unit is designed to hold one 55-gal drum. The cabinets are constructed of an epoxy enamel coated steel frame. The base of each cabinet has a raised, leakproof sill, and each shelf is lined with a high-density polyethylene tray. The base of each of

these containment systems is sufficiently impervious to contain leaks and spills, as required by 20 NMAC 4.1, Subpart V, 264.175(b)(1), revised November 1, 1995. Each containment system will hold, at a minimum, 10 percent of the volume of the potential liquid-bearing containers or the volume of the largest potential liquid-bearing container stored in each system, whichever is greater, pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(3), revised November 1, 1995.

4.2.2 Storage Configuration

The hazardous and mixed waste storage configuration varies for each container storage area. Storage configurations depend on facility throughput, size constraints, and the chemical and radiological characteristics of the waste in storage at any one time.

Containers holding hazardous or mixed waste in each container storage area will be protected from potential contact with accumulated liquids that could be introduced in the event of a plumbing failure, as a result of fire-suppression activities, leaks, spills, or precipitation by either being elevated or stored in an area that is designed and operated to remove accumulated liquids. Because Areas 1 through 11 and the container storage area located in TA-55-185 are indoors, run-on of precipitation will not occur in these areas. Large waste boxes and covered, self-containment units are elevated by design. Other containers will be elevated as appropriate. Additionally, the floor of the basement contains sump pits/pumps that are operated to facilitate the collection and removal of liquids. All containers holding hazardous or mixed waste will be kept from contact with standing liquids in accordance with the requirements of 20 NMAC 4.1, Subpart IX, 270.15(a)(2) and 270.15(b)(2), revised November 1, 1995. These design considerations and waste management practices also meet the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(2) and 264.175(c), revised November 1, 1995.

To allow for inspection, containers are arranged in rows with a minimum of 24 in. between the rows. Wastes contained in drums are arranged in rows and stacked to a maximum of two high for 55-gal drums. The 85-gal drums are not stacked. SWBs are stacked to a maximum of two high. Large waste boxes are stacked to a maximum of two high, unless size and weight restrictions prohibit stacking due to safety concerns. The large waste boxes vary in size and shape; therefore, rows consisting of these container types may vary in width. However, an aisle space of at least 24 in. is maintained between all rows. Main aisle space may vary for each area

and depends on the type and size of equipment used for container movement and spill control. Adequate aisle space allows personnel to quickly access exit doors in an emergency and facilitates container inspections.

4.2.3 Handling and Inspection [20 NMAC 4.1, Subpart V, 264.171, 264.173, and 264.174]

As required by 20 NMAC 4.1, Subpart V, 264.171, revised November 1, 1995, any container that is not in good condition (e.g., severe rusting, apparent structural defects) is overpacked or the wastes are repackaged in containers that are in good condition prior to storage. All containers holding hazardous or mixed waste are kept closed during storage in accordance with 20 NMAC 4.1, Subpart V, 264.173(a), revised November 1, 1995, except when a container's contents need to be repackaged or waste needs to be added to or removed from the container. Containers are handled and stored at all times in a manner that will not rupture a container nor cause it to leak, as required by 20 NMAC 4.1, Subpart V, 264.173(b), revised November 1, 1995.

The purpose of the inspections is to identify leaking containers, deterioration of containers, and loss of integrity of the containment system, as required by 20 NMAC 4.1, Subpart V, 264.174, revised November 1, 1995. Inspections will be performed at each container storage area according to the schedules in Section 6.0. The inspections include checking the structural integrity (e.g., for bulging) of the various waste containers used for storage at TA-55. Section 6.0 of this permit application provides more detailed information regarding inspection requirements and how they are met.

4.2.4 Ignitable, Reactive, and Incompatible Wastes [20 NMAC 4.1, Subpart V, 264.17(a), 264.176, and 264.177]

Ignitable, reactive, and incompatible wastes are and will be kept physically segregated during storage at TA-55. Ignitable or reactive waste may potentially be stored at any of the container storage areas addressed in this permit application. Pursuant to 20 NMAC 4.1, Subpart V, 264.17, revised November 1, 1995, LANL will follow specific waste management procedures for ignitable and reactive waste. Containers storing hazardous and/or mixed waste will be segregated according to the following compatibility group scheme: (1) flammables/ignitables, (2) oxidizers, (3) corrosive acids, (4) corrosive bases, (5) reactives (those reactive with water), (6) reactives (except those reactive with water) and (7) other wastes. TRU mixed waste in Area 6 is stored

based on the radionuclide content of the waste due to the "as low as reasonably achievable" principle, established by the Atomic Energy Act, and because of criticality concerns.

In accordance with the requirements of 20 NMAC 4.1, Subpart V, 264.176, revised November 1, 1995, containers holding ignitable or reactive waste are and will be stored at least 50 ft from the facility's property line (refer to Maps 1 and 2 of Revision 1.0 of the TA-55 Part A Permit Application ([LANL, 1996]). All ignitable and reactive wastes are also protected from sources of ignition or reaction, in accordance with 20 NMAC 4.1, Subpart V, 264.17(a), revised November 1, 1995. Smoking is not allowed at the container storage areas in TA-55-4, TA-55-185, or in and around the container storage pad. "No Smoking" signs are conspicuously placed at TA-55 wherever there is a potential hazard from ignitable or reactive waste as required by 20 NMAC 4.1, Subpart V, 264.17(a), revised November 1, 1995. In addition, most mechanical equipment operated within the area is grounded to minimize the potential for sparking and accidental ignition.

When incompatible wastes are stored at TA-55, they are and will be stored according to specific segregation schemes to meet the requirements of 20 NMAC 4.1, Subpart V, 264.177(c), revised November 1, 1995. Containers holding incompatible wastes and that potentially contain free liquids will be stored in separate secondary containment systems. No incompatible wastes will be mixed, and no wastes will be placed in containers that previously held incompatible wastes, as required by 20 NMAC 4.1, Subpart V, 264.177(a) and (b), revised November 1, 1995, and 20 NMAC 4.1, Subpart IX, 270.15(d), revised November 1, 1995. Only containers made of or lined with materials that will not react with and are otherwise compatible with the waste to be stored will be used for storage at these container storage areas. Wastes carrying the U.S. Environmental Protection Agency (EPA) Hazardous Waste Numbers F020, F021, F022, F023, F026, or F027 are neither generated nor stored at TA-55; therefore, the requirements of 20 NMAC 4.1, Subpart V, 264.175(d)(1), revised November 1, 1995, are not applicable.

4.2.5 Removal of Liquids [20 NMAC 4.1, Subpart IX, 270.15(a)(5)]

Liquids that might accumulate in any of the container storage areas or secondary containment systems will be removed as soon as possible or, if a potential criticality hazard exists, as soon as practicable. A HEPA vacuum, a portable pump, and/or sorbents may be used, depending on the volume and nature of the accumulated liquid, to remove the liquid for subsequent sampling and analysis. The collected liquids and/or sorbents will be transferred to appropriate containers

and will be sampled. If a sample represents a spill from an identifiable source, the sample will be analyzed for the hazardous waste constituents known to be components of the source. If a sample represents a spill from other than an identifiable source, or are liquids not resulting from a spill (e.g., water generated during fire-suppression activities), samples will be analyzed for the potential constituents listed in Table 7-3, as appropriate. The Nuclear Materials Technology (NMT) Division's Waste Management and Environmental Compliance Group will determine the ultimate disposition of these containers according to regulatory requirements. This method of removal and analysis of accumulated liquids will satisfy the requirements of 20 NMAC 4.1, Subpart IX, 270.15(a)(5), revised November 1, 1995, for prevention of overflow.

4.3 MIXED WASTE STORAGE TANK SYSTEMS [20 NMAC 4.1, Subpart IX, 270.16; 20 NMAC 4.1, Subpart V, 264.191, 264.192, and 264.193]

This section provides a description of the two storage tank systems in TA-55-4-401 addressed in this permit application. One storage tank system is comprised of glovebox GB-438 and ancillary equipment and is associated with the evaporator unit in TA-55-4-401. Glovebox GB-438 and its ancillary equipment comprise the "evaporator glovebox storage tank system." The other tank system is comprised of 5 stainless steel tanks and ancillary equipment and is associated with the cementation unit in TA-55-4-401. The 5 tanks and ancillary equipment comprise the "cementation unit storage tank system." Both tank systems are used to store evaporator bottoms solutions (i.e., TRU mixed waste) generated from the evaporator unit associated with the nitrate-based aqueous process.

Each description includes design, construction, materials, installation, testing, and operation information. Secondary containment for the tank systems is discussed in Section 4.3.3. Engineering drawings of both tank systems, including a process isometric of the two tank systems in relation to each other and the cementation unit (i.e., Figures 4-5 through 4-12 and Figures 4-15 through 4-21) are provided under separate cover to comply with UCNI procedures.

4.3.1 Evaporator Glovebox Storage Tank System [20 NMAC 4.1, Subpart V, 264.191(b)(4)]

The evaporator glovebox storage tank system consists of glovebox GB-438 and ancillary equipment near the west wall of TA-55-4-401. The tank system was constructed in 1986 and installed at its present location in TA-55-4-401 in 1988. The tank system is used to store

evaporator bottoms solutions received from the evaporator unit prior to storage in the cementation unit storage tank system and subsequent solidification in the cementation unit (see Figure 4-6).

4.3.1.1 Design, Construction, and Materials [20 NMAC 4.1, Subpart IX, 270.16(b), (c), (d), and (i); 20 NMAC 4.1, Subpart V, 264.191(b)(1) and (3)]

The evaporator glovebox storage tank is fabricated from 0.1875-in. 316 stainless steel with a 2B finish conforming to the American Society for Testing and Materials (ASTM) A240. The lower half of the tank is fabricated with additional layers of materials welded to the outside of the 0.1875-in.-thick stainless steel enclosure. These materials consist of 0.25-in.-thick lead shielding, conforming to ASTM B29, and an outer layer of 0.0625-in., 316 stainless steel cladding. The tank is of welded construction with all welds blended, ground, and polished to blend with adjacent material. All joints are vacuum tight.

The support frame and legs of the evaporator glovebox storage tank are constructed of carbon steel and conform to ASTM A36. The support frame is bolted to the base of the tank for stabilization. In addition, the legs of the tank are bolted to the support frame and secured to the 10-in.-thick concrete floor with anchor bolts. The 10-in.-thick concrete floor was constructed to conform to the building code requirements of the American Concrete Institute (ACI) 318-71 for reinforced concrete. The reinforcing steel was detailed and fabricated in accordance with the "Manual of Standard Practice for Detailing Reinforced Concrete Structures," ACI 315. The design construction and tolerance of the framework around the concrete is in accordance with ACI 347. Figures 4-7 through 4-10 show the dimensions of the evaporator glovebox storage tank and its support system.

The window components of the evaporator glovebox storage tank are constructed of 0.25-in. leaded glass, laminated on both sides with 0.125-in. clear glass, and installed with a neoprene gasket. Additionally, each window is backed with 0.25-in. safety glass installed with a neoprene gasket/seal that provides air-tight containment. The dual glass configuration is secured to the tank with a welded frame consisting of a 0.25-in.-thick lead shielding and a 0.0625-in., 316 stainless steel cladding similar to the additional layers of materials welded to the outside of the lower half of the tank. The welded window frames are bolted to the tank. Replacement windows and gaskets will be made of the same or similar materials.

The glove components of the evaporator glovebox storage tank are constructed of neoprene and Hypalon. Each glove is tested for material continuity by the manufacturer before acceptance and installation within the evaporator glovebox storage tank. Each glove is selected for its resistance to nitric acid as well as its lead-equivalent shielding power to gamma radiation. Replacement gloves will be made of the same or similar materials.

The evaporator glovebox storage tank houses two welded, steel trays and eight glass columns and associated ancillary equipment. Each of the steel trays has a capacity of approximately 27 L. Each of the eight glass columns has a capacity of 27 L. Liquid mixed waste can be vacuum-transferred from the steel trays to the glass columns and from the glass columns to the cementation unit storage tank system. Each glass column is individually filled and visually monitored when the waste is transferred from the steel trays into a glass column. If the maximum capacity of a column is reached, the liquid waste is automatically directed to a vacuum trap. The maximum capacity of the vacuum trap is approximately 5.5 L. The glass columns and the vacuum trap are constructed of PYREX® glass, manufactured by Corning, with stainless steel end plates. Replacement parts for the columns and vacuum trap will be of the same or similar materials. The glass columns are equipped with an air-sparging system. Sparging operations are carried out to homogeneously mix the waste prior to sampling or transferring.

The piping associated with the evaporator glovebox storage tank system includes the transfer line from the evaporator, the wet vacuum line, the lean residue transfer line, and the ventilation lines entering and exiting the evaporator glovebox storage tank. All piping and associated valves are constructed of single-walled, 316 stainless steel. The wet vacuum line and the lean residue transfer line are 0.75-in. pipe; the transfer line from the evaporator is 1.0-in. pipe; and the ventilation lines are 2.0-in. pipe. Pipe diameters may change in the event that a portion of the piping requires replacement. The evaporator glovebox storage tank's ancillary equipment is supported by a steel channel Uni-strut® support system. The Uni-strut® support system is secured to the concrete ceiling with anchor bolts and provides the system's ancillary equipment with support and protection against physical damage and excessive stress that could potentially result from settlement, vibration, expansion, or contraction. Replacement supports will be made of the same or similar materials. The entire system is located within a building; therefore, frost heave affects will not occur. Figures 4-11 and 4-12 illustrate the process flow and configuration for the piping associated with the evaporator glovebox storage tank system.

All of the components within the evaporator glovebox storage tank system are corrosion resistant and are compatible with the waste stored in the tank system. No external component of the tank system is in contact with soil or water.

4.3.1.2 Installation, Testing, and Certification [20 NMAC 4.1, Subpart IX, 270.16(a); 20 NMAC 4.1, Subpart V, 264.191(b) and 264.193(i)]

The evaporator glovebox storage tank system is considered an existing tank system in accordance with 20 NMAC 4.1, Subpart V, 264.191, revised November 1, 1995. The storage tank system has secondary containment that meets the requirements of 20 NMAC 4.1, Subpart V, 264.193, revised November 1, 1995; therefore, pursuant to 20 NMAC 4.1, Subpart V, 264.191(a), revised November 1, 1995, the requirement that the owner or operator of the tank system determine that the tank system is not leaking or is unfit for use is not applicable. In addition, the requirement that the owner or operator obtain and keep on file a written assessment attesting to the tank system's integrity is also not applicable. However, for the purpose of demonstrating that the evaporator glovebox storage tank system will function as a completely leak-proof system and would meet the assessment requirements if they were applicable, a written assessment has been prepared in accordance with 20 NMAC 4.1, Subpart V, 264.191(b), and 20 NMAC 4.1, Subpart IX, 270.16(a), revised November 1, 1995, attesting that the tank system is adequately designed and has sufficient structural integrity and compatibility with the waste stored to ensure that it will not collapse, rupture, or fail. The written assessment, reviewed and certified by an independent, qualified, registered professional engineer, is included as Attachment 4-2 of this permit application.

A helium leak test using a mass spectrometer was performed on the evaporator glovebox storage tank upon fabrication at Silver Engineering and again after the tank was installed and made operational at its present location in TA-55-4-401. Because secondary containment (see Section 4.3.3) is provided for this tank system, the requirements in 20 NMAC 4.1, Subpart V, 264.193(i), revised November 1, 1995, are not applicable.

4.3.2 Cementation Unit Storage Tank System [20 NMAC 4.1, Subpart IX, 270.16(e); 20 NMAC 4.1, Subpart V, 264.192(a)(3), (4), and (5)(i), (ii), and (iii), and 264.192(c), (e), and (f)]

The cementation unit storage tank system consists of five vertical tanks and ancillary equipment located perpendicular to the west wall of TA-55-4-401. The tanks are used to store evaporator bottoms solutions received from the evaporator glovebox storage tank system prior to solidification

in the cementation unit. The five tanks were fabricated in 1985. The tank system was considered an existing tank system in accordance with 20 NMAC 4.1, Subpart V, 264.191, revised November 1, 1995; however, new components (i.e., the cementation unit storage tank system header/manifold and the transfer line from the evaporator glovebox storage tank to the cementation unit storage tank system header/manifold) have recently been installed within the tank system and may be considered major, nonroutine modifications. Due to these modifications, the cementation unit storage tank system will be addressed in this permit application as a new tank system in accordance with 20 NMAC 4.1, Subpart V, 264.192, revised November 1, 1995.

The cementation unit storage tank system is erected upon a 10-in.-thick concrete floor within TA-55-4-401. The 10-in.-thick concrete floor provides a foundation that will maintain the load of the tank system when full. The concrete floor and ceiling were constructed to conform to the building code requirements of ACI 318-71 for reinforced concrete. The reinforcing steel was detailed and fabricated in accordance with the "Manual of Standard Practice for Detailing Reinforced Concrete Structures," ACI 315. The design construction and tolerance of the framework around the concrete is in accordance with ACI 347. The entire tank system, including ancillary equipment, is elevated and supported by a steel channel, Uni-strut® support system. The Uni-strut® support system is secured to the concrete floor and ceiling with anchor bolts and provides the system's ancillary equipment with support and protection against physical damage and excessive stress due to settlement and vibration. Replacement supports will be made of the same or similar materials. The system stores only solutions that have been previously cooled to room temperature, and the solutions are transferred utilizing a slight vacuum (i.e., 10 to 20 inches of mercury). The system does not operate under pressure. Because of the moderate operating parameters (i.e., temperature and pressure) of the system, physical damage and excessive stress due to expansion and contraction are not anticipated. Furthermore, the cementation tank system is not within a saturated zone or seismic fault zone and is within a building so frost heave effects are not expected.

4.3.2.1 Design, Construction, and Materials [20 NMAC 4.1, Subpart IX, 270.16(b), (c), (d), and (i); 20 NMAC 4.1, Subpart V, 264.192(a)(1)]

Each of the five cementation unit storage tanks has a capacity of 55 L. Each tank has an outside diameter of 6.625 in., a straight side height of 10 ft, a wall thickness of 0.28 in., and a conical bottom, as shown on Figure 4-15. The tanks are constructed of 316 stainless steel. The

stainless steel materials are corrosion-resistant and are compatible with the liquid waste stored in the tanks. Corrosion testing was conducted on the tanks in 1993 by TA-55 facility engineers. The vent trap and the vacuum trap operating within the cementation unit storage tank system also have an outside diameter of 6.625 in. The vent trap has a straight side height of 9 in. and a maximum capacity of approximately 4 L. The vacuum trap has a straight side height of 37 in., a conical bottom, and a maximum capacity of approximately 17 L. The vent trap and the vacuum trap are constructed of 316 stainless steel for corrosion resistance and materials compatibility with the waste. All of the tanks were designed in accordance with the latest applicable standards, including American Society of Mechanical Engineers, Section 8, Division 1 standards. The tanks are installed such that, if necessary, they can be replaced.

The piping associated with the cementation unit storage tank system includes the header/manifold, vacuum manifold, and lower manifold for the cementation unit storage tanks; the vent trap vent line and drain line; the transfer line from the evaporator glovebox storage tank to the cementation unit storage tank system header/manifold; and the transfer line from the lower manifold to the cementation unit. All piping and associated valves are constructed of 316 stainless steel. All intertank piping and transfer piping is single-walled 0.75-in. pipe. Pipe diameters may change in the event that a portion of the piping requires replacement. All tank-to-piping connections are flanged. Figures 4-16 and 4-17 illustrate the process flow and configuration for the piping system associated with these five storage tanks.

One vacuum pump serves both the evaporator glovebox storage tank system and the cementation unit storage tank system. The liquid waste can be vacuum-transferred from the evaporator glovebox storage tank system to the cementation unit storage tank system and from the cementation unit storage tank system to the cementation unit. The cementation unit storage tanks are vacuum-sparged to achieve a homogeneous waste mixture prior to transferring the tank contents to the cementation unit for treatment by solidification.

Each storage tank is equipped with a high-level detector that automatically shuts off the inlet valve to the tank system. If the sensing device is triggered, the inlet valve to the tank system is closed and the liquid waste is prevented from entering the system. The vacuum trap operating within the system is also equipped with a high-level detector. The 55-L cementation storage tanks receive waste from the 27-L glass columns in the evaporator glovebox storage tank; therefore,

it is very unlikely that the capacity of one of the cementation unit storage tanks would be reached before the motor-operated valves bypass the liquid waste to a second cementation unit storage tank.

4.3.2.2 Installation, Testing, and Certification [20 NMAC 4.1, Subpart IX, 270.16(a) and (f); 20 NMAC 4.1, Subpart V, 264.192(a), (b), (d), and (g) and 264.193(i)]

In accordance with 20 NMAC 4.1, Subpart V, 264.192(a), revised November 1, 1995, a written assessment has been prepared attesting that the cementation unit storage tank system has sufficient structural integrity and is acceptable for handling hazardous waste. The written assessment, reviewed and certified by an independent, qualified, registered professional engineer, is included as Attachment 4-3 of this permit application.

In accordance with 20 NMAC 4.1, Subpart V, 264.192(d), revised November 1, 1995, owners or operators of new tanks and ancillary equipment must ensure that the system is tested for tightness. The cementation unit storage tank system was tightness tested on May 30, 1996, at operating pressure (i.e., under a vacuum of 10 to 20 in. of mercury) and determined to be tight. The signed certification attesting to the system's tightness; the detailed tightness testing procedure adhered to during the tightness tests; and the results of the tightness tests are included as Attachment 4-4 of this permit application.

In accordance with 20 NMAC 4.1, Subpart V, 264.192(b), revised November 1, 1995, owners or operators of new tank systems or components must ensure that proper handling procedures are adhered to during installation in order to prevent damage to the system. The new components (i.e., the transfer line from the evaporator glovebox storage tank to the cementation unit storage tank system header/manifold and the cementation unit storage tank system header/manifold) have been inspected by a qualified inspector for weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, and other structural damage or inadequate construction or installation. The signed certification attesting to the proper installation of the new components and a copy of the inspection check list is included as Attachment 4-5 of this permit application.

Because secondary containment (see Section 4.3.3) is provided for this tank system, the requirements in 20 NMAC 4.1, Subpart V, 264.193(i), revised November 1, 1995, are not applicable.

4.3.3 Secondary Containment for the Storage Tank Systems [20 NMAC 4.1, Subpart IX, 270.16(g); 20 NMAC 4.1, Subpart V, 264.193]

TA-55-4-401 serves as secondary containment for each of the storage tank systems. The secondary containment will prevent the migration of wastes or accumulated liquids to any soil, groundwater, or surface water. Because the storage tanks and secondary containment are inside a building, run-on of precipitation will not affect the containment capacity. The floor of TA-55-4-401 is recessed 2.5 in. The room itself is approximately 60 ft long by 75 ft wide. The containment area can accommodate over 20,000 L of liquids. The entire floor is constructed of 10-in.-thick concrete and is coated with a chemical- and temperature-resistant epoxy primer and epoxy paint. This coating is compatible with the wastes stored in the tanks and will effectively prevent the migration of waste into the concrete. The construction joints in the floor slab and exterior walls of TA-55-4-401 are all constructed with chemical-resistant water stops in place. The conduit piping penetrating the floor of the room is secured with rubber boots, bushings, and flanges. All penetrations (i.e., holes for conduit) in the floor have been hermetically sealed to prevent liquids from entering the penetrations. Figures 4-13 and 4-14 provide structural drawings illustrating the first floor construction and the locations of floor penetrations.

The storage tank systems are inspected each working day to detect leaks. Eight continuous air monitoring (CAM) units are installed at various locations throughout TA-55-4-401 to detect any airborne alpha contamination that would be present if a leak were to occur at any point in the system. Additionally, radiological control technicians (RCT) periodically monitor for radioactive contamination and would detect any leaks during monitoring. Leaks or spills would be detected within 24 hours, as required by 20 NMAC 4.1, Subpart V, 264.193(c)(3), revised November 1, 1995. In the event of a leak or spill, the liquids will be removed as quickly as possible with sorbents and packaged in appropriate containers or vacuum-transferred, using the existing wet vacuum, into an available storage tank. The collected materials will then be sampled and analyzed for the hazardous waste constituents known to be components of the source or potential constituents listed in Table 7-3, as appropriate. NMT personnel will determine the ultimate disposition of this waste according to regulatory requirements. (Section 7.0 of this permit application provides more information on response actions to leaks or spills.)

4.4 WASTE MANAGEMENT PRACTICES APPLICABLE TO STORAGE TANK SYSTEMS [20 NMAC 4.1, Subpart V, Part 264, Subpart J]

The following sections provide a general overview of the operations and process information that are applicable to the storage tank systems addressed in this permit application. This overview includes a discussion of the characteristics of the waste stored (including hazardous characteristics and precautions taken when handling or storing incompatible, ignitable, or reactive wastes).

4.4.1 Hazardous Characteristics of the Waste to be Stored [20 NMAC 4.1, Subpart IX, 270.16(j); 20 NMAC 4.1, Subpart V, 264.17(a), 264.191(b)(2), 264.192(a)(2), 264.198, and 264.199]

The solutions stored in the evaporator glovebox storage tank system and the cementation unit storage tank system are generated from a nitrate-based aqueous process used to produce a relatively pure plutonium oxide. The process consists of a series of operations including preparation, plutonium leaching with nitric acid, anion exchange, plutonium/oxalate precipitation, and evaporation. The solutions sent to the evaporator consist of plutonium oxalate filtrate, solutions from plutonium leaching, and process waters. The evaporator bottoms solutions from the evaporator unit are discharged into the steel trays in the evaporator glovebox storage tank, and sufficient time is allotted for the solutions to cool to room temperature. As the solutions cool, waste salts crystallize and precipitate out of solution. The solutions are then filtered and vacuum-transferred from the steel trays to the glass columns in the evaporator glovebox storage tank system. The solutions can then be vacuum transferred from the glass columns to the cementation unit storage tank system. The only wastes stored in the evaporator glovebox storage tank system and the cementation unit storage tank system are the filtered evaporator bottoms solutions and waste salts generated from these solutions. The evaporator bottoms solutions and the waste salts are eventually solidified in the cementation unit. (Table 4-6 provides information on wastes that may be treated in the cementation unit.)

Currently, no ignitable or reactive mixed wastes are stored in the evaporator glovebox storage tank system or in the cementation unit storage tank system. Pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.198, revised November 1, 1995, in the event that ignitable or reactive waste is stored in the tanks, the waste will be stored in such a way that it is protected from any material or condition that may cause the waste to ignite or react.

It is not anticipated that incompatible wastes will be placed in the same tank system or that a mixed waste will be placed in a tank system that previously held an incompatible waste. However, in the event that incompatible wastes may be stored, precautions will be taken in accordance with the requirements of 20 NMAC 4.1, Subpart V, 264.17(b), revised November 1, 1995.

4.5 MIXED WASTE CEMENTATION UNIT [20 NMAC 4.1, Subpart IX, 270.23; 20 NMAC 4.1, Subpart V, Part 264, Subpart X]

This section provides a description of the cementation unit at TA-55-4. The cementation unit addressed in this permit application is used to solidify process waste generated as a result of plutonium processing at TA-55-4. The description includes the location, design, materials of construction, operation, and secondary containment.

4.5.1 Design, Materials of Construction, and Operation [20 NMAC 4.1, Subpart IX, 270.23(a); 20 NMAC 4.1, Subpart X, 264.101]

The cementation unit is located in glovebox GB-454 along the west wall of TA-55-4-401. The unit, which has been operating since 1991, consists of a pH adjustment column and vacuum trap, two motor-driven mixers, four impellers, associated support structures, and associated piping housed within the glovebox, as shown on Figures 4-18 and 4-19, which are included under separate cover to comply with UCNI procedures.

The pH column has a straight side height of 5 ft and an outside diameter of 6.66 in. The maximum capacity of the column is approximately 27 L. The column is raised above the glovebox floor approximately 3 in. by three steel legs and is secured to one wall of the glovebox with a steel bracket that binds the column approximately 3 ft up from the base of the column. The vacuum trap associated with the column has a straight side height of 2 ft and an inside diameter of 6 in. The maximum capacity of the vacuum trap is approximately 11 L. Both the pH column and the vacuum trap are constructed of PYREX® glass with stainless steel end plates similar to the glass columns in the evaporator storage tank system described in Section 4.3.1. Replacement parts for the column and vacuum trap will be of the same or similar materials. The glass and stainless steel materials are corrosion-resistant and compatible with the waste received in the column. The pH column is used to adjust the pH of the waste to ensure compatibility with the cement used to solidify the waste. The column receives waste from the evaporator glovebox storage tank system and/or the cementation unit storage tank system. An upper limit of

approximately 15 L of waste is transferred to the pH column at any one time. A compressed air line enters the glovebox and is connected to two pressurized air tanks outside of the glovebox. The compressed air line is used for sparging during pH treatment operations and for remote valve operation.

The two mixers within the unit are high-flow, gear-driven, fixed-mount mixers (manufacturer's information on the fixed-mount mixers is included as Appendix E of this permit application). All couplings, shafts, and impellers are constructed of 316 stainless steel. The shafts are 5 ft long. Two impellers are mounted to each shaft. Each impeller has a diameter of approximately 11 in. The mixers are driven by 3.5-horsepower motors encased within the mixer housing. The mixer housing is approximately 2.5 ft long. The maximum weight of each mixer is 225 pounds. Each mixer is mounted on steel plates and supported by two steel guides on either side of each mixer. Each guide is bolted to a 6-in. steel flange at either end and is secured to the glovebox floor and ceiling. Each motor is mounted to a center screw drive that allows the mixers to be independently raised and lowered within the glovebox. The glovebox is constructed of a section of 0.75-in. lead "sandwiched" between two sections of approximately 0.188-in.-thick low-carbon grade, 316 stainless steel. The floor of the glovebox contains two circular openings with removable covers that allow the shafts and impellers of each mixer to be lowered into drums attached beneath the glovebox.

During cementing operations, two 55-gal steel drums are positioned under the glovebox directly under the openings in the floor of the glovebox. A "bag-out" bag extends from the glovebox into each drum between the drum and the drum liner. This liner is fastened at the bottom of the glovebox with an elastic cord and clamped into place to prevent hazardous and/or radiological constituents from escaping the confinements of the glovebox and the drums during treatment operations. The cement and the waste to be solidified are transferred into the drums and the impellers lowered into the mix. The waste and cement are then homogeneously mixed inside the drums. Each drum is positioned on a steel platform/scale that is secured in a steel track. The platform allows the drums to be safely and easily removed from the unit after the cement has dried.

The piping associated with the cementation unit includes a pipe that enters glovebox GB-454 from the storage tank systems and extends to the pH column; the pH column vent line; the

compressed air line entering the glovebox and extending to the vacuum trap and the pH column; the wet-vacuum line extending from the vacuum trap; the sodium hydroxide line entering the glovebox and extending to the pH column and drum openings; and the transfer port exiting the pH column. All of the aforementioned piping is 316 stainless steel. Tygon® tubing is used to transfer the contents of the pH column from the transfer port to the drums. Replacement tubing will be of same or similar material. The cement is transferred into the glovebox and drums from a hopper/screw feeder through rubber tubing. Figures 4-20 and 4-21 illustrate the process flow and configuration for the piping system associated with the cementation unit.

4.5.2 Secondary Containment

Secondary containment for the cementation unit is provided by TA-55-4-401. The room's dimensions and containment features have been previously described in Section 4.3.3 for the storage tank systems.

4.6 WASTE MANAGEMENT PRACTICES APPLICABLE TO THE CEMENTATION UNIT

The following sections provide a general overview of the operations and process information that are applicable to the cementation unit addressed in this permit application. This overview includes a discussion of the characteristics of the waste treated (including hazardous characteristics and precautions taken when handling incompatible, ignitable, or reactive wastes); and operational controls and treatment effectiveness. This information is submitted to fulfill the requirements of 20 NMAC 4.1, Subpart V, Part 264, Subpart B, revised November 1, 1995.

4.6.1 Hazardous Characteristics of the Waste to be Treated [20 NMAC 4.1, Subpart V, 264.17(a)]

The materials treated in the cementation unit include the waste stored in the evaporator glovebox storage tank system and cementation unit storage tank system, used salts from pyrochemical processes, and inorganic and organic process solids. Table 4-6 provides information on wastes treated in the cementation unit.

Currently, no ignitable or reactive mixed wastes are treated in the cementation unit. Pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.198, revised November 1, 1995, in the event that ignitable or reactive waste may be treated in the unit, the waste will be treated and stored

in such a way that it is protected from any material or condition that may cause the waste to ignite or react.

It is not anticipated that incompatible wastes will be treated in the cementation unit or that a mixed waste will be treated in a vessel that previously held incompatible wastes. All wastes to be cemented are certified by TA-55 waste management personnel prior to treatment. Additionally, the cementation treatment process itself is administratively controlled to prevent commingling of incompatible wastes. However, in the unlikely event that incompatible wastes may be treated, precautions will be taken in accordance with the requirements of 20 NMAC 4.1, Subpart V, 264.17(b), revised November 1, 1995.

4.6.2 Treatment Effectiveness [20 NMAC 4.1, Subpart IX, 270.23(d)]

The cementation unit is subject to the TRU Waste Characterization Quality Assurance Program Plan (QAPP) (DOE, 1995b) and the WIPP Waste Acceptance Criteria (WAC) (DOE, 1991). Waste characterization procedures outlined in these documents are based on knowledge of raw materials and physical/chemical processes of waste generating activities and analytical results. The waste characterization and certification ensures that the waste is examined and the hazardous nature of the waste is identified in accordance with 20 NMAC 4.1, Subpart II, Part 261, Subparts C and D, revised November 1, 1995.

The treatment process itself is administratively controlled. Certification, packaging, storage, and transportation of TRU mixed waste from this operation are carried out in accordance with LANL's Chemical Science and Technology Division WAC, WIPP-WAC, 20 NMAC 4.1 regulations, and Department of Transportation requirements.

A report on the demonstration of treatment effectiveness of the cementation unit is provided as Attachment 4-6 to meet the requirements of 20 NMAC 4.1, Subpart IX, 270.23(d), revised November 1, 1995.

4.6.3 Environmental Performance Standards [20 NMAC 4.1, Subpart V, Part 264, Subpart X]

The cementation unit at TA-55-4 is located and will be operated, maintained, and closed in a manner that will ensure protection of human health and the environment, in accordance with 20 NMAC 4.1, Subpart V, 264.601, revised November 1, 1995. The unit is located in glovebox

GB-454 in TA-55-4-401 within the boundaries of LANL. Section 2.0 of this permit application discusses geologic and hydrologic characteristics of the LANL facility. The cementation unit has been designed to facilitate safe handling and treatment of wastes in order to prevent adverse human health and environmental impacts. Sections 4.5 and 4.6 discuss the design and waste management practices for this unit in detail. Section 3.0 of this permit application includes the waste analysis plan for this unit. The contingency plan (Section 7.0) of this permit application describes emergency response actions taken to minimize adverse impacts of unanticipated events.

4.6.3.1 Protection of the Ground Water [20 NMAC 4.1, Subpart V, 264.601(a)]

Adverse effects on human health or the environment due to migration of waste or hazardous constituents to the ground water as a result of the treatment operations conducted in the cementation unit are unlikely. The unit is located in a vacuum-pressurized glovebox within a room and inside a building. TA-55-4-401 provides secondary containment for the unit. The floor of the room is recessed 2.5 in. The room itself is approximately 60 ft long by 75 ft wide. The capacity of the containment area is greater than 100 percent of the volume of waste that may be treated in the unit at any one time. Because the unit is inside a building, run-on of precipitation will not affect the containment capacity. The entire floor is constructed of 10-in.-thick concrete and is coated with a chemical- and temperature-resistant primer and epoxy paint. This coating is compatible with the waste treated in the cementation unit and will effectively prevent the migration of waste into the concrete. Additionally, operating procedures followed at TA-55 and the waste management practices discussed herein will further ensure protection of the environment.

Certified operators inspect the unit each working day to detect leaks. Eight CAM units installed at various locations throughout TA-55-4-401 will detect any airborne alpha contamination that would be present if a leak were to occur resulting in a release outside of glovebox GB-454. In the event of a release, the materials in question will be removed as quickly as possible and will be packaged in an appropriate container. The contents of these containers will be analyzed and managed according to NMT and regulatory requirements.

Hydrogeologic Assessment and Potential Pathways and Exposure Routes

TA-55 is located in a semiarid, temperate, mountain climate. The annual precipitation in the Los Alamos area varies between 33 and 46 centimeters. The evaporation of free-standing water

exceeds the annual precipitation. Section 2.2.3 of this permit application provides site-specific information for the soils at TA-55, including permeability rates and available water-holding capacity. In addition, it is estimated that 875 to 1,100 ft of unsaturated tuff and volcanic rock separate the facility's soil surface from the main aquifer (refer to Figure 2-11). Collectively, the depth to the main aquifer and the annual moisture deficit significantly limit the potential for contaminants to migrate to the ground water in the unlikely event that contaminants reach the ground surface surrounding TA-55-4.

The only aquifer in Los Alamos capable of municipal and industrial water supply is the main aquifer. Figure 2-13 presents water supply wells in the Los Alamos area. No wells are located at TA-55.

LANL has established an extensive ground-water monitoring system to assess and protect the quality of the ground water in the Los Alamos area. The monitoring network includes test wells, supply wells, gauging stations, observation wells, and other hydrogeologic devices located both within and beyond LANL boundaries. Routine samples are analyzed for toxic constituents, basic water quality, and resource depletion. The results are published annually in the "Environmental Surveillance Report" and the "Water Supply Report." Details on the Environmental Surveillance Groundwater Monitoring Plan can be found in the "Groundwater Protection Management Program Plan" (LANL, 1995c).

4.6.3.2 Protection of Surface Water [20 NMAC 4.1, Subpart V, 264.601(b)]

The location of the cementation unit and the waste management practices and containment features discussed in Section 4.6.3.1 will effectively prevent environmental contamination, including migration of waste or hazardous constituents to surface water or wetlands. Therefore, adverse effects on human health or the environment due to migration of waste or hazardous constituents to surface water or wetlands as a result of the treatment operations conducted in the cementation unit are unlikely.

Hydrologic Assessment and Potential Pathways and Exposure Routes

The annual precipitation that occurs at or near TA-55 is low. Drainage from the site flows into Mortandad Canyon and/or Two Mile Canyon. The streamflow in both of these canyons is primarily ephemeral resulting from rainfall or snowmelt. These waters may, at times, also contain

National Pollutant Discharge Elimination System-permitted waste water discharge. Map 3 of Revision 1.0 of the TA-55 Part A Permit Application shows the locations of these surface waters.

4.6.3.3 Protection of Soil Surface [20 NMAC 4.1, Subpart V, 264.601(b)]

The location of the cementation unit and the waste management practices and containment features discussed in Section 4.6.3.1 will effectively prevent the migration of waste or hazardous constituents to the soil surface. Therefore, adverse affects on human health or the environment due to migration of waste or hazardous constituents to the soil surface as a result of the treatment operations conducted in the cementation unit are unlikely.

Geological Assessment and Potential Pathways and Exposure Routes

The texture of the soils in Los Alamos County ranges from very fine clay and sandy loams to gravelly, sandy loams and stony, clay loams. In the unlikely event that a release penetrates the confinements of TA-55-4 and reaches the soil surface, soil erosion by storm water or winds could potentially transport these contaminants to the surrounding area.

4.6.3.4 Protection of the Atmosphere [20 NMAC 4.1, Subpart V, 264.601(c)]

The location of the cementation unit and the waste management practices and containment features discussed in Section 4.6.3.1 will effectively prevent the migration of waste or hazardous constituents to the atmosphere. Additionally, the cementation unit is operated within a vacuum-pressurized glovebox equipped with HEPA filters. In total, the cementation unit is located within three succeedingly greater pressure zones. These zones are (in order of increasing pressure) the glovebox, TA-55-4-401, and the main corridor outside of TA-55-4-401. Therefore, adverse affects on human health or the environment due to migration of waste or hazardous constituents to the atmosphere as a result of the treatment operations conducted in the cementation unit are unlikely.

Meteorologic Assessment and Potential Pathways and Exposure Routes

The surface winds in Los Alamos are light, averaging 7 miles per hour. Section 2.1.4 of this permit application provides detailed information on winds in Los Alamos. Under normal conditions, resuspension of particulates is limited. The predominant prevailing wind direction is from the southwest to the northeast. Figures 2-4 and 2-5 of this permit application depict wind roses for the Los Alamos area.

4.7 RECORDKEEPING REQUIREMENTS [20 NMAC 4.1, Subpart V, Part 264, Subpart E]

Recordkeeping requirements applicable to all of the units addressed herein are discussed in the following sections.

4.7.1 Operating Record [20 NMAC 4.1, Subpart V, 264.73 and 264.74]

A written operating record will be maintained at the facility until closure. The operating record will contain the following information, as it becomes available:

- A description (including waste sources) and the quantity of each hazardous (including mixed) waste and the method(s) and date(s) of storage at TA-55 as required by Appendix I of 20 NMAC 4.1, Subpart V, 264, revised November 1, 1995
- The location of each hazardous waste within the facility, the quantity at each location, and the final disposition of each waste
- Records of acceptable knowledge or process knowledge information and available waste analysis results on the hazardous constituents of the wastes to be stored
- Summary reports and details of all incidents that require implementation of the contingency plan, as specified in 20 NMAC 4.1, Subpart V, 264.56(j), revised November 1, 1995
- Records and results of inspections, to be kept for at least three years, as required by 20 NMAC 4.1, Subpart V, 264.15(d) and 264.174, revised November 1, 1995
- Monitoring, testing, or analytical data, where required by 20 NMAC 4.1, Subpart V, Part 264, revised November 1, 1995, and corrective action, where required by 20 NMAC 4.1, Subpart V, 264.101, revised November 1, 1995
- Records of the quantities (and dates of placement) for each shipment of hazardous waste placed in land disposal units under an extension to the effective date of any land disposal restriction granted pursuant to 20 NMAC 4.1, Subpart VIII, 268.5, revised November 1, 1995; a petition pursuant to 20 NMAC 4.1, Subpart VIII, 268.6, revised November 1, 1995; or a certification under 20 NMAC 4.1, Subpart VIII, 268.8, revised November 1, 1995; and the applicable notice required by a generator under 20 NMAC 4.1, Subpart VIII, 268.7(a), revised November 1, 1995
- The information contained in the notice (except the manifest number) and the certification and demonstration, if applicable, required by the generator or the owner or operator under 20 NMAC 4.1, Subpart VIII, 268.7, revised November 1, 1995, or 20 NMAC 4.1, Subpart VIII, 268.8, revised November 1, 1995.

TA-55 has a dedicated representative in waste management from LANL's Environment, Safety, and Health Division Quality Assurance Support Group (ESH-14) for quality assurance control/review of process controls and procedures.

Information will be provided for inclusion in LANL's annual facilitywide report, required by 20 NMAC 4.1, Subpart V, 264.73(b)(9), revised November 1, 1995, on the waste minimization program. This information will include documentation that the proposed method of storage or treatment is the practicable method currently available to minimize threats to human health and the environment. All records, including plans, required under 20 NMAC 4.1, Subpart V, Part 264, Subpart E, revised November 1, 1995, will be furnished upon request and will be made available at all reasonable times for inspection by duly designated representatives of the DOE, the New Mexico Environment Department (NMED), and/or the EPA. To satisfy the requirements of 20 NMAC 4.1, Subpart V, 264.74(c), revised November 1, 1995, a copy of records of waste disposal locations and quantities, as required by 20 NMAC 4.1, Subpart V, 264.73(b)(2), revised November 1, 1995, will be submitted to NMED and the local land authority upon closure of the facility. Any shipments to off-site facilities will comply with the appropriate requirements of 20 NMAC 4.1, Subpart III, Part 262, revised November 1, 1995; 20 NMAC 4.1, Subpart V, Part 264, revised November 1, 1995; and 20 NMAC 4.1, Subpart VIII, Part 268, revised November 1, 1995.

4.7.2 Biennial Report [20 NMAC 4.1, Subpart V, 264.75]

The DOE Los Alamos Area Office (LAAO) and LANL will prepare and submit a biennial report to the NMED by March 1 of each even-numbered year. The biennial report will be submitted to the NMED on EPA Form 8700-13B. The report will cover facility activities during the previous calendar year and will include:

- The EPA identification number, name, and address of the facility
- The calendar years covered by the report
- A description and the quantity of each hazardous (including mixed) waste the facility received during the year
- The method of treatment, storage, or disposal for each hazardous waste

- For generators who treat, store, or dispose of hazardous waste on-site, a description of the efforts undertaken during the year to reduce the volume and toxicity of waste generated

- For generators who treat, store, or dispose of hazardous waste on-site, a description of the changes in volume and toxicity of waste actually achieved during the year in comparison to previous years to the extent such information is available for the years prior to 1984

- The certification signed by DOE/LAAO or an authorized representative.

4.7.3 Additional Reports [20 NMAC 4.1, Subpart V, 264.77]

In accordance with the requirements of 20 NMAC 4.1, Subpart V, 264.77, revised November 1, 1995, DOE/LAAO will also report the following to the NMED:

- Releases, fires, and explosions as specified in 20 NMAC 4.1, Subpart V, 264.56(j), revised November 1, 1995

- Facility closures specified in 20 NMAC 4.1, Subpart V, 264.115, revised November 1, 1995

- As otherwise required by 20 NMAC 4.1, Subpart V, Part 264, Subparts F, BB, and CC, revised November 1, 1995.

Table 4-1

Transuranic Mixed Waste Stored at Technical Area 55

Waste Description	TRUPACT-II Content (TRUCON) Codes	Waste-Generating Process Description	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[b] (milligrams per liter)
Solidified inorganic process solids and liquids[c]	LA 114	Inorganic process solids and liquids that may include process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines, generated as a result of plutonium (Pu) processing operations that are solidified in cement.	D007	Chromium	5.0
Combustible waste	LA 116	Combustible solids (e.g., paper, rags, plastic, rubber) and a small fraction of noncombustibles (e.g., metal scrap) generated from Pu processing activities.	D004 D005 D006 D007 D008 D009 D010 D011 F001 F002 F003 F005	Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver Spent halogenated solvents	5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0 NA[d]
Noncombustible metal waste	LA 117	Noncombustible metal waste (e.g., motors, pumps, tools, process equipment) and glass with a small fraction of combustible waste (e.g., plastics) generated from Pu processing activities.	D005 D006 D008 D009 D011	Barium Cadmium Lead Mercury Silver	100.0 1.0 5.0 0.2 5.0
Glass waste	LA 118	Glass waste (e.g., discarded laboratory glassware, windows, bottles), and metal with a small fraction of combustibles (e.g., plastics) generated from Pu processing activities.	D008 D009	Lead Mercury	5.0 0.2
Leaded glove waste	LA 123	Leaded gloves discarded with a small fraction of noncombustible waste (e.g., motors, tools) generated from Pu processing activities.	D008	Lead	5.0
Mixed combustible/ noncombustible waste	LA 125	Mixtures of combustible and noncombustible waste including paper, rags, plastic, rubber, leaded glovebox gloves, glass, motors, pumps, tools, and miscellaneous metal waste.	D004 D005 D006 D007 D008 D009 D010 D011 F002	Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver Spent halogenated solvents	5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0 NA

Refer to footnotes at end of table.

Table 4-1 (Continued)

Transuranic Mixed Waste Stored at Technical Area 55

Waste Description	TRUPACT-II Content (TRUCON) Codes	Waste-Generating Process Description	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[b] (milligrams per liter)
Solidified organic process solids and liquids[c]	LA 126	Solidified process solids and liquids which, together with plastic packaging, result in >5% and normally ≤10% organics. These process solids may include process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines, generated as a result of Pu processing operations that are solidified in cement.	D007	Chromium	5.0

[a] U.S. Environmental Protection Agency.
[b] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, Part 261, Subpart D, revised November 1, 1995.
[c] At TA-55, these wastes may potentially contain liquids.
[d] Not applicable: Refers to the absence of regulatory limits for F-listed wastes.

Table 4-2

Low-Level Solid Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Homogeneous Wastes				
Unused solid reagent chemicals	Discarded off-specification unused reagent powders and crystalline materials.	D001 D002 D003 D004 D005 D006 D007 D008 D009 D011 All P- or U-listed waste codes	Ignitability Corrosivity Reactivity Arsenic Barium Cadmium Chromium Lead Mercury Silver	NA[c] NA NA 5.0 100.0 1.0 5.0 5.0 0.2 5.0 NA
Heterogeneous Wastes				
Contaminated bulk lead shielding and scrap	Radiation shielding in laser applications and materials from demolition and decommissioning of research laboratories containing metal fittings, piping, and tools with Uranium-238 contamination and/or heavy metal materials.	D006 D007 D008	Cadmium Chromium Lead	1.0 5.0 5.0
Discarded bricks	Lead bricks from radiation shielding and debris from decontamination and decommissioning projects.	D006 D008	Cadmium Lead	1.0 5.0

Refer to footnotes at end of table.

Table 4-2 (Continued)

Low-Level Solid Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Organic-contaminated noncombustible solids	Absorbed oils, laboratory debris, and discarded equipment.	D004	Arsenic	5.0
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
		D027	1,4-Dichlorobenzene	7.5
		D030	2,4-Dinitrotoluene	0.13
		D032	Hexachlorobenzene	0.13
		D033	Hexachlorobutadiene	0.5
		D034	Hexachloroethane	3.0
		D042	2,4,6-Trichlorophenol	2.0
		F001	1,1,1-Trichloroethane, Trichloroethylene	NA
		F002	Cholobenzene, Methylene chloride, Trichloroethylene, Tetrachloroethylene	NA
		F004	Cresol, Nitrobenzene	NA
		F005	Toluene, Methyl ethyl ketone, Benzene	NA
Mercury waste	Free elemental mercury, mercuric compounds, gels containing mercuric compounds, old thermometers, hygrometers, vacuum tubes, fluorescent light bulbs, and other instruments and equipment containing unrecoverable mercury.	D009	Mercury	0.2
		U151	Mercury	NA
Batteries	Discarded battery cores (with potential residual liquid), including lead-acid, rechargeable nickel-cadmium, and mercury.	D001	Ignitability	NA
		D002	Corrosivity	NA
		D003	Reactivity	NA
		D004	Arsenic	5.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2

Refer to footnotes at end of table.

Table 4-2 (Continued)

Low-Level Solid Mixed Waste Stored at Technical Area 55

[a] U.S. Environmental Protection Agency.
[b] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261, Subpart D, revised November 1, 1995.
[c] Not applicable: Refers to the absence of regulatory limits for ignitable, corrosive, and reactive characteristic wastes and F-, P-, and U-listed wastes.

Table 4-3

Solid Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Contaminated solid wastes	Machining operations, chemistry research, decontamination and decommissioning projects, metal finishing operations, and general maintenance operations.	D001	Ignitability	NA[d]
		D003	Reactivity	NA
		D004	Arsenic	5.0
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
		D018	Benzene	0.5
		D022	Chloroform	6.0
		D030	2,4-Dinitrotoluene	0.13
		D032	Hexachlorobenzene	0.13
		D033	Hexachlorobutadiene	0.5
		D034	Hexachloroethane	3.0
		D036	Nitrobenzene	2.0
		D039	Tetrachloroethylene	0.7
		D040	Trichloroethylene	0.5
		D042	2,4,6-Trichlorophenol	2.0
		F001	1,1,1-Trichloroethane, Carbon tetrachloride	NA
		F002	1,1,1-Trichloroethane	NA
		F003	Acetone, Methanol	NA
		F005	Toluene, Benzene	NA
Paint and paint-related wastes	Painting and finishing operations, and general facility maintenance.	D001	Ignitability	NA
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D011	Silver	5.0
		F003	Xylene	NA
		F005	Toluene	NA

Refer to footnotes at end of table.

Table 4-3 (Continued)

Solid Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Solid metals and metallic compounds	Machining and cutting operations; synthesis reactions; solder from electronic manufacturing, repair, and brazing operations; and grinding operations.	D001 D003 D004 D005 D006 D007 D008 D009 D010 D011	Ignitability Reactivity Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	NA NA 5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0
Mercury wastes	Lamp replacement, laboratory operations, mercury spill clean-up, and equipment cleaning and maintenance.	D009 U151	Mercury Mercury	0.2 NA
Used batteries	Equipment maintenance.	D002 D006 D007 D008 D009 D011	Corrosivity Cadmium Chromium Lead Mercury Silver	NA 1.0 5.0 5.0 0.2 5.0
Unused/off-specification commercial chemical products	Laboratory research and spill residues.	D001 D003 D004 through D043 All P- and U-listed waste codes	Ignitability Reactivity Toxicity characteristic leaching procedure wastes Discarded commercial chemical products and off-specification species	NA NA –[c] NA

[a] Denotes information from the Los Alamos National Laboratory Chemical Science and Technology Division Waste Profile Form database.
[b] U.S. Environmental Protection Agency.
[c] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed (D004-D043) at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, Part 261, Subpart D, revised November 1, 1995.
[d] Not applicable: Refers to the absence of regulatory limits for ignitable, corrosive, and reactive characteristic waste and F-, P-, and U-listed wastes.

Table 4-4

Low-Level Liquid Mixed Waste Stored At Technical Area 55

Waste Description	Waste-Generating Process Description	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Spent solvents and contaminated solvent mixtures	Extraction operations, bench-scale experimental inorganic chemistry, environmental analysis, and radiochemistry.	D001	Ignitability	NA[c]
		D002	Corrosivity	NA
		D004	Arsenic	5.0
		D005	Barium	100.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
		D018	Benzene	0.5
		D019	Carbon tetrachloride	0.5
		D021	Chlorobenzene	100.0
		D022	Chloroform	6.0
		D027	1,4-Dichlorobenzene	7.5
		D028	1,2-Dichloroethane	0.5
		D030	2,4-Dinitrotoluene	0.13
		D032	Hexachlorobenzene	0.13
		D033	Hexachlorobutadiene	0.5
		D034	Hexachloroethane	3.0
		D036	Nitrobenzene	2.0
		D042	2,4,6-Trichlorophenol	2.0
		D043	Vinyl chloride	0.2
		F001	Tetrachloroethylene, Trichloroethylene, Methylene chloride, 1,1,1-Trichloroethane, Carbon tetrachloride, Chlorinated fluorocarbons	NA
		F002	Tetrachloroethylene, Trichloroethylene, 1,1,1-Trichloroethane, 1,1,2-Trichloro-1,2,2-trifluoroethane	NA
		F003	Xylene, Acetone, Ethyl acetate, Ethyl ether, Methyl isobutyl ketone, n-Butyl alcohol, Methanol	NA
		F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene	NA
Corrosive liquid wastes	Radiochemistry research, plutonium-processing operations, and analytical chemistry.	D001	Ignitability	NA
		D002	Corrosivity	NA
		D007	Chromium	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
		D036	Nitrobenzene	2.0

Refer to footnotes at end of table.

Table 4-4 (Continued)

Low-Level Liquid Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Nonaqueous, noncorrosive liquids contaminated with heavy metals	Metal polishing operations, and radiochemistry research.	D001	Ignitability	NA
		D004	Arsenic	5.0
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
Oil wastes	Equipment maintenance operations.	D004	Arsenic	5.0
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D028	1,2-Dichloroethane	0.5
		F001	Tetrachloroethylene, Trichloroethylene, Methylene chloride, 1,1,1-Trichloroethane, Carbon tetrachloride, Chlorinated fluorocarbons,	NA
		F002	Tetrachloroethylene, Trichloroethylene, 1,1,1-Trichloroethane, 1,1,2-Trichloro-1,2,2-trifluoroethane	NA
		F003	Xylene, Acetone, Ethyl acetate, Ethyl ether, Methyl isobutyl ketone, n-Butyl alcohol, Methanol	NA
		F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene	NA
Unused liquid reagent chemicals	Discarded off-specification unused liquid reagent chemicals.	D001	Ignitability	NA
		D002	Corrosivity	NA
		All P- and U-listed waste codes	Discarded commercial chemical products and off-specification species	NA
Photographic processing and photocopier wastes	Photographic film processing and photocopying operations.	D001	Ignitability	NA
		D002	Corrosivity	NA
		D007	Chromium	5.0
		D008	Lead	5.0
		D011	Silver	5.0

Refer to footnotes at end of table.

Table 4-4 (Continued)

Low-Level Liquid Mixed Waste Stored at Technical Area 55

[a] U.S. Environmental Protection Agency.
[b] A waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed (D004–D043) at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261, Subpart D, revised November 1, 1995.
[c] Not applicable: Refers to the absence of regulatory limits for ignitable and corrosive characteristic wastes and F-, P-, and U-listed wastes.

Table 4-5

Liquid Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Spent solvents and contaminated solvent mixtures	Research and development activities; laser research; organic and inorganic chemistry research (e.g., solvent extractions, liquid chromatography solvents, polymer synthesis, and distillations); cleaning; and degreasing operations.	D001	Ignitability	NA[d]
		D002	Corrosivity	NA
		D003	Reactivity	NA
		D004	Arsenic	5.0
		D005	Barium	100.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
		D018	Benzene	0.5
		D019	Carbon tetrachloride	0.5
		D021	Chlorobenzene	100.0
		D022	Chloroform	6.0
		D028	1,2-Dichloroethane	0.5
		D030	2,4-Dinitrotoluene	0.13
		D032	Hexachlorobenzene	0.13
		D035	Methyl ethyl ketone	200.0
		D036	Nitrobenzene	2.0
		D038	Pyridine	5.0
		D040	Trichloroethylene	0.5
		D043	Vinyl chloride	0.2
		F001	Tetrachloroethylene, Trichloroethylene, Methylene chloride, 1,1,1-Trichloroethane, Carbon tetrachloride, Chlorofluorocarbons	NA
		F002	Tetrachloroethylene, Trichloroethylene, 1,1,1-Trichloroethane, 1,1,2-Trichloro-1,2,2-trifluoroethane	NA
		F003	Xylene, Acetone, Ethyl acetate, Ethyl ether, Methanol, Methyl isobutyl ketone, n-Butyl alcohol	NA
		F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene	NA

Refer to footnotes at end of table.

Table 4-5 (Continued)

Liquid Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Paint and paint-related wastes	Painting and finishing operations, and general facility maintenance.	D001	Ignitability	NA
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D011	Silver	5.0
		F003	Xylene	NA
		F005	Toluene	NA
Photographic processing and photocopier wastes	Photographic film processing and photocopying operations.	D001	Ignitability	NA
		D002	Corrosivity	NA
		D007	Chromium	5.0
		D008	Lead	5.0
		D011	Silver	5.0
Corrosive liquid wastes	Analytical research and operations, electroetching, and electropolishing.	D001	Ignitability	NA
		D002	Corrosivity	NA
		D004	Arsenic	5.0
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
		D038	Pyridine	5.0
		F002	Tetrachloroethylene, Methylene chloride, Trichloroethylene, 1,1,1-Trichloroethane, Chlorobenzene, 1,1,2-Trichloro-1,2,2-trifluoroethane, Ortho-dichlorobenzene, Trichlorofluoromethane, 1,1,2-Trichloroethane	NA
		F003	Methanol	NA
		F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene, 2-Ethoxyethanol, 2-Nitropropane	NA

Refer to footnotes at end of table.

Table 4-5 (Continued)

Liquid Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Contaminated noncorrosive, aqueous and nonaqueous solutions and sludges, including oils	Vacuum pump maintenance, spectrometric operations, equipment cleaning and maintenance, synthesis reactions, analytical operations, metal polishing operations, and vehicle maintenance.	D001	Ignitability	NA
		D003	Reactivity	NA
		D004	Arsenic	5.0
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
		D018	Benzene	0.5
		D038	Pyridine	5.0
		D040	Trichloroethylene	0.5
		F002	Tetrachloroethylene, Methylene chloride, Trichloroethylene, 1,1,1-Trichloroethane, Chlorobenzene, 1,1,2-Trichloro-1,2,2-trifluoroethane, Ortho-dichlorobenzene, Trichlorofluoromethane, 1,1,2-Trichloroethane	NA
		F003	Xylene, Acetone, Ethyl acetate, Ethyl benzene, Ethyl ether, Methanol, Methyl isobutyl ketone, n-Butyl alcohol, Cyclohexanone	NA
		F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene, 2-Ethoxyethanol, 2-Nitropropane	NA
Battery fluids	Equipment maintenance.	D002	Corrosivity	NA
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D011	Silver	5.0

Refer to footnotes at end of table.

Table 4-5 (Continued)

Liquid Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Unused/off-specification commercial chemical products	Laboratory research and spills residues.	D001 D002 D003 D004 through D043 All P- and U-listed waste codes	Ignitability Corrosivity Reactivity Toxicity characteristic leaching procedure wastes Discarded commercial chemical products and off-specification species	NA NA NA –[c] NA

[a] Denotes information from the Los Alamos National Laboratory Chemical Science and Technology Division Waste Profile Form database.
[b] U.S. Environmental Protection Agency.
[c] A waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed (D004-D043) at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, Part 261, Subpart D, revised November 1, 1995.
[d] Not applicable: Refers to the absence of regulatory limits for ignitable, corrosive, and reactive characteristic waste, and F-, P-, and U-listed wastes.

Table 4-6

Transuranic Mixed Waste Characterized for Treatment in the Cementation Unit at Technical Area 55

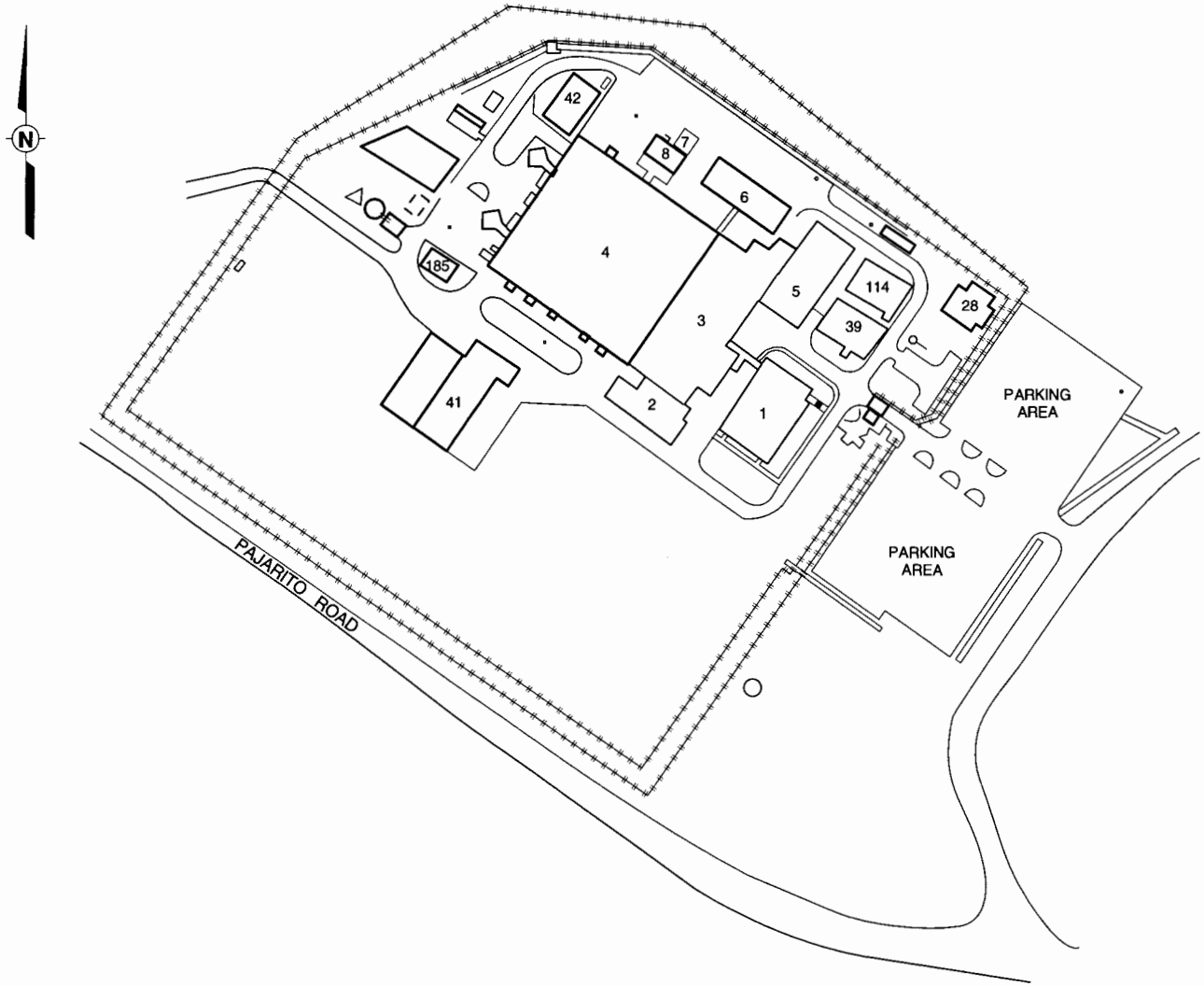
Waste Description	TRUPACT-II Content (TRUCON) Codes	Waste-Generating Process Description	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[b] (milligrams per liter)
Solidified inorganic process solids and liquids[c]	LA 114	Inorganic process solids and liquids that may include process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines, generated as a result of plutonium (Pu) processing operations that are solidified in cement.	D007	Chromium	5.0
Solidified organic process solids and liquids[c]	LA 126	Solidified process solids and liquids which, together with plastic packaging, result in >5% and normally ≤10% organics. These process solids may include process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines, generated as a result of Pu processing operations that are solidified in cement.	D007	Chromium	5.0

[a] U.S. Environmental Protection Agency.
[b] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261, Subpart D, revised November 1, 1995.
[c] At TA-55, these wastes may potentially contain liquids.

Figures 4-1 through 4-21 have been provided confidentially under separate cover.

ATTACHMENT 4-1

Index to Selected Buildings/Structures at Technical Area 55



Structure #	Description
1	Administration Building
2	Support Office Building
3	Support Building
4	Plutonium Building
5	Warehouse
6	Utility Building
7	Calcium Building
8	Generator Building
28	Nuclear Materials Building
39	Educational Support Center
41	Nuclear Materials Storage
42	Process Support Building
114	Office Building
185	Drum Storage Building

Index to Selected Buildings/Structures at Technical Area 55

ATTACHMENT 4-2

Registered Professional Engineer Written Assessment/Certification for the Evaporator Glovebox Storage Tank System

REGISTERED PROFESSIONAL ENGINEER
WRITTEN ASSESSMENT/CERTIFICATION

EVAPORATOR GLOVEBOX STORAGE TANK SYSTEM
TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

The evaporator glovebox storage tank system (i.e., glovebox GB-438 and ancillary equipment) located at Los Alamos National Laboratory (LANL), Technical Area 55, Building 4, Room 401 (TA-55-4-401) is considered an existing tank system in accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart VI, 265.191. The system was constructed in 1986 and installed at its present location in TA-55-4-401 in 1988 [20 NMAC 4.1, Subpart VI, 265.191(b)(4)]. The evaporator glovebox storage tank system has secondary containment that meets the requirements of 20 NMAC 4.1, Subpart VI, 265.193; therefore, the requirement that the owner or operator of the tank system determine that the tank system is not leaking or is unfit for use is not applicable. In addition, the requirement that the owner or operator obtain and keep on file a written assessment, reviewed and certified by an independent, qualified, registered professional engineer, attesting to the tank system's integrity is also not applicable [20 NMAC 4.1, Subpart VI, 265.191(a)]. However, for the purpose of demonstrating that the evaporator glovebox storage tank system will function as a completely leak-proof system and would meet the assessment requirements if they were applicable, the following written assessment has been prepared in accordance with 20 NMAC 4.1, Subpart VI, 265.191(b), attesting that the tank system is adequately designed and has sufficient structural integrity and compatibility with the waste stored to ensure that it will not collapse, rupture, or fail.

The evaporator glovebox storage tank is fabricated from 3/16-inch, 316 stainless steel with a 2B finish conforming to the American Society for Testing and Materials (ASTM) A240. The lower half of the tank is fabricated with additional layers of materials welded to the outside of the 3/16-inch-thick stainless steel enclosure. These materials consist of 1/4-inch-thick lead shielding, conforming to ASTM B29, and an outer layer of 1/16-inch, 316 stainless steel cladding. The tank system is of welded construction with all welds blended, ground, and polished to blend with adjacent material. Welding procedure qualifications and welder's performance qualifications conform to the requirements of either the American Welding Society B3.0-41 or the American Society of Mechanical Engineers (ASME) Section IX for welding and brazing qualifications. Questionable welds, if any, are liquid penetrant inspected according to ASME Section VIII [20 NMAC 4.1, Subpart VI, 265.191(b)(1)]. All joints are vacuum tight.

The support frame and legs of the evaporator glovebox storage tank are constructed of carbon steel and conform to ASTM A36. The support frame is bolted to the base of the tank for stabilization. In addition, the legs of the tank are bolted to the support frame and secured to the

10-inch-thick concrete floor with anchor bolts. The 10-inch-thick concrete floor was constructed to conform to the building code requirements of the American Concrete Institute (ACI) 318-71 for reinforced concrete. The reinforcing steel was detailed and fabricated in accordance with the "Manual of Standard Practice for Detailing Reinforced Concrete Structures," ACI 315. The design construction and tolerance of the framework around the concrete is in accordance with ACI 347.

The window components of the evaporator glovebox storage tank are constructed of 1/4-inch leaded glass, laminated on both sides with 1/8-inch clear glass, and installed with a neoprene gasket. Additionally, each window is backed with 1/4-inch safety glass installed with a neoprene gasket/seal that provides air-tight containment. The dual glass configuration is secured to the tank with a welded frame consisting of a 1/4-inch-thick lead shielding and a 1/16-inch, 316 stainless steel cladding similar to the additional layers of materials welded to the outside of the lower half of the tank. The welded window frames are bolted to the tank system.

The glove components of the evaporator glovebox storage tank are constructed of neoprene and Hypalon. Each glove is tested for material continuity by the manufacturer before acceptance and installation within the evaporator glovebox storage tank. Each glove is selected for its resistance to nitric acid as well as its lead equivalent shielding power to gamma radiation.

All of the components within the tank system are corrosion resistant and are compatible with the waste stored in the tank system. No external component of the tank system is in contact with soil or water [20 NMAC 4.1, Subpart VI, 265.191(b)(3)].

The stored waste consists of nitrate-based aqueous mixed waste solutions and waste salts generated from these solutions. The potential hazardous characteristics of the waste include corrosivity and toxicity for cadmium, chromium, and lead (i.e., EPA Hazardous Waste Numbers D002, D006, D007, and D008). Currently, no ignitable, reactive, or incompatible mixed wastes are stored or are anticipated to be stored in this tank system [20 NMAC 4.1, Subpart VI, 265.191(b)(2)].

A helium leak test using a mass spectrometer was performed on the evaporator glovebox storage tank upon fabrication at Silver Engineering and again after the tank was installed and made operational at its present location in TA-55-4-401. During leak testing, in accordance with the standard helium leak testing procedure for gloveboxes, any detectable leak at welds, gasket sealed joints, or any other part of the glovebox is unacceptable. In the event a leak is detected

during initial testing of any glovebox to be utilized at LANL, the glovebox is repaired and retested. Gloveboxes that have been repaired and fail retesting are not accepted for use by LANL. In addition to the initial leak tests performed on the evaporator glovebox storage tank, continuous leak detection is mandatory operating procedure for TA-55-4-401 and thus provides continuous leak detection for the tank system. Eight continuous air monitoring units are installed at various locations throughout TA-55-4-401 to detect any airborne alpha contamination (i.e., the radioactive constituent of the solutions stored in the tank system). Additionally, fixed head air monitors are installed on the outside of the tank system and filter the air as it is pulled through the vacuum vent lines at TA-55-4-401. The filters from these monitors are changed and analyzed weekly for the presence of the radioactive constituent of the stored waste. The above continuous leak detection devices are capable of rapidly detecting leaks in volumes less than 0.03 ounce, far exceeding conventional tank system leak detection devices [20 NMAC 4.1, Subpart VI, 265.191(b)(5)].

(The procedure adhered to during the helium leak test is included in this attachment following the certification. The procedure is referenced from the "Technical Specifications for Glove Boxes, Drop Boxes, Introductory Boxes and Conveyor Tunnels," Specification No. MST-8-S184-R00, Los Alamos National Laboratory, Los Alamos, New Mexico, July 27, 1988. A copy of the checklist documenting operability tests and equipment verification for proper operation of the evaporator glovebox storage tank system is also included in this attachment following the certification.)

LA-UR-07-0212

Approved for public release; distribution is unlimited.

Title: TECHNICAL AREA 55 PART B PERMIT APPLICATION, REVISION 0.0, JUNE 1996

Author(s): Jack E. Ellvinger, ENV-RCRA

Intended for: New Mexico Environment Department- Hazardous Waste Bureau

Los Alamos
NATIONAL LABORATORY
EST. 1943

Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by the Los Alamos National Security, LLC for the National Nuclear Security Administration of the U.S. Department of Energy under contract DE-AC52-06NA25396. By acceptance of this article, the publisher recognizes that the U.S. Government retains a nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or to allow others to do so, for U.S. Government purposes. Los Alamos National Laboratory requests that the publisher identify this article as work performed under the auspices of the U.S. Department of Energy. Los Alamos National Laboratory strongly supports academic freedom and a researcher's right to publish; as an institution, however, the Laboratory does not endorse the viewpoint of a publication or guarantee its technical correctness.

Form 836 (7/06)

4413

Document:	LANL TA-55 Part B
Revision No.:	0.0
Date:	June 28, 1996

Technical Area 55
Part B Permit Application
Volume I

Building 4, Container Storage Areas 1–11
Storage Tank Systems
Cementation Treatment Unit

Container Storage Pad

Building 185, Container Storage Area

Los Alamos National Laboratory
Hazardous and Solid Waste Group (ESH-19)
Los Alamos, New Mexico 87545

June 1996

TABLE OF CONTENTS

LIST OF TABLES xi
LIST OF FIGURES xiii
LIST OF ATTACHMENTS xvi
LIST OF MAPS xvii
LIST OF ABBREVIATIONS/ACRONYMS xviii

1.0 INTRODUCTION 1-1

2.0 FACILITY DESCRIPTION 2-1
2.1 GENERAL DESCRIPTION [20 NMAC 4.1, Subpart IX, 270.14(b)(1) and 270.14(b)(19)(xii)] 2-1
2.1.1 TA-55 Waste Management Units 2-4
2.1.2 Topographic Maps [20 NMAC 4.1, Subpart IX, 270.14(b)(19)] 2-5
2.1.3 Wells and Surface Waters [20 NMAC 4.1, Subpart IX, 270.14(b)(19)(iii) and (ix)] 2-7
2.1.4 Wind Rose [20 NMAC 4.1, Subpart IX, 270.14(b)(19)(v)] 2-8
2.1.5 Land Use [20 NMAC 4.1, Subpart IX, 270.14(b)(19)(iv)] 2-9
2.2 LOCATION INFORMATION 2-9
2.2.1 Seismic Standard [20 NMAC 4.1, Subpart IX, 270.14(b)(11)(i and ii) and 20 NMAC 4.1, Subpart V, 264.18(a)] 2-9
2.2.2 Floodplain Standard [20 NMAC 4.1, Subpart IX, 270.14(b)(11)(iii) and 270.14(b)(19)(ii)] 2-9
2.2.3 Soils 2-10
2.2.4 Geology 2-11
2.2.4.1 Regional Geology 2-11
2.2.4.2 Site-Specific Geology 2-12
2.2.4.2.1 Stratigraphy 2-13
2.2.4.2.2 Structural Geology 2-16
2.2.5 Ground Water 2-17
2.3 TRAFFIC PATTERNS [20 NMAC 4.1, Subpart IX, 270.14(b)(10)] 2-19
2.3.1 General 2-19
2.3.2 Waste Collection Areas 2-20
2.3.3 Routes of Travel 2-20
2.3.4 Traffic Volumes 2-20
2.3.5 Traffic Control Signals 2-21
2.3.6 Road Load-Bearing Capacity 2-21

3.0 WASTE ANALYSIS PLAN FOR HAZARDOUS AND MIXED WASTE STORAGE AND TREATMENT AT TECHNICAL AREA 55 3-1
3.1 GENERAL WASTE ANALYSIS REQUIREMENTS 3-2
3.1.1 Facility Description 3-2
3.1.2 Description of Hazardous and Mixed Waste Management Units 3-3
3.1.3 Sample Handling, Preservation, and Storage 3-3
3.1.4 Analytical Laboratory Selection and Analytical Methods [20 NMAC 4.1, Subpart V, 264.13(b)(2)] 3-4
3.1.5 Special Procedural Requirements [20 NMAC 4.1, Subpart V, 264.13(b)(6)] 3-5

3.1.5.1 Procedures for Ignitable and Reactive Wastes 3-5
3.1.5.2 Procedures for Incompatible Wastes 3-5
3.1.5.3 Procedures to Ensure Compliance with LDR Requirements [20 NMAC 4.1, Subpart VIII, 268.7(a), 268.7(b)(1), (3), (4), and (5) and 268.9(b), (c), and (d)] 3-6

3.2 WASTE ANALYSIS REQUIREMENTS FOR THE STORAGE OF TRU MIXED WASTE 3-6
3.2.1 Facility Waste-Generating Processes, Activities, and Identification of TRU Mixed Wastes Stored 3-7
3.2.1.1 LANL TRUCON Codes 3-8
3.2.2 Waste Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)] 3-10
3.2.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)] 3-10
3.2.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)] 3-10
3.2.3 Characterization of TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)] 3-11
3.2.3.1 Waste Profiling System [20 NMAC 4.1, Subpart V, 264.13(a)(3), 264.13(b)(4) and (5), and Subpart IX, 270.14(b)(2)] 3-13
3.2.3.2 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2), 264.13(b)(5), and Subpart IX, 270.14(b)(2)] . 3-14
3.2.3.3 Sampling and Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2) and (3), and Subpart IX, 270.14(b)(2)] 3-17
3.2.3.3.1 Visual Examination [20 NMAC 4.1, Subpart V, 264.13(b)(2), and Subpart IX, 270.14(b)(2)] 3-17
3.2.3.3.2 TRU Solid Mixed Waste Sampling and Analysis [20 NMAC 4.1, Subpart V, 264.13(b)(3)] 3-18
3.2.4 Verification Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3)] 3-18
3.3 WASTE ANALYSIS REQUIREMENTS FOR THE TREATMENT OF TRU MIXED WASTE 3-19
3.3.1 Facility Waste-Generating Processes, Activities, and Identification of TRU Mixed Wastes Managed 3-19
3.3.1.1 TRUCON Codes 3-19
3.3.2 Waste Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)] 3-19
3.3.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)] 3-19
3.3.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)] 3-20
3.3.3 Characterization of Treated TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)] 3-20
3.3.3.1 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2), 264.13(b)(5), and Subpart IX, 270.14(b)(2)] . 3-21

3.3.3.2 Sampling and Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2) and (3), and Subpart IX, 270.14(b)(2)] 3-21
3.3.3.2.1 TRU Solid Mixed Waste Sampling and Analysis [20 NMAC 4.1, Subpart V, 264.13(b)(3)] 3-22
3.3.3.2.2 TRU Liquid Mixed Waste Sampling and Analysis 3-22
3.3.4 Verification Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3)] 3-22
3.4 WASTE ANALYSIS REQUIREMENTS FOR THE STORAGE OF LOW-LEVEL MIXED WASTE 3-23
3.4.1 Facility Waste-Generating Processes, Activities, and Identification of Low-Level Mixed Wastes Managed 3-23
3.4.1.1 Homogeneous Low-Level Solid Mixed Wastes 3-23
3.4.1.2 Heterogeneous Low-Level Solid Mixed Wastes 3-24
3.4.1.3 Low-Level Liquid Mixed Wastes 3-25
3.4.2 Waste Analysis Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)] 3-26
3.4.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)] 3-26
3.4.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)] 3-27
3.4.3 Characterization of Low-Level Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)] 3-27
3.4.3.1 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2), 264.13(b)(5), and Subpart IX, 270.14(b)(2)] . 3-28
3.4.3.2 Sampling and Analysis for Low-Level Solid Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3), 264.13(b)(2), (3), and (4), and Subpart IX, 270.14(b)(2)] 3-28
3.4.3.3 Sampling and Analysis for Low-Level Liquid Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2), (3), and (4), and Subpart IX, 270.14(b)(2)] 3-30
3.4.4 Verification Analysis for Low-Level Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3)] 3-30
3.5 WASTE ANALYSIS REQUIREMENTS FOR THE STORAGE OF HAZARDOUS WASTE 3-31
3.5.1 Facility Waste-Generating Processes, Activities, and Identification of Hazardous Wastes Managed 3-31
3.5.1.1 Hazardous Wastes Managed 3-32
3.5.2 Waste Analysis Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)] 3-34
3.5.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)] 3-34
3.5.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)] 3-34
3.5.3 Characterization of Hazardous Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)] 3-35
3.5.3.1 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2) and (3), 264.13(b)(4) and (5), and Subpart IX, 270.14(b)(2)] 3-36

3.5.3.2 Sampling and Analysis for Hazardous Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2), (3), and (4), and Subpart IX, 270.14(b)(2)] 3-36
3.5.4 Verification Analysis for Hazardous Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3) and (b)(4)] 3-37

4.0 DESIGN, OPERATIONS, AND PROCESS INFORMATION 4-1
4.1 CONTAINER STORAGE AREAS [20 NMAC 4.1, Subpart IX, 270.15; 20 NMAC 4.1, Subpart V, Part 264, Subpart I] 4-1
4.1.1 Container Storage Areas 1, 2, and 3 4-2
4.1.2 Container Storage Area 4 4-3
4.1.3 Container Storage Area 5 4-3
4.1.4 Container Storage Area 6 4-4
4.1.5 Container Storage Area 7 4-4
4.1.6 Container Storage Areas 8 and 9 4-5
4.1.7 Container Storage Area 10 4-6
4.1.8 Container Storage Area 11 4-6
4.1.9 Container Storage Pad 4-7
4.1.10 Container Storage Area/TA-55-185 4-7
4.2 WASTE MANAGEMENT PRACTICES APPLICABLE TO THE CONTAINER STORAGE AREAS [20 NMAC 4.1, Subpart V, Part 264, Subpart I] 4-8
4.2.1 Container Types 4-8
4.2.2 Storage Configuration 4-10
4.2.3 Handling and Inspection [20 NMAC 4.1, Subpart V, 264.171, 264.173, and 264.174] 4-11
4.2.4 Ignitable, Reactive, and Incompatible Wastes [20 NMAC 4.1, Subpart V, 264.17(a), 264.176, and 264.177] 4-11
4.2.5 Removal of Liquids [20 NMAC 4.1, Subpart IX, 270.15(a)(5)] 4-12
4.3 MIXED WASTE STORAGE TANK SYSTEMS [20 NMAC 4.1, Subpart IX, 270.16; 20 NMAC 4.1, Subpart V, 264.191, 264.192, and 264.193] 4-13
4.3.1 Evaporator Glovebox Storage Tank System [20 NMAC 4.1, Subpart V, 264.191(b)(4)] 4-13
4.3.1.1 Design, Construction, and Materials [20 NMAC 4.1, Subpart IX, 270.16(b), (c), (d), and (i); 20 NMAC 4.1, Subpart V, 264.191(b)(1) and (3)] 4-14
4.3.1.2 Installation, Testing, and Certification [20 NMAC 4.1, Subpart IX, 270.16(a); 20 NMAC 4.1, Subpart V, 264.191(b) and 264.193(i)] 4-16
4.3.2 Cementation Unit Storage Tank System [20 NMAC 4.1, Subpart IX, 270.16(e); 20 NMAC 4.1, Subpart V, 264.192(a)(3), (4), and (5)(i), (ii), and (iii), and 264.192(c), (e), and (f)] 4-16
4.3.2.1 Design, Construction, and Materials [20 NMAC 4.1, Subpart IX, 270.16(b), (c), (d), and (i); 20 NMAC 4.1, Subpart V, 264.192(a)(1)] 4-17
4.3.2.2 Installation, Testing, and Certification [20 NMAC 4.1, Subpart IX, 270.16(a) and (f); 20 NMAC 4.1, Subpart V, 264.192(a), (b), (d), and (g) and 264.193(i)] 4-19
4.3.3 Secondary Containment for the Storage Tank Systems [20 NMAC 4.1, Subpart IX, 270.16(g); 20 NMAC 4.1, Subpart V, 264.193] 4-20

4.4 WASTE MANAGEMENT PRACTICES APPLICABLE TO STORAGE TANK SYSTEMS [20 NMAC 4.1, Subpart V, Part 264, Subpart J] 4-21
4.4.1 Hazardous Characteristics of the Waste to be Stored [20 NMAC 4.1, Subpart IX, 270.16(j); 20 NMAC 4.1, Subpart V, 264.17(a), 264.191(b)(2), 264.192(a)(2), 264.198, and 264.199] 4-21
4.5 MIXED WASTE CEMENTATION UNIT [20 NMAC 4.1, Subpart IX, 270.23; 20 NMAC 4.1, Subpart V, Part 264, Subpart X] 4-22
4.5.1 Design, Materials of Construction, and Operation [20 NMAC 4.1, Subpart IX, 270.23(a); 20 NMAC 4.1, Subpart X, 264.101] 4-22
4.5.2 Secondary Containment 4-24
4.6 WASTE MANAGEMENT PRACTICES APPLICABLE TO THE CEMENTATION UNIT 4-24
4.6.1 Hazardous Characteristics of the Waste to be Treated [20 NMAC 4.1, Subpart V, 264.17(a)] 4-24
4.6.2 Treatment Effectiveness [20 NMAC 4.1, Subpart IX, 270.23(d)] 4-25
4.6.3 Environmental Performance Standards [20 NMAC 4.1, Subpart V, Part 264, Subpart X] 4-25
4.6.3.1 Protection of the Ground Water [20 NMAC 4.1, Subpart V, 264.601(a)] 4-26
4.6.3.2 Protection of Surface Water [20 NMAC 4.1, Subpart V, 264.601(b)] 4-27
4.6.3.3 Protection of Soil Surface [20 NMAC 4.1, Subpart V, 264.601(b)] 4-28
4.6.3.4 Protection of the Atmosphere [20 NMAC 4.1, Subpart V, 264.601(c)] 4-28
4.7 RECORDKEEPING REQUIREMENTS [20 NMAC 4.1, Subpart V, Part 264, Subpart E] 4-29
4.7.1 Operating Record [20 NMAC 4.1, Subpart V, 264.73 and 264.74] . . 4-29
4.7.2 Biennial Report [20 NMAC 4.1, Subpart V, 264.75] 4-30
4.7.3 Additional Reports [20 NMAC 4.1, Subpart V, 264.77] 4-31

5.0 PROCEDURES TO PREVENT HAZARDS 5-1
5.1 SECURITY [20 NMAC 4.1, Subpart IX, 270.14 (b)(4) and 270.14(b)(19)(viii); 20 NMAC 4.1, Subpart V, 264.14] 5-1
5.2 PREPAREDNESS AND PREVENTION REQUIREMENTS [20 NMAC 4.1, Subpart V, Part 264, Subpart C] 5-2
5.2.1 Required Equipment [20 NMAC 4.1, Subpart V, 264.32] 5-3
5.2.2 Testing and Maintenance of Equipment [20 NMAC 4.1, Subpart V, 264.33] 5-6
5.2.3 Access to Communications or Alarm System [20 NMAC 4.1, Subpart V, 264.34] 5-7
5.2.4 Aisle Space Requirements [20 NMAC 4.1, Subpart V, 264.35] 5-7
5.2.5 Support Agreements with Outside Agencies [20 NMAC 4.1, Subpart V, 264.37(a)] 5-7
5.3 PREVENTIVE PROCEDURES, STRUCTURES, AND EQUIPMENT [20 NMAC 4.1, Subpart IX, 270.14(b)(8)] 5-8
5.4 PREVENTION OF ACCIDENTAL IGNITION OR REACTION OF IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTE [20 NMAC 4.1, Subpart IX,

270.14(b)(9), 270.15(c) and (d), 270.16(j), 270.23(a)(2); 20 NMAC 4.1, Subpart V, 264.17, 264.176, 264.177, 264.198, 264.199, and 264.601] 5-11
5.5 AIR EMISSIONS STANDARDS FOR EQUIPMENT LEAKS [20 NMAC 4.1, Subpart V, Part 264, Subpart BB] 5-12
5.6 ORGANIC AIR EMISSION STANDARDS [20 NMAC 4.1, Subpart V, Part 264, Subpart CC] 5-13

6.0 INSPECTION PLAN 6-1
6.1 GENERAL INSPECTION REQUIREMENTS AND SCHEDULES [20 NMAC 4.1, Subpart IX, 270.14(b)(5); 20 NMAC 4.1, Subpart V, 264.15(a),(b), and (c)] .. 6-1
6.1.1 Inspection Records [20 NMAC 4.1, Subpart V, 264.15(d)] 6-2
6.1.1.1 Inspection Record Form 6-2
6.1.2 Inspection Frequency 6-3
6.1.3 Actions Resulting From Inspections [20 NMAC 4.1, Subpart V, 264.15(c), 264.171, 264.196, and 264.601] 6-3
6.1.3.1 Preventive Action 6-4
6.1.3.2 Remedial and Emergency Action 6-4
6.2 INSPECTION SCHEDULE AND REQUIREMENTS FOR CONTAINER STORAGE AREAS [20 NMAC 4.1, Subpart V, 264.15(b) and 264.174] 6-4
6.2.1 Daily 6-4
6.3 INSPECTION SCHEDULE AND REQUIREMENTS FOR STORAGE TANK SYSTEMS [20 NMAC 4.1, Subpart V, 264.15(b) and 264.195(a)] 6-5
6.3.1 Daily 6-5
6.4 INSPECTION SCHEDULE AND REQUIREMENTS FOR THE CEMENTATION UNIT [20 NMAC 4.1, Subpart V, 264.15(b) and 264.602] 6-6
6.4.1 Daily 6-6
6.5 INSPECTION PROCEDURES AND FREQUENCIES FOR AREA 6 AT TA-55 [20 NMAC 4.1, Subpart V, 264.15(b) and 264.174] 6-7
6.5.1 Daily 6-7
6.5.2 Area 6 Receipt and Issue Inspection 6-8
6.5.3 Material Control and Accountability 6-9
6.5.4 Safeguards 6-9
6.6 ADDITIONAL INSPECTION ITEMS 6-9

7.0 CONTINGENCY PLAN 7-1
7.1 TA-55 EMERGENCIES AND EMERGENCY NOTIFICATION STRUCTURES . 7-1
7.2 HAZARDOUS AND MIXED WASTE EMERGENCY RESPONSE RESOURCES [20 NMAC 4.1, Subpart V, 264.52(c) and 264.53] 7-2
7.2.1 TA-55 Emergency Response Personnel 7-4
7.2.2 Emergency Management and Response Office [20 NMAC 4.1, Subpart V, 264.52(d) and 264.55] 7-5
7.2.3 Hazardous Materials Response Group 7-6
7.2.4 Other ESH Response Groups 7-7
7.2.4.1 Air Quality Group 7-7
7.2.4.2 Water Quality and Hydrology Group 7-7
7.2.4.3 Hazardous and Solid Waste Group 7-8
7.2.4.4 Environmental Assessments and Resource Evaluations Group 7-8
7.2.5 Other LANL Response Resources 7-8

7.2.5.1 CST Division 7-8
7.2.6 Contracted Response Groups 7-8
7.2.6.1 Protection Technology Los Alamos 7-8
7.2.6.2 Johnson Controls World Services Inc. 7-8
7.2.6.3 Los Alamos County Fire Department 7-9
7.2.7 LANL Support Groups 7-9
7.2.7.1 Health Physics Operations Group 7-9
7.2.7.2 Occupational Medicine Group 7-9
7.2.7.3 Industrial Hygiene and Safety Group 7-10
7.2.7.4 Criticality Safety Group 7-10
7.2.7.5 Occurrence Investigation Group 7-10
7.2.8 Outside Response Agencies 7-10
7.2.8.1 Los Alamos County Police Department 7-11
7.2.8.2 Los Alamos Medical Center 7-11
7.3 EMERGENCY EQUIPMENT AND COMMUNICATIONS [20 NMAC 4.1, Subpart V, 264.52(e)] 7-11
7.3.1 Emergency Equipment 7-11
7.3.2 Emergency Communications [20 NMAC 4.1, Subpart V, 264.56(a)] . 7-11
7.3.2.1 TA-55 Operations Center 7-12
7.3.2.2 Emergency Central Alarm Station 7-12
7.3.2.3 Utilities Control Center 7-12
7.3.2.4 Additional Communication Systems 7-13
7.4 CONTINGENCY PLAN IMPLEMENTATION [20 NMAC 4.1, Subpart V, 264.56] 7-14
7.4.1 Guidelines For Implementation [20 NMAC 4.1, Subpart V, 264.51(b) and 264.56] 7-14
7.4.2 Emergency Notification [20 NMAC 4.1, Subpart V, 264.56(a) and (b)] 7-15
7.4.3 Emergency Manager Actions [20 NMAC 4.1, Subpart V, 264.56 (b-h)] 7-16
7.5 SPILLS [20 NMAC 4.1, Subpart V, 264.56(e)] 7-17
7.5.1 Spill Control Procedures 7-19
7.5.1.1 Tank System Spill Control and Reporting 7-19
7.5.1.2 Tank System/Secondary Containment Repair and Closure 7-20
7.5.1.3 Certification of Major Repairs 7-20
7.5.2 Decontamination Verification 7-20
7.6 EXPLOSION 7-22
7.7 FIRE 7-22
7.8 UNPLANNED NONSUDDEN RELEASES 7-23
7.8.1 Responsibility 7-23
7.8.2 Nonsudden Releases 7-24
7.8.3 Nonsudden Release Surveillance 7-24
7.9 EXPOSURE TO HAZARDOUS OR MIXED WASTE 7-25
7.10 EVACUATION [20 NMAC 4.1, Subpart V, 264.52(f)] 7-25
7.10.1 Emergency Process Shutdown Prior To Evacuation 7-25
7.10.1.1 TA-55-4 Cementation Unit 7-26
7.10.2 Evacuation Plan 7-26
7.11 SALVAGE AND CLEANUP [20 NMAC 4.1, Subpart V, 264.56(g) and (h)] . . 7-27
7.12 POST-EMERGENCY ASSESSMENT 7-28

7.13 EMERGENCY RESPONSE RECORDS AND REPORTS [20 NMAC 4.1, Subpart V, 264.56(j)] . . . 7-29
7.14 CONTINGENCY PLAN AMENDMENT [20 NMAC 4.1, Subpart V, 264.54] . . 7-29

8.0 PERSONNEL TRAINING . . . 8-1
8.1 HAZARDOUS AND MIXED WASTE MANAGEMENT/RESPONSIBILITIES . . . 8-1
8.2 TRAINING CONTENT, FREQUENCY, AND TECHNIQUES [20 NMAC 4.1, Subpart IX, 270.14(b)(12); 20 NMAC 4.1, Subpart V, 264.16(a)(b) and (d)] . . 8-2
8.2.1 LANL-Wide Training . . . 8-4
8.2.2 Facility-Specific Training . . . 8-4
8.2.3 On-the-Job Training . . . 8-5
8.2.4 Training Coordinator [20 NMAC 4.1, Subpart V, 264.16(a)(2)] . . . 8-5
8.3 EMERGENCY TRAINING [20 NMAC 4.1, Subpart V, 264.16(a)(3) and (c)] . . 8-5
8.4 IMPLEMENTATION OF TRAINING PROGRAMS . . . 8-6

9.0 CLOSURE PLAN . . . 9-1
9.1 GENERAL CLOSURE INFORMATION . . . 9-2
9.1.1 Closure Performance Standard [20 NMAC 4.1, Subpart V, 264.111] . . 9-2
9.1.2 Partial and Final Closure Activities [20 NMAC 4.1, Subpart V, 264.112(d)] . . . 9-3
9.1.3 Closure Schedule [20 NMAC 4.1, Subpart V, 264.112(b)(6) and 264.113] . . . 9-3
9.1.4 Amendment of the Closure Plan [20 NMAC 4.1, Subpart V, 264.112(c)] . . . 9-4
9.1.5 Financial and Liability Requirements [20 NMAC 4.1, Subpart V, 264.140(c)] . . . 9-5
9.1.6 Closure Certification [20 NMAC 4.1, Subpart V, 264.115] . . . 9-5
9.1.7 Security . . . 9-5
9.1.8 Quality Assurance/Quality Control . . . 9-5
9.1.9 Closure Report . . . 9-6
9.1.10 Survey Plat and Post-Closure Requirements [20 NMAC 4.1, Subpart V, 264.116, 264.117 through 264.120] . . . 9-6
9.2 CLOSURE PROCEDURES FOR CONTAINER STORAGE AREAS [20 NMAC 4.1, Subpart V, 264.112] . . . 9-7
9.2.1 Estimate of Maximum Waste in Storage . . . 9-8
9.2.2 Description of Waste . . . 9-8
9.2.3 Removal of Waste . . . 9-9
9.2.4 Closure Procedures and Decontamination . . . 9-9
9.2.5 Decontamination Equipment . . . 9-11
9.2.6 Decontamination Verification . . . 9-11
9.3 CLOSURE PROCEDURES FOR THE STORAGE TANK SYSTEMS [20 NMAC 4.1, Subpart V, 264.112] . . . 9-12
9.3.1 Estimate of Maximum Waste in Storage . . . 9-13
9.3.2 Description of Waste . . . 9-13
9.3.3 Removal of Waste . . . 9-13
9.3.4 Closure Procedures and Decontamination . . . 9-13
9.3.5 Decontamination Equipment . . . 9-15
9.3.6 Decontamination Verification . . . 9-16

9.4 CLOSURE PROCEDURES FOR THE CEMENTATION UNIT [20 NMAC 4.1, Subpart V, 264.112] 9-16
9.4.1 Estimate of Maximum Waste Capacity of the Cementation Unit 9-17
9.4.2 Description of Waste 9-17
9.4.3 Removal of Waste 9-17
9.4.4 Closure Procedures and Decontamination 9-17
9.4.5 Decontamination Equipment 9-19
9.4.6 Decontamination Verification 9-19
9.5 SAMPLING AND ANALYTICAL PROCEDURES [20 NMAC 4.1, Subpart V, 264.112(b)(4)] 9-20
9.5.1 Soil and Sediment Sampling 9-20
9.5.1.1 Sampling Procedures 9-21
9.5.1.2 Cleaning of Samplers 9-22
9.5.2 Liquid Sampling 9-22
9.5.2.1 Sampling Procedure 9-22
9.5.2.2 Cleaning of Samplers 9-23
9.5.3 Sample Handling and Documentation 9-23
9.5.4 Analytical Procedures 9-25
9.5.5 Field and Laboratory QA/QC 9-25

10.0 CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS 10-1
10.1 SWMU DESCRIPTIONS 10-1
10.1.1 SWMUs Identified for Corrective Actions in Module VIII 10-1
10.1.1.1 Incinerator Complex 10-2
10.1.1.2 Decontamination Areas 10-2
10.1.1.3 Septic System 10-2
10.1.1.4 Sumps and Tanks 10-3
10.1.1.5 Monitoring Sump 10-3
10.1.2 SWMUs Identified in the 1990 SWMU Report 10-3
10.1.2.1 Cementation Unit 10-4
10.1.2.2 Evaporators 10-4
10.1.2.3 Filtration Unit 10-4
10.1.2.4 Container Storage Areas 10-5
10.1.2.5 Containment Area 10-6
10.1.2.6 Glass Breaker 10-6
10.1.2.7 Thermal Treatment Units 10-6
10.1.2.8 Solvent Spill 10-6
10.1.2.9 Drains and Outfalls 10-7
10.1.3 Active Hazardous/Mixed Waste Management Units Not Identified in the 1990 SWMU Report 10-7
10.1.3.1 Container Storage Areas 10-7
10.1.3.2 Oxygen Sparging Unit 10-9
10.2 RELEASES 10-9
10.2.1 Characterization of Releases 10-10
10.2.2 Corrective Actions 10-10

11.0 OTHER FEDERAL LAWS 11-1

12.0 CERTIFICATION [20 NMAC 4.1, Subpart IX, 270.11(d)] 12-1

13.0 LIST OF REFERENCES 13-1

APPENDIX A — Determination of 100-Year Floodplain Elevations at Los Alamos National Laboratory

APPENDIX B — 1991 and 1992 Traffic Studies at Intersection of Diamond Drive and Trinity Drive

APPENDIX C — Manufacturer's Information on Protective Coating Materials

APPENDIX D — Manufacturer's Information on Waste Containers and Containment Units

APPENDIX E — Manufacturer's Information on Fixed-Mount Mixers

APPENDIX F — Contract Between the U.S. Department of Energy and the Incorporated County of Los Alamos

APPENDIX G — Memorandum of Understanding Between the U.S. Department of Energy Los Alamos Area Office and the Incorporated County of Los Alamos, New Mexico Concerning Mutual Aid and Emergency Response

APPENDIX H — Memorandum of Understanding Between the U.S. Department of Energy and the Los Alamos Medical Center Concerning Mutual Assistance and Emergency Support

LIST OF TABLES

TABLE NO.	TITLE
1-1	Regulatory References and Corresponding Permit Application Location
3-1	Recommended Sample Containers, Preservation Techniques, and Holding Times
3-2	Summary of Waste Characterization Techniques for Transuranic Mixed Waste
3-3	Summary of Waste Characterization Techniques for Low-Level Mixed Waste
3-4	Summary of Waste Characterization Techniques for Hazardous Waste
3-5	Cross Reference of Matrix Parameter Codes and TRUPACT-II Content Codes
3-6	Transuranic Mixed Waste Characterization Matrix for Currently Generated Waste at Technical Area 55
3-7	Parameters, Characterization Methods, and Rationale for Transuranic Mixed Waste Stored and Treated at Technical Area 55
3-8	Descriptions of Low-Level Mixed Waste Stored at Technical Area 55
3-9	Parameters, Characterization Methods, and Rationale for Low-Level Mixed Waste Stored at Technical Area 55
3-10	Descriptions of Hazardous Waste Stored at Technical Area 55
3-11	Parameters, Characterization Methods, and Rationale for Hazardous Waste Stored at Technical Area 55
4-1	Transuranic Mixed Waste Stored at Technical Area 55
4-2	Low-Level Solid Mixed Waste Stored at Technical Area 55
4-3	Solid Hazardous Waste Stored at Technical Area 55
4-4	Low-Level Liquid Mixed Waste Stored at Technical Area 55
4-5	Liquid Hazardous Waste Stored at Technical Area 55

LIST OF TABLES
(Continued)

TABLE NO.	TITLE
4-6	Transuranic Mixed Waste Characterized for Treatment in the Cementation Unit at Technical Area 55
6-1	Inspection Schedule for Hazardous and/or Mixed Waste Units at Technical Area 55
7-1	Response Groups and Agencies Available to the Emergency Management and Response Office for Guidance and/or Emergency Assistance
7-2	Emergency Management and Response Office Emergency Managers
7-3	Waste Analysis Parameters and Test Methods
7-4	Evacuation Determination and Reentry Conditions
9-1	Closure Schedule for the Container Storage Areas at Technical Area 55
9-2	Closure Schedule for the Storage Tank Systems at Technical Area 55
9-3	Closure Schedule for the Cementation Unit at Technical Area 55
9-4	Analytical Parameters and Test Methods for Technical Area 55 Container Storage Areas, Storage Tank Systems, and Cementation Unit
9-5	Sample Containers, Preservation, and Holding Times for Sediment/Soil/ Sludge Samples
9-6	Sample Containers, Preservation, and Holding Times for Liquid Samples
9-7	Target Detection Limits, Analytical Methods, and Instrumentation for Metals Analysis
9-8	Target Detection Limits, Analytical Methods, and Instrumentation for Organics Analysis
9-9	Summary of Field Quality Control Samples
9-10	Summary of Laboratory Quality Control Procedures by Analytical Method
10-1	Solid Waste Management Unit (SWMU) Descriptions

LIST OF FIGURES

FIGURE NO.	TITLE
2-1	Regional Location Map of Los Alamos National Laboratory and Surrounding Land Use
2-2	Location Map of Los Alamos National Laboratory (LANL) Technical Areas
2-3	Locations of Waste Management Units at Technical Area (TA) 55
2-4	Annual Wind Roses for Los Alamos National Laboratory (LANL) - Day
2-5	Annual Wind Roses for Los Alamos National Laboratory (LANL) - Night
2-6	Location Map of Access Roads and Traffic Control Signs in the Vicinity of Technical Area (TA) 55
2-7	Relationship of Slope, Vegetation, and Parent Material to Frijoles, Typic Eutroboralfs, Clayey-Skeletal, and Carjo Soils
2-8	Relationship of Slope and Parent Material to Carjo, Tocal, Typic Eutroboralfs, Fine, and Pogna Soils
2-9	Index Map Showing Major Tectonic Elements of North-Central New Mexico
2-10	Physiographic Features of the Jemez Mountains
2-11	East - West Geologic Section Showing Stratigraphy and Structure from the Sierra de Los Valles across the Pajarito Plateau to the Rio Grande
2-12	Location Map of Los Alamos National Laboratory Facilities Relative to Nearby Active or Potentially Active Fault Traces
2-13	Generalized Piezometric Surface of Main Aquifer
2-14	Major Roads and Primary Traffic Routes at Los Alamos National Laboratory (LANL)
3-1	Land Disposal Restrictions Notification Form
3-2	Waste Profile Form
4-1	Technical Area 55, Building 4, Basement Showing Container Storage Areas 1 through 7
4-2	Technical Area 55, Building 4, First Floor Showing Container Storage Areas 8 through 11

LIST OF FIGURES
(Continued)

FIGURE NO.	TITLE
4-3	Container Storage Pad West of Building 4 at Technical Area 55
4-4	Technical Area 55, Building 185, Container Storage Area
4-5	Mechanical Symbols for Storage Tank Systems and Cementation Unit Drawings
4-6	Technical Area 55, Building 4, Storage Tank Systems and Cementation Unit Process Isometric Drawing
4-7	Technical Area 55, Building 4, Evaporator Glovebox Storage Tank, Front View
4-8	Technical Area 55, Building 4, Evaporator Glovebox Storage Tank, Side Views.
4-9	Technical Area 55, Building 4, Evaporator Glovebox Storage Tank, Top View
4-10	Technical Area 55, Building 4, Evaporator Glovebox Storage Tank, Support Frame and Legs
4-11	Technical Area 55, Building 4, Evaporator Glovebox Storage Tank System Process Flow Diagram
4-12	Technical Area 55, Building 4, Evaporator Glovebox Storage Tank System Piping and Instrumentation Diagram
4-13	Technical Area 55, Building 4, First Floor and Foundation Plan
4-14	Technical Area 55, Building 4, First Floor Plan Showing Penetration Locations
4-15	Technical Area 55, Building 4, Cementation Unit Storage Tanks
4-16	Technical Area 55, Building 4, Cementation Unit Storage Tank System Process Flow Diagram
4-17	Technical Area 55, Building 4, Cementation Unit Storage Tank System Piping and Instrumentation Diagram
4-18	Technical Area 55, Building 4, Cementation Unit Front Elevation

LIST OF FIGURES
(Continued)

FIGURE NO.	TITLE
4-19	Technical Area 55, Building 4, Cementation Unit Plan View
4-20	Technical Area 55, Building 4, Cementation Unit Process Flow Diagram
4-21	Technical Area 55, Building 4, Cementation Unit Piping and Instrumentation Diagram
5-1	Location Map Showing Security Fences, Entry Gates, and Entry Station at Technical Area (TA) 55
7-1	Emergency Notification Structure for Technical Area (TA) 55-Specific Emergency Responses
7-2	General Hazardous and Mixed Waste Emergency Notification Structure
7-3	Emergency Facilities
7-4	Evacuation Routes and Muster Area at Technical Area (TA) 55
7-5	Evacuation Routes at Technical Area (TA) 55, Building 4, Basement
7-6	Evacuation Routes at Technical Area (TA) 55, Building 4, First Floor
7-7	Evacuation Routes at Technical Area 55, Building 185
9-1	Location of Technical Area (TA) 55
9-2	Technical Area (TA) 55
10-1	Solid Waste Management Units (SWMU) in Technical Area (TA) 55

LIST OF ATTACHMENTS

ATTACHMENT NO.	TITLE
4-1	Index to Selected Buildings/Structures at Technical Area 55
4-2	Registered Professional Engineer Written Assessment/Certification for the Evaporator Glovebox Storage Tank System
4-3	Registered Professional Engineer Written Assessment/Certification for the Cementation Unit Storage Tank System
4-4	Tightness Testing Certification for the Cementation Unit Storage Tank System
4-5	Installation Inspection Certification for the Cementation Unit Storage Tank System
4-6	Demonstration of Treatment Effectiveness for the Cementation Unit
6-1	Hazardous and Mixed Waste Facility Inspection Record Form (and Instructions for Use)
7-1	Emergency Equipment
8-1	Los Alamos National Laboratory-Wide Training Program
8-2	Facility-Specific and On-the-Job Training for Hazardous and Mixed Waste Handling Operations

LIST OF MAPS

MAP NO.	TITLE
1	Contour Map Showing Mixed Waste Units at TA-3, TA-55, TA-50
2	Contour Map Showing Mixed Waste Units at TA-15 and TA-36
3	Contour Map Showing Mixed Waste Units at TA-16
4	Contour Map Showing Mixed Waste Units at TA-21
5	Contour Map Showing Hazardous and Mixed Waste Units at Technical Area (TA) 50
6	Contour Map Showing Mixed Waste Units at TA-53
7	Contour Map Showing Mixed Waste Units at Technical Area (TA) 54, Areas G and L
8	Contour Map Showing Mixed Waste Units at Technical Area (TA) 54 West
9	Contour Map Showing the Location of the TA-14 Firing Point and Burn Cage and the TA-40 Scrap Detonation Site
10	Contour Map Showing the Locations of the Technical Area (TA) 15 and TA-36 Firing Points
11	Contour Map Showing Location of TA-16 Open Burning Unit and TA-16-1150 Incinerator
12	Contour Map Showing the Locations of the TA-35-125 and TA-35-85 Surface Impoundments
13	Contour Map Showing the Locations of the Technical Area (TA) 39 Firing Points
14	Contour Map Showing the Locations of the Batch Treatment System and Container Storage Area and the Waste Incinerator
15	Contour Map Showing the Location of the TA-54, Area L Treatment Tanks, Surface Impoundments, Waste Packaging and Storage Pad, Shafts, and TA-54, Area G

LIST OF ABBREVIATIONS/ACRONYMS

ACI	American Concrete Institute
ALARA	as low as reasonably achievable
amsl	above mean sea level
ANSI	American National Standards Institute
"AR"	action required
ASTM	American Society for Testing and Materials
BEP	building emergency plan
CAM	continuous air monitor
CAS	Central Alarm Station
29 CFR	Code of Federal Regulations, Title 29
40 CFR	Code of Federal Regulations, Title 40
CFR	Code of Federal Regulations
CH	clay
CL	clay loam
CL-ML	clay loam-loam
cm	centimeter(s)
cm/cm	centimeter per centimeter
cm/hr	centimeters per hour
cm/s	centimeters per second
COLIWASA	composite liquid waste sampler
CST	LANL's Chemical Science and Technology Division
CST-9	LANL's Inorganic Trace Analysis Group
D&D	decontamination and decommissioning

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DPF	Drum Prep Facility
EDS	Employee Development System
EM&R	LANL's Emergency Management and Response Office
EMP	Emergency Management Plan
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
EOC	Emergency Operations Center
EPA	U.S. Environmental Protection Agency
ERT	TA-55 Emergency Response Team
ES&H	Environment, Safety, and Health
ESH	LANL's Environment, Safety, and Health Division
ESH-1	LANL's Health Physics Operations Group
ESH-2	LANL's Occupational Medicine Group
ESH-5	LANL's Industrial Hygiene and Safety Group
ESH-6	LANL's Criticality Safety Group
ESH-7	LANL's Occurrence Investigation Group
ESH-10	LANL's Hazardous Materials Response Group
ESH-13	LANL's ES&H Training Group
ESH-14	LANL's Quality Assurance Support Group
ESH-17	LANL's Air Quality Group
ESH-18	LANL's Water Quality and Hydrology Group

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

ESH-19	LANL's Hazardous and Solid Waste Group
ESH-20	LANL's Environmental Assessments and Resource Evaluations Group
°F	degrees Fahrenheit
FIC	Facility Incident Commander
FMCS	facility monitor/control system
FSS	LANL's Facilities, Security, and Safeguards Division
FSS-9	LANL's Operations and Maintenance Services
FSS-20	LANL's EM&R Office
ft	foot (feet)
ft/mi	feet per mile
ft/yr	feet per year
gal	gallon(s)
gal/min	gallons per minute
gal/min/ft	gallons per minute per foot
GET	General Employee Training
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	high-efficiency particulate air
HMGS	Hazardous Materials Group Supervisor
HWF	Hazardous Waste Facility
IC	Incident Commander
in.	inch(es)
IRF	Inspection Record Form

LIST OF ABBREVIATIONS/ACRONYMS (Continued)

IWP	Installation Work Plan
JCI	Johnson Controls World Services Inc.
L	liter(s)
LAAO	DOE's Los Alamos Area Office
LACFD	Los Alamos County Fire Department
LACPD	Los Alamos County Police Department
LAMC	Los Alamos Medical Center
LANL	Los Alamos National Laboratory
LDR	land disposal restrictions
m	meter(s)
m^3	cubic meter(s)
mi	mile(s)
mi^2	square mile(s)
ML	loam
MOU	memorandum of understanding
mph	miles per hour
m/s	meters per second
MSDS	Material Safety Data Sheet
NA	not applicable
NAWAS	National Warning System
NIIMS	National Interagency Incident Management System
20 NMAC 4.1	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
NMED	New Mexico Environment Department

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

NMT	LANL's Nuclear Materials Technology Division
NMT-7	TA-55's Waste Management and Environmental Compliance Group
NMT-8	TA-55's Facilities Management Group
NPDES	National Pollutant Discharge Elimination System
OJT	on-the-job training
OSHA	Occupational Safety and Health Administration
PA	public address
pCi/g	picocuries per gram
PPE	personal protective equipment
ppmw	parts per million by weight
psig	pounds per square inch gauge
PTLA	Protection Technology Los Alamos
Pu238	plutonium 238
QA	quality assurance
QAPP	Quality Assurance Program Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RCT	radiological control technician
R&D	research and development
RTD	reagent transfer device
RTL	regulatory threshold limit
RTR	real-time radiography
SAR	safety analysis report

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

SM	sandy loam
SM-409	ESH-2's central medical facility
SOP	standard operating procedure
SVOC	semivolatile organic compound
SW-846	EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
SWB	standard waste box
SWMU	solid waste management unit
TA	technical area
TC	toxicity characteristic
TCLP	toxicity characteristic leaching procedure
TID	tamper-indicating device
TRU	transuranic
TRUCON	TRUPACT-II Content
TSR	technical safety requirement
UC	Unified Command
UCC	Utilities Control Center
UCNI	Unclassified Controlled Nuclear Information
USC	United States Code
USCS	Unified Soil Classification System
USQD	unreviewed safety question determination
VCID	Vault Container Inspection Database
VOC	volatile organic compound
WAC	waste acceptance criteria

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

WAP	waste analysis plan
WIPP	Waste Isolation Pilot Plant
WPF	Waste Profile Form

1.0 INTRODUCTION

This Part B permit application has been prepared for submittal to the New Mexico Environment Department (NMED) to meet the requirements of the New Mexico Hazardous Waste Act. Additionally, this permit application has been prepared to meet the requirements of the implementing regulations, specifically the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), for those units identified as hazardous and mixed waste storage and treatment units at Los Alamos National Laboratory (LANL), Technical Area (TA) 55. Continuous initiatives are administered to ensure identification of additional units, if any, that may potentially be regulated under 20 NMAC 4.1.

This Part B permit application addresses all of the units at TA-55 that have previously been included in LANL's Part A permit application submittals. The original Part A permit application (LANL, 1991a) for mixed waste units at LANL was submitted to NMED in January 1991 and included units at TA-55. Additional TA-55 units were subsequently included in Revision 1.0 (LANL, 1993a) and Revision 2.0 (LANL, 1994a) of the original Part A and were submitted to NMED in September 1993 and September 1994, respectively. In July 1995, per direction from NMED, a TA-55-specific Part A permit application was submitted to NMED pursuant to 20 NMAC 4.1, Subpart IX, 270.72, revised November 1, 1995. Following is a list of the units at TA-55 included in previous Part A submittals and for which this Part B permit application is being submitted. (These units are shown in detail on Figures 4-1 through 4-21 which are provided under separate cover to comply with Unclassified Controlled Nuclear Information procedures.)

- **TA-55, Building 4 (TA-55-4), Areas 1 through 5**, container storage areas for hazardous waste, transuranic (TRU) mixed waste, and low-level mixed waste in the basement. These units were included in the January 1991 Part A permit application.

- **TA-55-4, Area 6**, a container storage area for TRU mixed waste in the basement. This unit was included in the January 1991 Part A permit application.

- **TA-55-4, Area 7**, a container storage area that may be used for hazardous waste, TRU mixed waste, and low-level mixed waste in the northwest section of the basement. This unit was included in Revision 1.0 of the Part A permit application.

- **TA-55-4, Areas 8 and 9**, container storage areas that may be used for TRU mixed waste and low-level mixed waste in Room 401 (TA-55-4-401). These units were included in Revision 1.0 of the Part A permit application.

- **TA-55-4, Area 10**, a container storage area that may be used for TRU mixed waste and low-level mixed waste in TA-55-4-433. This unit was included in Revision 1.0 of the Part A permit application.

- **TA-55-4, Area 11**, a container storage area that may be used for TRU mixed waste in TA-55-4-432. This unit was included in Revision 1.0 of the Part A permit application.

- **A container storage pad** outside near TA-55-4 for hazardous waste, TRU mixed waste, and low-level mixed waste. This unit was included in the January 1991 Part A permit application.

- **TA-55-185**, a building that may be used for container storage of hazardous waste, TRU mixed waste, and low-level mixed waste. This unit was included in Revision 2.0 of the Part A permit application.

- **TA-55-4, a storage tank system** consisting of a glovebox and ancillary equipment for TRU mixed waste associated with the evaporator process in TA-55-4-401. This unit was included as eight storage tanks and a container storage area in the January 1991 Part A permit application. In this Part B permit application, this unit is referred to as the "evaporator glovebox storage tank system."

- **TA-55-4, a storage tank system** consisting of five tanks and ancillary equipment for TRU mixed waste associated with the cementation unit in TA-55-4-401. The five tanks were included in the January 1991 Part A permit application. In this Part B permit application, this unit is referred to as the "cementation unit storage tank system."

- **TA-55-4, a cementation unit** for mixed waste located within glovebox GB-454 in TA-55-4-401. This unit was included in the January 1991 Part A permit application.

In both the Part A and Part B permit applications, a unit to be permitted or an area within LANL may sometimes be referred to as a "facility" (e.g., the Plutonium Facility). The term "facility," as it appears in this context, is used only to denote building or area names and does not imply the regulatory meaning of "facility" as defined in 20 NMAC 4.1, Subpart I, 260.10, revised November 1, 1995. However, pursuant to 20 NMAC 4.1, Subpart I, 260.10, revised November 1, 1995, LANL as a whole does meet the regulatory definition of a facility.

An outline of this permit application with citations of the regulations covered by each section is given in Table 1-1. Where applicable, regulatory citations in this application reference 20 NMAC 4.1, which adopts, with a few limited exceptions, all of the Code of Federal Regulations, Title 40, Parts 260-266, Part 268, and Part 270.

Table 1-1

Regulatory References and Corresponding Permit Application Location

Regulatory Reference[a]			
20 NMAC 4.1, Subpart IX	20 NMAC 4.1, Subpart V	Description of Requirement	Location in this Permit Application
270.10(a)	--	Permit application	1.0
270.10(g)(1)	--	Updating permit applications	1.0
270.11(a)	--	Signatories	12.0
270.11(d)	--	Certification	12.0
270.13	--	Contents of Part A permit application	Technical Area (TA) 55 Part A[b]
270.13(a)	--	Activities conducted	TA-55 Part A
270.13(b)	--	Name, mailing address, and location	TA-55 Part A
270.13(c)	--	Principal standard industrial classification (SIC) codes	TA-55 Part A
270.13(d)	--	Operator information	TA-55 Part A
270.13(e)	--	Owner information	TA-55 Part A
270.13(f)	--	Whether located on Indian lands	TA-55 Part A
270.13(g)	--	New or existing facility	TA-55 Part A
270.13(h)	--	Scale drawing and photographs	TA-55 Part A
270.13(i)	--	Description of waste processes	TA-55 Part A
270.13(j)	--	Specification and quantity of hazardous wastes	TA-55 Part A
270.13(k)	--	List of permits and construction approvals	TA-55 Part A
270.13(l)	--	Topographic maps	TA-55 Part A
270.13(m)	--	Description of nature of business	TA-55 Part A
270.14(b)(1)	--	General facility description	2.1
270.14(b)(2)	264.13(a)	Chemical and physical analyses	3.0
270.14(b)(3)	264.13(b)	Waste analysis plan	3.0

Refer to footnotes at end of table.

Table 1-1 (Continued)

Regulatory References and Corresponding Permit Application Location

Regulatory Reference[a]			
20 NMAC 4.1, Subpart IX	20 NMAC 4.1, Subpart V	Description of Requirement	Location in this Permit Application
	264.13(b)(1)	Parameters and rationale	3.0
	264.13(b)(2)	Test methods	3.0
	264.13(b)(3)	Sampling methods	3.0
	264.13(b)(4)	Frequency of analyses	3.0
	264.13(b)(5)	Waste analysis information for off-site facilities	3.0
270.14(b)(4)	264.14	Security procedures and equipment	5.1
270.14(b)(5)	264.15(b)	General inspection requirements	6.1
	264.174	Inspection requirements for container storage areas	6.2 and 6.5
	264.195	Inspection requirements for storage tanks	6.3
	264.602	Inspection requirements for miscellaneous units	6.4
270.14(b)(7)	264 Subpart D	Contingency plan	7.0
	264.51	Contingency plan design and implementation	7.0 and 7.4
	264.52	Contingency plan content	7.0
	264.53	Contingency plan copies	7.2
	264.54	Contingency plan amendment	7.14
	264.55	Emergency coordinator	7.2.2
	264.56	Emergency procedures	7.3 – 7.12
270.14(b)(8)	264 Subpart C	Preparedness and prevention	5.2
	264.31	Design and operation of facility	5.0
	264.32	Required equipment	5.2.1 and 5.3
	264.33	Testing and maintenance of equipment	5.2.2
	264.34	Communications/alarm system	5.2.1 and 7.3

Refer to footnotes at end of table.

Table 1-1 (Continued)

Regulatory References and Corresponding Permit Application Location

Regulatory Reference[a]			
20 NMAC 4.1, Subpart IX	20 NMAC 4.1, Subpart V	Description of Requirement	Location in this Permit Application
	264.35	Required aisle space	5.2.4
	264.37	Arrangements with local authorities	5.2.5 and 7.2
270.14(b)(9)	264.17	Prevention of accidental ignition or reaction	5.4
270.14(b)(10)	--	Traffic pattern, volume, and controls	2.3
270.14(b)(11)(i) & (ii)	264.18(a)	Seismic standard	2.2.1
270.14(b)(11)(iii)	264.18(b)	Floodplain standard	2.2.2
270.14(b)(12)	264.16	Personnel training	8.0
270.14(b)(13)	264 Subpart G	Closure and post-closure plans	9.0
	264.111	Closure performance standard	9.1.1
	264.112(a)&(b)	Written content of closure plan	9.2 – 9.5
	264.112(c)	Amendment of closure plan	9.1.4
	264.112(d)	Notification of partial and final closure	9.1.2
	264.112(e)	Removal of wastes and decontamination/dismantling of equipment	9.2 – 9.4
	264.113	Time allowed for closure	9.1.3
	264.114	Disposal/decontamination	9.2 – 9.4
	264.115	Certification of closure	9.1.6
	264.117	Post-closure care and use of property	9.1.10
	264.120	Certification of post-closure	9.1.10
	264.178	Closure of container storage areas	9.2
	264.197	Closure of tank systems	9.3
	264.603	Closure of miscellaneous units	9.4

Refer to footnotes at end of table.

Table 1-1 (Continued)

Regulatory References and Corresponding Permit Application Location

Regulatory Reference[a]			
20 NMAC 4.1, Subpart IX	20 NMAC 4.1, Subpart V	Description of Requirement	Location in this Permit Application
270.14(b)(19)(i)(vi) (vii) & (x)	--	Topographic maps	2.1.2
270.14(b)(19)(ii)	264.18(b)	100-year floodplain	2.2.2
270.14(b)(19)(iii)	--	Surface waters	2.1.3
270.14(b)(19)(iv)	--	Land use	2.1.5
270.14(b)(19)(v)	--	Wind rose	2.1.4
270.14(b)(19)(viii)	264.14(b)	Access control	5.1
270.14(b)(19)(ix)	--	Wells	2.1.3
270.14(b)(19)(xi)	--	Drainage barriers	5.3
270.14(b)(19)(xii)	--	Location of operational units	2.1
270.14(b)(20)	--	Other federal laws	11.0
270.14(c)	264.90(a)	Ground-water monitoring	2.2.5
270.14(d)(1)	--	Requirements for solid waste management units (SWMU)	10.0
270.14(d)(1)(i)	--	Location of SWMUs on topographic map	Figure 10-1
270.14(d)(1)(ii)	--	Types of SWMUs	10.1
270.14(d)(1)(iii)	--	Structural description of SWMUs	10.1
270.14(d)(1)(iv)	--	Dates of operation	10.1
270.14(d)(1)(v)	--	Waste types managed at SWMUs	10.1
270.15	264 Subpart I	Containers	4.1 and 4.2.1
270.15(a)	264.175	Containment system	4.1, 4.3.3, and 4.5.2
270.15(b)	264.175(c)	No free liquids	4.1.1 – 4.1.10
270.15(c)	264.176	Ignitable or reactive wastes	4.2.4 and 5.4
270.15(d)	264.177	Incompatible wastes	4.2.4 and 5.4
270.16	264 Subpart J	Tank systems	4.3
270.16(a)	264.191 264.192	Written assessment and certification	4.3.1.2, 4.3.2.2, and Attachments 4-2 and 4-3

Refer to footnotes at end of table.

Table 1-1 (Continued)

Regulatory References and Corresponding Permit Application Location

Regulatory Reference[a]			
20 NMAC 4.1, Subpart IX	20 NMAC 4.1, Subpart V	Description of Requirement	Location in this Permit Application
270.16(b)	264.191 264.192	Capacity/dimensions	4.3.1 and 4.3.2
270.16(c)	--	Systems and controls	4.3.1 and 4.3.2
270.16(d)	--	Piping and process flow	4.3.1 and 4.3.2
270.16(e)	264.192	External corrosion protection	4.3.1.1 and 4.3.2.1
270.16(f)	264.192	Installation	4.3.1.2 and 4.3.2.2
270.16(g)	264.193	Secondary containment system	4.3.3
270.16(i)	264.194	Spill prevention	4.3.1.1 and 4.3.2.1
270.16(j)	264.198 264.199	Ignitable, reactive, or incompatible wastes	4.4.1 and 5.4
270.23	264 Subpart X	Miscellaneous units	4.5
270.23(a)(1) & (2)	--	Detailed unit description	4.5.1
270.23(b)	264.601	Hydrologic, geologic, and meteorologic assessments	4.6.3
270.23(c)	264.601	Potential exposure pathways	4.6.3
270.23(d)	--	Demonstration of treatment effectiveness	4.6.2 and Attachment 4-6
	264.602	Monitoring, analysis, inspection, response, reporting, and corrective action	4.6.3

[a] The New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), adopts, with a few limited exceptions, Title 40 of the Code of Federal Regulations (40 CFR), Parts 260–266, Part 268, and Part 270 (1995). 20 NMAC 4.1, Subparts V and IX, contain equivalent regulations to 40 CFR Parts 264 and 270, respectively.

[b] The Technical Area 55 RCRA Part A Permit Application, Revision 1.0, is being submitted to the New Mexico Environment Department (NMED) with this Part B permit application. The units included therein were previously described in Los Alamos National Laboratory's original Part A permit application submitted to NMED in January 1991, and in Revisions 1.0 and 2.0, which were submitted in September 1993 and September 1994, respectively.

WASTE ANALYSIS PLAN FOR HAZARDOUS AND MIXED WASTE STORAGE AND TREATMENT AT TECHNICAL AREA 55

2.0 FACILITY DESCRIPTION

The information provided in this section is submitted in accordance with the applicable requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), for the following subject areas:

- A general description of the Los Alamos National Laboratory (LANL) facility, including a brief discussion of units at Technical Area (TA) 55 addressed in this permit application [20 NMAC 4.1, Subpart IX, 270.14, revised November 1, 1995]
- Topographic map requirements [20 NMAC 4.1, Subpart IX, 270.14(b)(19), revised November 1, 1995]
- Facility location information for compliance with the seismic standard and floodplain requirements [20 NMAC 4.1, Subpart IX, 270.14(b)(11)(i, ii, and iii), and 270.14(b)(19)(ii), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.18(a), revised November 1, 1995]
- Traffic patterns, volume, and control [20 NMAC 4.1, Subpart IX, 270.14(b)(10), revised November 1, 1995].

2.1 GENERAL DESCRIPTION [20 NMAC 4.1, Subpart IX, 270.14(b)(1) and 270.14(b)(19)(xii)]

LANL is located in Los Alamos County, an incorporated county, in north-central New Mexico, approximately 60 miles (mi) north-northeast of Albuquerque and 25 mi northwest of Santa Fe. The regional location of LANL is shown on Figure 2-1. LANL, which occupies an area of 43 square mi (mi^2), and the associated residential and commercial areas of Los Alamos County, which occupy an area of 109 mi^2, are situated on the Pajarito Plateau. The plateau consists of a series of finger-like mesas separated by deep east-west trending canyons. Ephemeral, or intermittent, streams lie at the bottoms of all the canyons. The mesa tops range in elevation from approximately 7,800 feet (ft) above mean sea level (amsl) at the flank of the Jemez Mountains, located to the west of Los Alamos, to about 6,200 ft amsl at their eastern extent, where they terminate above the Rio Grande Valley.

LANL, a multidisciplinary laboratory owned by the U.S. Department of Energy (DOE), is operated jointly by DOE and the University of California, DOE's management and operating contractor. The principal mission of LANL includes the research, design, development, and analysis of weapons components for the nation's nuclear arsenal. This effort is supported by research

programs such as nuclear physics, hydrodynamics, conventional explosives, chemistry, metallurgy, radiochemistry, and biology. In addition to its defense program efforts, LANL supports energy research and environmental missions with programs including medium-energy physics; space nuclear systems; controlled thermonuclear fusion; laser research; environmental research; geothermal, solar, and fossil energy research; nuclear safeguards; biomedical research; and space physics. In 1992, LANL expanded its mission in support of environmental management to include development of new programs in the areas of health and biotechnology, environmental technologies, and industrial partnerships.

LANL is divided into 49 TAs, 38 of which are developed (Figure 2-2). The hazardous and mixed waste management units addressed in this permit application are located at TA-55 and include the following:

- Seven container storage areas (Areas 1 through 7) in the basement of TA-55, Building 4 (TA-55-4)
- Four container storage areas (Areas 8 through 11) on the first floor of TA-55-4 in Rooms 401, 432, and 433 (TA-55-4-401, TA-55-4-432, and TA-55-4-433)
- One container storage pad located outside near TA-55-4
- One container storage area at TA-55-185
- Two storage tank systems in TA-55-4-401 associated with the evaporator process and cementation unit
- One cementation unit in TA-55-4-401.

Other hazardous and/or mixed waste management units located at or planned for construction at LANL (see Figure 2-2) include the following:

- Units that are permitted for hazardous waste storage and treatment
- Hazardous and mixed waste storage and treatment units that operate under standards pursuant to 20 NMAC 4.1, Subpart VI, revised November 1, 1995.

Units that are permitted for hazardous waste storage and treatment include the following:

- Container storage areas and treatment/storage tanks at TA-54, Area L.
- The controlled air incinerator and associated storage areas at TA-50-37.
- An industrial incinerator at TA-16.

Units that have received conditional approval for mixed waste storage include:

- Container storage areas for transuranic (TRU) mixed waste at TA-54, Area G. These container storage areas include storage domes designated TA-54-226, TA-54-229, TA-54-230, TA-54-231, and TA-54-232, and Storage Pads 2 and 4.

Units that are operating under the requirements of 20 NMAC 4.1, Subpart VI, revised November 1, 1995, for hazardous and mixed waste storage and treatment include the following:

- Thermal treatment units for open burning/open detonation of high-explosive waste at TA-14, TA-15, TA-16, TA-36, and TA-39.
- Container storage areas and storage tanks for hazardous and/or mixed waste located at TA-3, TA-16, TA-21, TA-50, and TA-54.
- Surface impoundments for storage of mixed waste at TA-53.
- A mixed waste treatment unit (waste solidification/cementation) at TA-50-1.
- An oxygen sparging unit in TA-55-4-429 for treatment of mixed waste. This unit has undergone closure pursuant to 20 NMAC 4.1, Subpart VI, revised November 1, 1995, and is pending final closure approval.
- Container storage areas for mixed waste at the Radioassay and Nondestructive Testing Facility (TA-54-38), formerly the Nondestructive Assay/Nondestructive Examination Facility, at TA-54 West.

Units that have been closed pursuant to 20 NMAC 4.1, Subpart VI, revised November 1, 1995, include the following:

- Two of four treatment/storage tanks at TA-54, Area L.
- A thermal treatment unit (the Scrap Detonation Site) at TA-40.
- The Batch Waste Treatment Unit at TA-50-1.

There are one existing and one planned hazardous/mixed waste decontamination areas at LANL. A centralized Decontamination Facility at TA-50 is used for cleanup of equipment, some of which is associated with hazardous and mixed waste operations. One decontamination area in the facility is located in Room 34B in the south wing of TA-50-1. TA-50-1-34B is a high bay that can accommodate equipment of all sizes, including heavy equipment. TA-50-1 is shown on Maps 1 and 5 of this section. A decontamination area was established at the Drum Prep Facility (DPF) at TA-54, Area G, during an upgrade of that facility, which was completed in 1995. This area will be used for drum cleaning, cleanup of equipment associated with drum venting and characterization activities at TA-54, Area G, and for general site activities. The decontamination area in the DPF is large enough to accommodate large earth-moving equipment. The location of the DPF (TA-54-33) is shown on Map 7 of this section.

2.1.1 TA-55 Waste Management Units

TA-55 is located on a finger mesa between a branch of Mortandad Canyon on the north and Two Mile Canyon on the south. Mesa-top elevations at TA-55 range from approximately 7,100 to 7,300 ft amsl. The locations of the units at TA-55 addressed in this Part B permit application are shown on Figure 2-3 of this section and on Map 2 of Revision 1.0 of the TA-55 Part A permit application (LANL, 1996).

TA-55 treats liquid mixed waste and stores solid and liquid hazardous waste and mixed waste. TA-55 is a plutonium-processing facility, which began operating in 1978. Plutonium processing and related activities occur in TA-55-4, which is the largest building at TA-55. The units addressed in this application are located at TA-55-4 and in the vicinity of TA-55-4 (Figure 2-3). A brief discussion of the units, their locations, and wastes managed at each unit is provided in the following paragraphs.

As described in Section 2.1, 13 container storage areas at TA-55 are addressed in this permit application. As provided in 20 NMAC 4.1, Subpart I, 260.10, revised November 1, 1995, the definition of "container" is "any portable device in which a material is stored, transported, treated, disposed of, or otherwise handled." Eleven of the 13 container storage areas are located in TA-55-4. Areas 1 through 7 are in the basement of TA-55-4 and Areas 8 through 11 are located on the first floor of TA-55-4. The types of wastes managed at these container storage areas are summarized as follows:

Unit(s)	Waste Types Stored
Areas 1 through 5	Hazardous waste, TRU mixed waste, and low-level mixed waste
Area 6	TRU mixed waste
Area 7	Hazardous waste, TRU mixed waste, and low-level mixed waste
Areas 8, 9, and 10	TRU mixed waste and low-level mixed waste
Area 11	TRU mixed waste

A container storage pad, located outside and west of TA-55-4 (Figure 2-3), is used to store hazardous waste, TRU mixed waste, and low-level mixed waste. The remaining container storage area is located in TA-55-185, a building located west of TA-55-4 (Figure 2-3). This building may be used to store hazardous waste, TRU mixed waste, and low-level mixed waste. The container storage areas may also be used to store nonwaste items.

The two storage tank systems addressed in this permit application are located in TA-55-4-401. The storage tank systems manage TRU mixed waste associated with the evaporator process and the cementation unit, which are also located in TA-55-4-401. The cementation unit located in TA-55-4-401 also manages TRU mixed waste.

2.1.2 Topographic Maps [20 NMAC 4.1, Subpart IX, 270.14(b)(19)]

Due to the size of LANL and the number of waste management units addressed in this permit application, several maps and figures are provided to meet the requirements of 20 NMAC 4.1, Subpart IX, 270.14(b)(19), revised November 1, 1995. All maps clearly show a map scale, the date of preparation, and a north arrow. The maps and figures used to fulfill these regulatory requirements include the following:

- The locations of the hazardous and mixed waste management units at TA-55 addressed in this permit application are shown on Map 2 of Revision 1.0 of the TA-55 Part A permit application.
- A LANL-wide 100-year floodplain map is provided on page 36 of the report included as Appendix A.

- Surface waters, including intermittent streams, are shown on Map 3 of Revision 1.0 of the TA-55 Part A permit application.
- Surrounding land uses are shown on Figure 2-1 of this section.
- Wind roses for LANL are shown on Figures 2-4 and 2-5 of this section.
- The legal boundaries of LANL are shown on Map 1 of Revision 1.0 of the TA-55 Part A permit application.
- Access control features (e.g., fences, gates) are shown on Figure 5-1 in Section 5.0 of this Part B permit application.
- Well locations are shown on Map 3 of Revision 1.0 of the TA-55 Part A permit application.
- Buildings and structures at TA-55 are shown on Map 2 of Revision 1.0 of the TA-55 Part A permit application.
- Natural surface drainages at TA-55 are shown on Map 2 of Revision 1.0 of the TA-55 Part A permit application.
- Access ways and internal roads are shown on Figure 2-6 of this section.

Map 1 of Revision 1.0 of the TA-55 Part A permit application is a topographic map at a scale of 1 inch (in.) = 3,000 ft. Map 2 of Revision 1.0 of the TA-55 Part A permit application is at a scale of 1 in. = 200 ft. Contour lines on Map 2 are in intervals of 10 ft, which are sufficient to detail natural drainage in the vicinity of the waste management units. As provided in 20 NMAC 4.1, Subpart IX, 270.14(b)(19), revised November 1, 1995, LANL requests that the New Mexico Environment Department (NMED) accept the maps at these scales and contour intervals due to the size of the waste management units, the extent of the LANL facility, and the topographic relief in the area.

Map 2 of Revision 1.0 of the TA-55 Part A permit application shows the locations and surrounding topography of the hazardous and mixed waste units at TA-55. Maps 1, 3, 4, and 5 are also included in Revision 1.0 of the TA-55 Part A permit application to satisfy the requirements of 20 NMAC 4.1, Subpart IX, 270.13(l), revised November 1, 1995. To meet the requirements of 20 NMAC 4.1, Subpart IX, 270.14(b)(19)(xii), revised November 1, 1995, topographic maps showing the locations of all the hazardous and mixed waste units and subunits at additional LANL locations are included in this section as Maps 1–15.

2.1.3 Wells and Surface Waters [20 NMAC 4.1, Subpart IX, 270.14(b)(19)(iii) and (ix)]

The municipal and industrial water supply for LANL and Los Alamos County is supplied by 11 deep wells in three well fields. The wells are located on the Pajarito Plateau and in canyons east of LANL. Water is pumped from the main aquifer, the surface of which ranges from approximately 600 to 1,200 ft below the surface of the plateau. The locations of supply wells, monitoring wells, test wells, springs, and surface-water sampling stations are shown on Map 3 of Revision 1.0 of the TA-55 Part A permit application. Surface water on LANL property is limited primarily to ephemeral, or intermittent, streams in the canyon bottoms. The volume of water flow in these streams is generally dependent upon storm runoff, snow melt, and numerous National Pollutant Discharge Elimination System (NPDES) outfalls discharging treated sanitary and industrial effluents. Perennial surface flow occurs in the Rito de los Frijoles south of LANL and in Santa Clara Canyon north of LANL. Springs on the flanks of the Jemez Mountains between elevations of 7,900 and 8,900 ft supply base flow throughout the year to the upper reaches of Cañon de Valle and in Guaje, Los Alamos, Pajarito, and Water Canyons (Purtymun, 1975). The flow volume from the springs is insufficient to maintain surface flow within more than the western third of the canyons before it is depleted by evaporation, transpiration, and infiltration into the underlying alluvium. Surface, well, and spring waters are sampled routinely and analyzed for radionuclides as well as organics (volatiles, semivolatiles, pesticides, herbicides, and polychlorinated biphenyls), heavy metals, fluorides, nitrates, carbonates, bicarbonates, silica, sodium, magnesium, and conductivity. Analytical results are published annually by LANL's Environmental Assessments and Resource Evaluations Group (ESH-20) (LANL, 1994b). Copies of this publication are submitted annually to the NMED and the U.S. Environmental Protection Agency (EPA), Region 6, Administrator.

LANL has one geothermal well at TA-57, the Fenton Hill Geothermal Site, approximately 20 air mi west of Los Alamos. An NPDES-permitted industrial outfall for geothermal discharge is located at this site. This industrial outfall is designated NPDES Serial No. 001. The Fenton Hill Geothermal Site is shown on Map 5 of Revision 1.0 of the TA-55 Part A permit application. Locations of all NPDES-permitted outfalls within the LANL boundary are provided on Map 4 of Revision 1.0 of the TA-55 Part A permit application.

2.1.4 Wind Rose [20 NMAC 4.1, Subpart IX, 270.14(b)(19)(v)]

Surface winds are light at Los Alamos, averaging 7 mi per hour (mph), or 3 meters per second (m/s). Typically, winds are strongest from March through May and weakest in December and January. The strongest winds are generally southwesterly to northwesterly and occur in the afternoon or evening. Night winds are usually west-northwesterly at the western edge of the Pajarito Plateau because of persistent cold air drainage down the plateau. Daytime winds are generally southeasterly to southwesterly, caused by upslope and up-valley winds. Daytime winds are also frequently westerly during the windy season (i.e., March through May).

Mean, annually averaged wind directions are plotted in wind roses at four sites (shown on Figures 2-4 and 2-5). Annually averaged daytime wind roses are depicted on Figure 2-4. Nighttime wind roses are shown on Figure 2-5. Day and night are defined by the times of sunrise and sunset. A wind rose is a circle with bars extending from the center, representing the direction from which the wind blows. The length of each bar is proportional to the wind-direction frequency. Each direction is 1 of 16 primary compass points (e.g., N, NNE) and is centered on a 22.5-degree-wide sector. The wind directions were taken at a height above ground of about 36 ft (11 meters [m]) at four stations: TA-6; TA-49; TA-53; and TA-54/White Rock. The wind direction at 300 ft (92 m) is also given for TA-6. The wind rose for this height is in the far upper-left corner of Figures 2-4 and 2-5. The numbers in the center of each wind rose represent the percent frequency of calm winds (i.e., winds less than 1 mph). Conditions at TA-55 are expected to most closely resemble those observed at TA-6, because TA-55 is located immediately adjacent to and east of TA-6.

Los Alamos surface winds often vary dramatically with time of day, location, and height above ground because of the complex terrain. On sunny days, thermally driven (convective) upslope winds develop over the Pajarito Plateau. Upslope winds are generally light, less than 6 mph (3 m/s). Winds usually become more south-southwesterly and southerly at locations toward the Rio Grande Valley, where a larger-scale, thermally driven up-valley wind predominates.

When sky conditions are clear and large-scale winds are light, locally produced winds reverse at night. At sunset, shallow drainage winds from the north to the northwest flow down the plateau, especially near the Jemez Mountains and in other areas with a greater slope. These winds can reach speeds of 6 to 8 mph (3 to 3.5 m/s).

2.1.5 Land Use [20 NMAC 4.1, Subpart IX, 270.14(b)(19)(iv)]

Los Alamos County, an incorporated county, encompasses several residential areas. The residential areas located closest to LANL are Los Alamos, located just north of LANL; White Rock, located east-southeast of LANL; and a trailer park within TA-61, which is located near the north-central boundary of LANL. According to 1992 University of New Mexico Bureau of Business and Economic Research data, the total population of Los Alamos County is approximately 18,200. Most of Los Alamos County, as well as adjoining portions of neighboring Sandoval, Rio Arriba, and Santa Fe Counties, is undeveloped. The only significant developments in Los Alamos County are the LANL facilities and the associated residential and commercial areas. Large tracts of land in the Jemez Mountains, west of LANL in Los Alamos County, are held by the U.S. Forest Service (i.e., Santa Fe National Forest) and the National Park Service (i.e., Bandelier National Monument) (Figure 2-1). This land is largely covered by piñon and ponderosa pine, juniper, fir, and aspen forests. Horticulture in the vicinity of LANL is limited to home gardens. In the river valleys to the east, agriculture is limited to the cultivation of relatively small irrigated plots. Primary crops are corn, chili, tree fruits, and alfalfa.

2.2 LOCATION INFORMATION

2.2.1 Seismic Standard [20 NMAC 4.1, Subpart IX, 270.14(b)(11)(i and ii) and 20 NMAC 4.1, Subpart V, 264.18(a)]

TA-55 is in compliance with the seismic standards of 20 NMAC 4.1, Subpart IX, 270.14(b)(11), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.18(a), revised November 1, 1995. A geologic field investigation, which consisted of exploratory trenching, was conducted within 3,000 ft of TA-55-4 and TA-55-185 during the fall of 1992 and summer of 1993. Based on trench stratigraphy, no evidence of Holocene faulting was observed (Woodward-Clyde Federal Services, 1995).

2.2.2 Floodplain Standard [20 NMAC 4.1, Subpart IX, 270.14(b)(11)(iii) and 270.14(b)(19)(ii)]

In accordance with 20 NMAC 4.1, Subpart IX, 270.14(b)(11)(iii), revised November 1, 1995, the hazardous and mixed waste units addressed in this permit application are not located within the 100-year floodplain boundary. As required in "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515" (EPA, 1990; EPA, 1994a), LANL has mapped all 100-year floodplain boundaries within the LANL complex.

A report was published documenting the floodplain mapping procedures (McLin, 1992). This report is included as Appendix A. A LANL-wide 100-year floodplain map is provided on page 36 of that report. Individual floodplain boundary location maps are being finalized that will supplement the floodplain report. The floodplain boundary maps will reside on LANL's computer-based Autometric™ Geographic Information System—Mapping Overlay Statistical System, a graphic information system database.

2.2.3 Soils

A comprehensive soil survey of Los Alamos County was prepared by Nyhan et al. (1978). This soil survey classifies the soils according to the soil series, soil type, and soil phase.

The principal parent materials of about 95 percent of the Los Alamos County soils are Bandelier Tuff, volcanic rocks of the Tschicoma Formation, volcaniclastic sedimentary rocks of the Puye Formation, basaltic rocks of Chino Mesa, and remnants of the El Cajete pumice. The remaining five percent of the soils were formed from colluvium, alluvium, andesitic rocks of the Paliza Canyon Formation, Cerro Rubio quartz latites, and tuffs associated with sediments of Cerro Toledo rhyolite. Textures of these soils range from very fine sandy loams (SM) and clay loams (CL) to gravelly, SM and stony, silty CL.

The soils at TA-55 are Carjo and Tocal series soils. The Carjo series consists of moderately deep, well-drained soils that formed in material weathered from tuff. The Carjo soil is classified in the Unified Soil Classification System (USCS) as clay-loam, loam (CL-ML). The top layer of the Carjo series consists of a grayish brown loam (ML), or very fine SM, approximately 10 centimeters (cm) thick. The subsoil is a brown to reddish brown CL and clay (CH) approximately 40 cm thick. The substratum, approximately 10 cm thick, is a light brown, very fine SM (Figure 2-7). Permeability rates range from 1.5 to 5.0 cm per hour (cm/hr) in the top layers to 0.15 to 5.0 cm/hr in the lower layers. The shrink-swell potential is low in the top and bottom layers and moderate in the middle layers. Available water holding capacity ranges from 0.14 to 0.21 cm per cm (cm/cm), and the soil pH is 6.3 to 7.8. Native vegetation for this soil type is mainly blue and black grama and ponderosa pine (Nyhan et al., 1978).

The Tocal series consists of very shallow to shallow, well-drained soils that formed in material weathered from tuff on gently to moderately sloping mesa tops. The Tocal soil is classified in the

USCS as very fine SM. The top layer of the Tocal series consists of a grayish brown, very fine SM, SM, or ML, approximately 10 cm thick. The subsoil is a reddish brown CL or CH, approximately 15 cm thick. The substratum is a light brown silt ML, about 5 cm thick (Figure 2-8). Permeability rates range from 1.5 to 15 cm/hr in the upper layers to 0.5 to 5 cm/hr in the lower layers. The shrink-swell potential is low in the upper layers, moderate in the middle layers, and low in the lower layers. Available water holding capacity ranges from 0.11 to 0.21 cm/cm, and the soil pH is 6.6 to 7.3. Native vegetation for this soil type is mainly ponderosa pine, mountain mahogany, and Kentucky bluegrass (Nyhan et al., 1978).

2.2.4 Geology

2.2.4.1 Regional Geology

The discussions of the regional geology, stratigraphy, structural geology, and ground water were extracted primarily from LANL's "Installation Work Plan for Environmental Restoration" (IWP) (LANL, 1993b). The IWP has been prepared in accordance with the Hazardous and Solid Waste Amendments Module VIII requirements of LANL's Hazardous Waste Facility Permit (New Mexico Environmental Improvement Division, 1989). One of the major components of the IWP is an installation description that provides information on current environmental conditions at LANL. The IWP is updated annually and submitted to the NMED.

LANL is located on the Pajarito Plateau along the eastern flank of the Jemez Mountains, which are part of the Jemez volcanic field. The Jemez volcanic field consists of approximately 432 cubic mi of volcanic rocks that cover an area of over 30 mi east to west and 50 mi north to south. The volcanic rocks were erupted from numerous vents, including a large multistage caldera (Gardner et al., 1986). The Jemez volcanic field (Figure 2-9) is located at the intersection of the Jemez lineament and the Rio Grande rift (Aldrich, 1986).

About 1.5 and 1.13 million years ago, respectively, two major volcanic eruptions in the Jemez Mountains produced widespread and voluminous ash-flow sheets. These ash-flow sheets are the Otowi and Tshirege Members of the Bandelier Tuff (Smith and Bailey, 1966; Spell et al., 1990). The Pajarito Plateau morphology is dominated by a gently eastward-sloping surface dissected by numerous steep-sided canyons. The Otowi and Tshirege Members of the Bandelier Tuff were erupted concomitantly with the collapse of the Toledo and Valles calderas, respectively. Volcanism continued after the formation of the calderas, as evidenced by the extrusion of domes

along ring fractures. The El Cajete pumice and Banco Bonito rhyolite flow comprise the latest eruption in the Jemez Mountains. This eruption occurred about 130,000 years ago (Gardner et al., 1986; Self et al., 1988). Solfataric and hot spring activity continue as vestiges of volcanic activity today, both within and outside of the Valles caldera (Goff et al., 1989).

The Pajarito Plateau is located in the western part of the Española basin of the Rio Grande rift, a major tectonic feature of the western United States. The eastern margin of the Española basin lacks distinct major faults, but faults of major vertical offset may exist within Precambrian rocks of the Sangre de Cristo uplift (Vernon and Riecker, 1989; Biehler et al., 1991). A prominent zone of major faults, which cuts Miocene to Quaternary rocks of the Jemez volcanic field, characterizes the western margin of the Española basin (Smith et al., 1970; Gardner and Goff, 1984; Goff et al., 1990). The location and development of the Jemez volcanic field was strongly influenced by these border faults (Gardner and Goff, 1984; Gardner et al., 1986).

Rocks exposed around the margins of and underlying the Española basin were deposited prior to the development of the Rio Grande rift. These rocks consist of Mississippian to Permian marine limestones, sandstones, and shales; Mesozoic marine to terrestrial sandstones and shales; and Eocene sandstones, shales, and freshwater limestones. Precambrian quartzite, granitic gneiss and schist, and greenstone are exposed in the cores of the flanking Sangre de Cristo, Nacimiento, and Brazos uplifts (Kelley, 1978) (Figure 2-9). Earliest sediments deposited in the Española basin are those of the Tertiary Abiquiu, Picuris, and Los Piños Formations. These formations consist of tuffaceous sandstones and volcaniclastic conglomerates derived largely from volcanic highlands to the north and northeast. They range in age from about 28 to 17 million years old (Baldridge et al., 1980; May, 1984; Ingersoll et al., 1990).

2.2.4.2 Site-Specific Geology

TA-55 is located in the central part of the Pajarito Plateau (Figure 2-10), which forms an apron of volcanic and sedimentary rocks around the eastern flanks of the Jemez Mountains. The plateau is aligned approximately north-south and is about 20 to 25 mi long and 5 to 10 mi wide. It is bounded on the east by White Rock Canyon (which contains the Rio Grande), on the north and northeast by the Puye escarpment, and on the west by Sierra de los Valles. The Pajarito Plateau slopes gently eastward from an elevation of about 7,500 ft near the mountains toward the Rio Grande, where it terminates at an elevation of about 5,400 ft in steep slopes and cliffs formed

by downcutting of the river. The plateau has been dissected into a number of narrow mesas by southeastward-trending streams. The stratigraphy and structural features of the Pajarito Plateau are described in the following sections.

2.2.4.2.1 Stratigraphy

The mesas of the Pajarito Plateau, comprised primarily of Bandelier Tuff, are covered by a veneer of soils and alluvial deposits and are underlain by a sequence of sedimentary and volcanic rocks typical of a terrain produced by concurrent sedimentation and volcanism (Figure 2-11). The oldest unit exposed around the margins of the Pajarito Plateau and penetrated by water-supply wells is the Miocene and early Pliocene age Santa Fe Group. The Santa Fe in this area is a thick series of terrestrial conglomerates, sandstones, and mudstones, with minor limestones, evaporites, volcanic tuffs, and intercalated basalts. Most production from water wells at Los Alamos is from the Santa Fe Group (Griggs and Hem, 1964; Purtymun, 1984). Sedimentary rocks usually dominate the Santa Fe, although basalts constitute up to 45 percent of the section penetrated by water-supply wells at LANL (Purtymun et al., 1984). In the Española basin and underlying the northern part of Los Alamos County, the Santa Fe is subdivided into two formations, the Tesuque and the Chamita. Several members of the Tesuque and Chamita Formations reflect the diversity of the coalesced alluvial fans deposited in the Española basin (Galusha and Blick, 1971; Ingersoll et al., 1990). Early investigators inferred that all Santa Fe rocks exposed around the flanks of the Pajarito Plateau and intersected by water-supply wells beneath the plateau belonged to the Tesuque Formation, although more recent investigations suggest that some of the upper Santa Fe is Chamita Formation (Turbeville et al., 1989).

Interfingering with the Santa Fe Group are the volcanic rocks of the Tschicoma Formation. This formation consists of a sequence of dacitic domes and lavas that were erupted from vents in the central to northeastern Jemez Mountains between about 7 and 3 million years ago (Gardner et al., 1986). These volcanic rocks outcrop extensively in the mountains immediately west of LANL. They are reported in the subsurface beneath the western and southern part of the LANL boundary (Weir and Purtymun, 1962; Griggs and Hem, 1964; Dransfield and Gardner, 1985).

Overlying the Santa Fe Group and interfingering with the Tschicoma Formation are the rocks of the Puye Formation. The Puye consists of a Pliocene-to-Pleistocene fanglomerate that was shed

eastward from Tschicoma volcanic centers in the northeastern Jemez volcanic field between about 4 and 1.7 million years ago. Earlier workers (e.g., Griggs and Hem, 1964) included the Totavi Lentil, now considered a separate formation, as part of the Puye. Most of the Puye conglomerates contain cobbles of dacite and andesite in a volcanic sand matrix. The Puye includes stream-flow deposits, debris-flow deposits, volcanic-ash and block-flow deposits, and ash-fall and pumice-fall deposits (Waresback and Turbeville, 1990). It is best exposed north of LANL; however, lithologically similar rocks have been penetrated in drill holes as far south as Frijoles Mesa (Weir and Purtymun, 1962; Dransfield and Gardner, 1985). The Puye is interstratified with basalts of the Cerros del Rio volcanic field under parts of LANL. In Los Alamos water-supply wells, the top of the main aquifer is usually within the Puye.

Immediately beneath the fanglomerates of the Puye Formation and unconformably overlying the Santa Fe Group is a section of poorly consolidated fluvial gravels. Griggs originally named this unit the Totavi Lentil of the Puye Formation (Griggs and Hem, 1964). The gravels contain clasts that differ lithologically from those in the Puye, including abundant well-rounded cobbles and boulders of quartzite, granite, and pegmatite that record a source area distant from the Jemez Mountains. This unit probably represents axial channel gravels of an ancestral Rio Grande. Waresback and Turbeville (1990) redefined these fluvial gravels as a separate formation, the Totavi Formation. The Totavi includes lacustrine sediments that are complexly interstratified with the upper Puye Formation. The Totavi was reported in some water-supply wells beneath LANL between the Santa Fe and the Puye, occurring at lower elevations in the eastern wells (Cooper et al., 1965; Purtymun et al., 1983; Purtymun et al., 1984). The presence of the Totavi at these levels suggests that river gravels of the Rio Grande were deposited on erosional surfaces. This setting is analogous to Quaternary terraces of the Rio Grande in the Española basin described by Dethier et al. (1988) before deposition of the Puye fans, which unconformably overlie older formations.

Overlying and interfingering the Totavi and Puye Formations are the basaltic flows, breccias, and scoria of the Cerros del Rio basalts. This formation occurs in the subsurface beneath much of the Pajarito Plateau (Dransfield and Gardner, 1985) and outcrops in the east and southeast parts of Los Alamos County (Griggs and Hem, 1964). These volcanic rocks are associated with the Pliocene-to-Pleistocene Cerros del Rio basalt field, east of the Rio Grande. Rocks from this field have been dated at 4.6 to 2.0 million years old (Gardner et al., 1986), and the youngest lava

flows occurred between 1.5 and 1.13 million years ago. Part of this volcanic field is also known as the basaltic rocks of Chino Mesa (Griggs and Hem, 1964). The top of the main aquifer beneath LANL is locally within this section of basaltic rocks.

In the subsurface beneath much of the Pajarito Plateau and in outcrops in many of the canyons, the Otowi Member of the Bandelier Tuff underlies the Tshirege Member (Griggs and Hem, 1964). The Otowi Member is mostly a nonwelded ash-flow tuff (ignimbrite) that was erupted from the Jemez Mountains approximately 1.5 million years ago (Spell et al., 1990). It is highly porous, poorly indurated, and composed of multiple flow units. Cooling joints are typically absent in outcrops because of relatively low emplacement temperatures and the lack of induration. Generally the Guaje Pumice Bed occurs at the base of the Otowi Member. The Guaje consists of sorted pumice fragments that average from 0.8 to 1.6 in. in size (Crowe et al., 1978). An interbedded sequence of rhyolitic tuffs and sediments commonly occurs between the Otowi and Tshirege Members of the Bandelier Tuff. The rhyolitic tuffs were erupted between 1.5 and 1.2 million years ago, predominantly from the Cerro Toledo domes in the northeastern Jemez Mountains (Heiken et al., 1986). Beneath the Pajarito Plateau, the sediments are epiclastic sands and sandy gravels that lithologically resemble Puye Formation fanglomerates. Deposits in this interval at LANL have sometimes been referred to as "Tsankawi pumice" or the "Tsankawi member."

The Tshirege Member of the Bandelier Tuff is the most widespread rock unit on the Pajarito Plateau (Griggs and Hem, 1964). The Tshirege was erupted from the Valles caldera about 1.13 million years ago (Spell et al., 1990). It is composed of multiple flow units of crystal-rich ignimbrite, which display significant variations in welding and alteration, both in a single stratigraphic section and with varying distance from the caldera. To the west, individual units tend to be thicker and more welded. Flow units are locally separated by volcanic surge deposits of well-sorted, fine-grained, cross-bedded crystal and pumice fragments. Vapor-phase alteration occurs in much of this unit. Often the base of the Tshirege is marked by 1.5 to 10 ft of bedded, unconsolidated, pumice-rich ash-fall tuff of Tsankawi pumice (Bailey et al., 1969; Crowe et al., 1978). In ash-flow tuffs, cooling joint spacing varies primarily with the thickness of the unit, emplacement temperature, substrate temperature, and topography. Joint density tends to be greatest in welded tuff and least in nonwelded tuff. Hydraulic conductivities are generally greatest

in the fractured, welded parts of ash flow tuffs and least in the nonwelded parts (Crowe et al., 1978).

2.2.4.2.2 Structural Geology

The Pajarito fault system forms the western margin of the Española basin. This fault system exhibits Holocene movement and historic seismicity (Gardner and House, 1987; Gardner et al., 1990). The fault system is made up of over 65 mi of mapped fault traces. It connects with regional structures that extend at least as far as Cochiti to the south and Taos to the northeast (Gardner and House, 1987).

Within Los Alamos County, the Pajarito fault system consists of a number of active or potentially active faults, including the Pajarito, Rendija Canyon, and Guaje Mountain faults (Figure 2-12). The Pajarito fault is a zone of faulting that is greater than 0.25 mi wide. Its major scarp forms the western boundary of LANL. Near the southwestern corner of LANL's boundary, the major scarp of the Pajarito fault is over 410 ft high in rocks about 1 million years old. Movement on this fault is normal-oblique. The eastern side of the fault is relatively downdropped. Where exposed north of Los Alamos Canyon, the Rendija Canyon and Guaje Mountain faults are characterized by zones of gouge and breccia ranging from 100 to 150 ft wide. The Rendija Canyon and Guaje Mountain faults produce visible offsets of stratigraphic horizons; both are dominantly normal-oblique faults whose west sides are downdropped. Some strike-slip movements on the Guaje Mountain fault have been noted (Wachs et al., 1988; Aldrich and Dethier, 1990; Gardner et al., 1990). The youngest movements on the Guaje Mountain fault have been constrained between roughly 4,000 and 6,000 years (Gardner et al., 1990). Displacement on the Guaje Mountain and Rendija Canyon faults apparently decreases south of Los Alamos Canyon, where narrow zones of faulting are replaced by over 300-ft-wide zones of intense brecciation and fracturing superimposed on the network of cooling joints in the Bandelier Tuff (Vaniman and Wohletz, 1990).

A variety of data have been integrated to produce structure contour and paleogeologic maps of the pre-Bandelier Tuff surface beneath the Pajarito Plateau (Dransfield and Gardner, 1985). These maps indicate that subsurface rock units are cut by a series of down-to-the-west normal faults. However, the overlying Bandelier Tuff is not obviously displaced by these buried faults.

Detailed fracture studies have shown that fracture abundances and apertures increase in the Bandelier Tuff over some of the buried fault projections (Vaniman and Wohletz, 1990).

2.2.5 Ground Water

In the Los Alamos area, ground water occurs in three modes: (1) water in shallow alluvium in some of the larger canyons, (2) as perched water (a ground-water body above a less permeable layer that separates it from the underlying main aquifer by an unsaturated zone), and (3) the main aquifer of the Los Alamos area.

Alluvium in canyons that head on the Pajarito Plateau is relatively fine-grained and consists of clays, silts, sands, and gravels derived from the Bandelier Tuff. Saturated hydraulic conductivity of the alluvium ranges from 10^{-2} cm per second (cm/s) for sand to 10^{-4} cm/s for silty sand (Abeele et al., 1981). Ephemeral runoff in some canyons infiltrates the alluvium until downward movement is impeded by the less permeable tuff and sediments. The impeded movement results in a buildup of a shallow alluvial ground-water body. The horizontal and vertical extent of the alluvial water is controlled primarily through depletion by evapotranspiration and by limited movement into the underlying rocks (Purtymun et al., 1977). The limited saturated thickness and extent of the alluvial ground water preclude its use as a viable source of municipal and industrial supply to LANL and the surrounding community.

Perched ground-water bodies occur at intermediate depths in the conglomerates and basalts beneath the alluvium in portions of Pueblo, Los Alamos, and Sandia Canyons. Depth to perched water ranges from about 90 ft in the midreach of Pueblo Canyon to about 450 ft in lower Sandia Canyon. Water from the Pueblo Canyon perched aquifer discharges at Basalt Spring in lower Los Alamos Canyon. Recent tritium measurements of intermediate depth perched ground water from four locations in Pueblo and Los Alamos Canyons indicate that recharge to these depths has occurred during the last several decades (Gallaher, 1995).

The only aquifer of the Pajarito Plateau capable of providing a large-scale municipal and industrial water supply is in rocks of the Santa Fe Group and Puye Formation. The upper surface of this main aquifer rises westward from the Rio Grande through the Santa Fe and into the lower part of the Puye beneath the central and western parts of the plateau (Figure 2-11). The exact source of recharge to the main aquifer is unknown. Three sources of recharge have been suggested by

Cushman (1965): infiltration of runoff in canyons, underflow from the Valles caldera through the Tschicoma Formation, and infiltration on mesas. A large quantity of hydrologic, structural, and geochemical data indicate, however, that the caldera may not serve as an appreciable source of recharge to the main aquifer (Conover et al., 1963; Griggs and Hem, 1964; Goff, 1991). Furthermore, natural recharge through undisturbed Bandelier Tuff on the mesa tops is believed to be insignificant (Purtymun and Kennedy, 1971; Kearl et al., 1986). Limited data exist to support an evaluation of canyon runoff and alluvial water as a recharge source. Recent work using tritium and carbon-14 as hydrologic tracers indicates that some downward movement of moisture occurs beneath the canyons (LANL, 1993b; LANL, 1994b) and that some recharge has occurred at three locations (i.e., Los Alamos, Mortandad, and Pueblo Canyons) over the last four decades (Gallaher, 1995). Investigations are continuing to further evaluate the possible pathways for tritium movement toward the main aquifer. Water-level elevations suggest that ground water flows from the Jemez Mountains east and east-southeast toward the Rio Grande, where a part is discharged into the river through seeps and springs (Purtymun et al., 1980) (Figure 2-13). It is inferred that major recharge occurs from the west because the piezometric surface slopes downward to the east. The ground-water flow rate ranges from 20 ft per year (ft/yr) in the Tesuque Formation to 345 ft/year in the more permeable Puye (Purtymun, 1984).

Figure 2-13 shows contours drawn to depict the piezometric surface of the main aquifer. The hydraulic gradient of the aquifer averages about 60 to 80 ft per mi (ft/mi) within the Puye but increases to 80 to 100 ft/mi along the eastern edge of the plateau as the water enters the Santa Fe. The depth to the water table under LANL ranges from about 600 to 1,200 ft. The wells in the main aquifer near the Rio Grande exhibit artesian conditions.

As expected, wells completed in the high permeability sediments and volcanics of the Santa Fe Group and Puye Formation are very productive. Wells located in the eastern well field, which penetrates about 1,600 ft of the fine-grained sediments of the Santa Fe, yield an average of 500 gallons per minute (gal/min), with a specific capacity of 8 gallons per minute per foot (gal/min/ft) of drawdown. Wells in the central part of the plateau, which are completed in the Puye and in the coarser sediments of the Santa Fe, are higher yielding and average 1,000 gal/min, with a specific capacity of about 35 gal/min/ft of drawdown.

Water-balance calculations for the area of LANL indicate that the annual evapotranspiration rate exceeds the annual precipitation rate. Additionally, field investigations have shown that infiltration of precipitation into the Bandelier Tuff is essentially zero. At depths below 10 ft, the volumetric moisture content of the tuff at LANL varies from about 4 to 6 percent on the mesas and from approximately 6 percent to saturation in the canyons with perched aquifers. In canyons where no perched aquifers are present, the volumetric moisture content of the tuff at depths below 10 ft ranges from about 4 to 10 percent. If sufficient moisture is present to permit migration of moisture, unsaturated flow would be the predominant mechanism of movement in the Bandelier Tuff. If insufficient moisture is present, vapor phase transport appears to be the predominant mechanism of movement. Additional information on Los Alamos ground-water and vadose zone characteristics is presented in "Hydrogeologic Assessment of Technical Area 54, Areas G and L, Los Alamos National Laboratory" (IT, 1987) and in the IWP (LANL, 1993b).

Ground-Water Monitoring [20 NMAC 4.1, Subpart IX, 270.14(c) and 20 NMAC 4.1, Subpart V, 264.90(a)]

Requirements for ground-water monitoring and protection specified in 20 NMAC 4.1, Subpart IX, 270.14(c), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.90(a), revised November 1, 1995, apply to owners and operators of the following "regulated units" only: surface impoundments, waste piles, land treatment units, and landfills. This permit application addresses container storage areas, storage tank systems, and a cementation unit, which are not regulated units subject to 20 NMAC 4.1, Subpart IX, 270.14(c), revised November 1, 1995.

2.3 TRAFFIC PATTERNS [20 NMAC 4.1, Subpart IX, 270.14(b)(10)]

2.3.1 General

The rugged topography of alternating mesas and canyons present at LANL limits traffic circulation to only a few major arterial roads. A total of 85 mi of paved roads are present within LANL (Pan Am World Services Inc., 1986). The major roads are shown on Figure 2-14. There are 19 mi of highway, 22 mi of TA access roads, and 44 mi of roads in LANL's TAs.

The main access route to LANL is State Road 502; the majority of traffic to LANL approaches from the east on this road. Alternate access routes are available from the south on State Roads 4 (NM 4) and 501 (West Jemez Road).

The pattern of east-west trending canyons at LANL prohibits north-south automobile travel in nearly all portions of LANL, with the exception of Diamond Drive. Los Alamos Canyon is spanned at Diamond Drive by an 820-ft-long steel-arch bridge that was completed in 1951 and improved in 1993. This bridge provides the main access between LANL facilities located on either side of Los Alamos Canyon.

Approximately 10,000 people are currently employed at LANL (including full-time, part-time, and casual LANL personnel and subcontractors). Roughly 4,000 people commute to LANL daily from communities outside Los Alamos County.

2.3.2 Waste Collection Areas

Hazardous and mixed waste is generated at TAs throughout LANL. Small quantities of waste are generally accumulated in containers at less-than-90-day storage areas or satellite accumulation areas and then packed in containers, such as drums, boxes, or crates, for transport, as necessary, to permitted storage or treatment areas or to storage or treatment areas operating under the requirements of 20 NMAC 4.1, Subpart VI, revised November 1, 1995. Bulk liquid waste is contained primarily in drums or tanks. Because hazardous and mixed waste may be generated throughout LANL, waste transport may occur on nearly all roads within LANL.

2.3.3 Routes of Travel

Hazardous and/or mixed waste stored and treated at TA-55 is generated at TA-3 and TA-55. Hazardous and/or mixed waste is occasionally transported from TA-55 to other areas at LANL (e.g., TA-54). The primary traffic routes that may be used to transport hazardous and mixed waste to and from TA-55 include Diamond Drive, Pajarito Road, Pecos Drive, and Mesita del Buey Road (Figures 2-6 and 2-14). Because DOE relies on TA-55 to maintain core capabilities, and to develop new technologies as necessary for the processing of nuclear materials (which may include the treatment of TRU mixed wastes currently inventoried at other sites within DOE), in the future, nuclear material and/or TRU mixed waste may be accepted from off site.

2.3.4 Traffic Volumes

According to a 1991 traffic study, the peak traffic periods are between 7:15 and 8:15 a.m., 12:20 and 1:20 p.m., and 4:25 and 5:25 p.m. (Los Alamos County, 1991). The 1991 traffic study was limited to the intersection of Diamond Drive and Trinity Drive, just north of TA-3. Consequently,

the data presented in the study should reflect the existing traffic conditions in the TA-3 area at LANL. TA-3 will typically have higher vehicular volumes than the rest of LANL; thus, this study provides a conservative estimate of facilitywide traffic volumes. Maps from the cited study depicting vehicular traffic-count movements at the intersection of Diamond and Trinity Drives are included in Appendix B. Based on the 1991 traffic study, the Diamond Drive and Trinity Drive intersection had a volume of 2,269 vehicles from 7:15 to 8:15 in the morning and 2,096 from 4:25 to 5:25 in the afternoon. The count is biased low for the following reasons: because the northbound traffic from Diamond Drive turning east onto Trinity Drive was not fully tallied during this study; and because alternate routes were being used while the Los Alamos Canyon bridge was being improved.

Appendix B also includes data from a traffic count conducted at the same intersection in September 1992 (Los Alamos County, 1992). In this count, the traffic volume from 7:15 to 8:15 a.m. was 3,047 vehicles. From 4:30 to 5:30 p.m., the volume was 3,313 vehicles. The traffic volumes in the 1992 study were higher than those in the 1991 study because in the 1992 study, northbound traffic from Diamond Drive turning east onto Trinity Drive was tallied, whereas it was not fully tallied in the 1991 study.

2.3.5 Traffic Control Signals

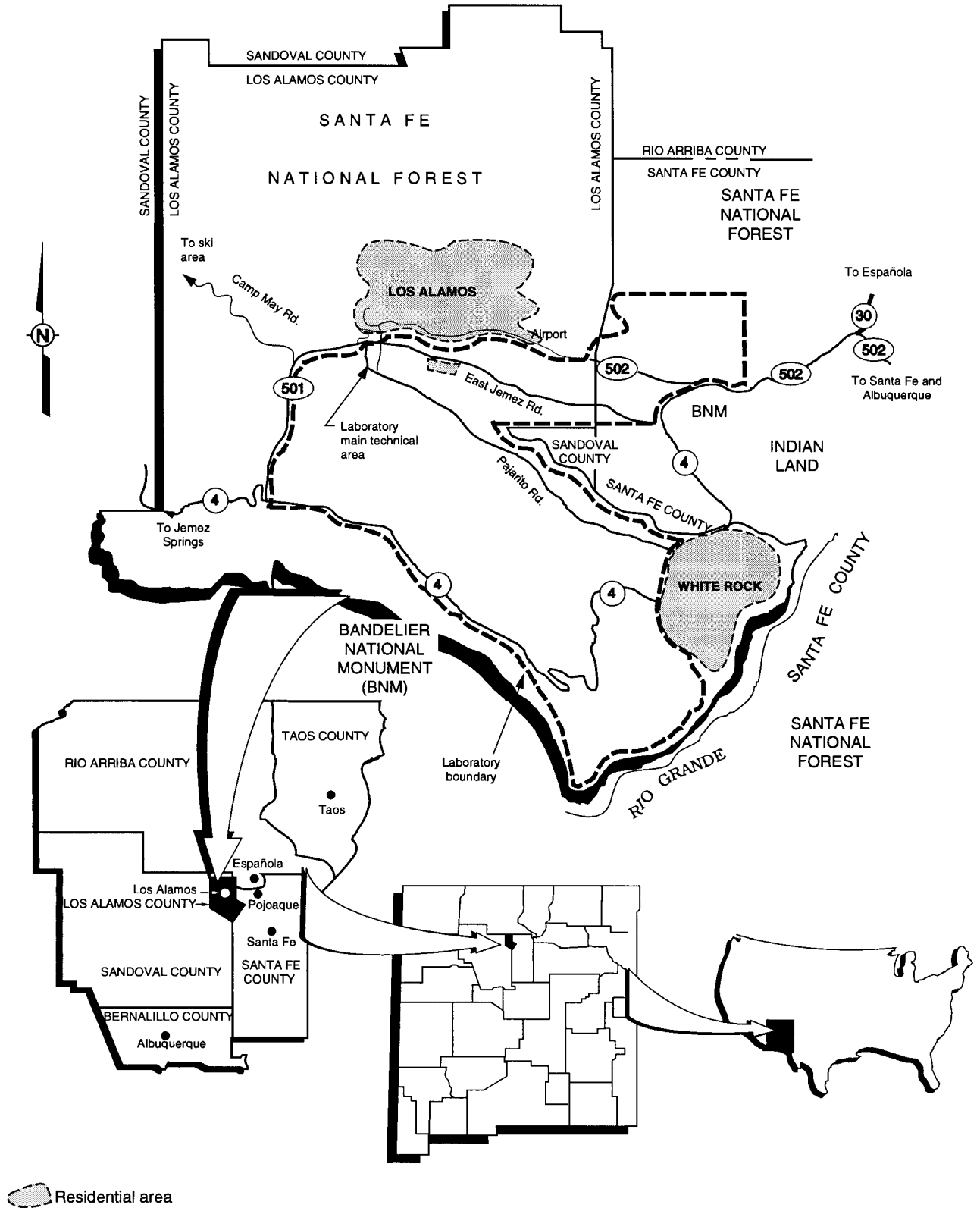
Sitewide traffic flow at LANL is controlled by traffic lights, stop signs, and yield signs. Traffic lights are in place at all major intersections. Traffic signs are used at "T" intersections throughout LANL. Access to the high-security TAs is controlled by security guards and is restricted to vehicles having specific identification. Only personnel having appropriate security clearance and identification or escorted visitors are allowed access to the secured TAs. Vehicles and personnel entering these TAs are subject to periodic search by security personnel.

Traffic control signals within TA-55 include stop signs, posted speed limits, and other traffic and pedestrian control signs. The locations of existing signs at TA-55 are shown on Figure 2-6.

2.3.6 Road Load-Bearing Capacity

Roads at LANL carrying the greatest traffic volumes include Diamond Drive, Pajarito Road, and East and West Jemez Roads. These roads were constructed with a 10-in.-thick base overlain with a 5-in.-thick asphaltic concrete surface. They were designed and built in conformance with

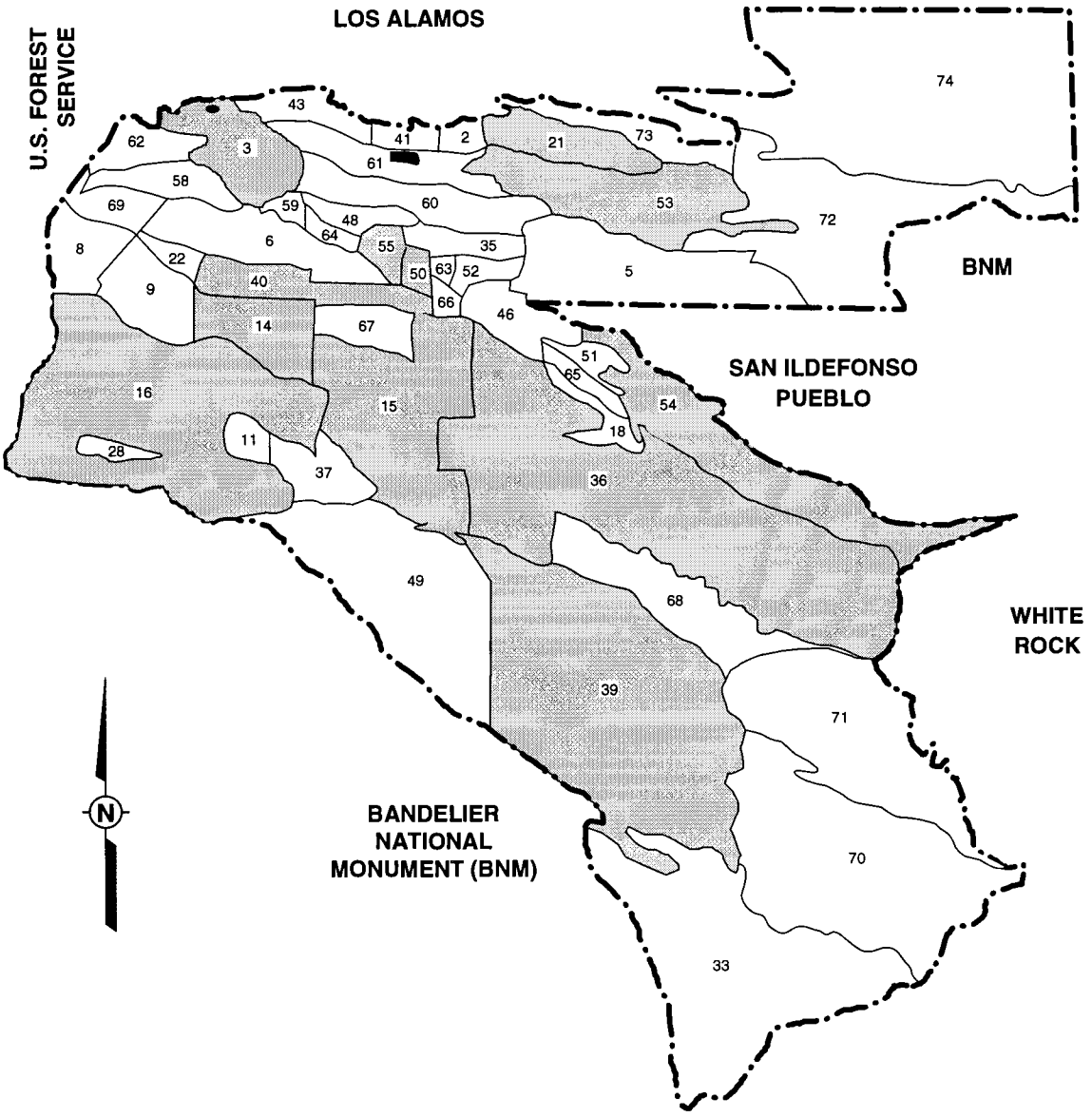
American Association of State Highway Transportation Officials specification HS-20. This specification is intended to accommodate truck loading capacities of 32,000 pounds per axle. Roads within TAs are generally two-lane roads with asphaltic concrete surfaces.



Modified from: "Environmental Surveillance at Los Alamos During 1992," 1994, LA-12764-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure 2-1

Regional Location Map of Los Alamos National Laboratory and Surrounding Land Use



Shading indicates technical areas in which hazardous waste or mixed waste units are located or planned for construction.

Not LANL property.

4800 0 4800
Scale in Feet

Note: Technical Area 57, the Fenton Hill Geothermal Site, is not shown on this figure.

Figure 2-2
Location Map of Los Alamos National Laboratory (LANL) Technical Areas

761157\TA-55 PT-B A25

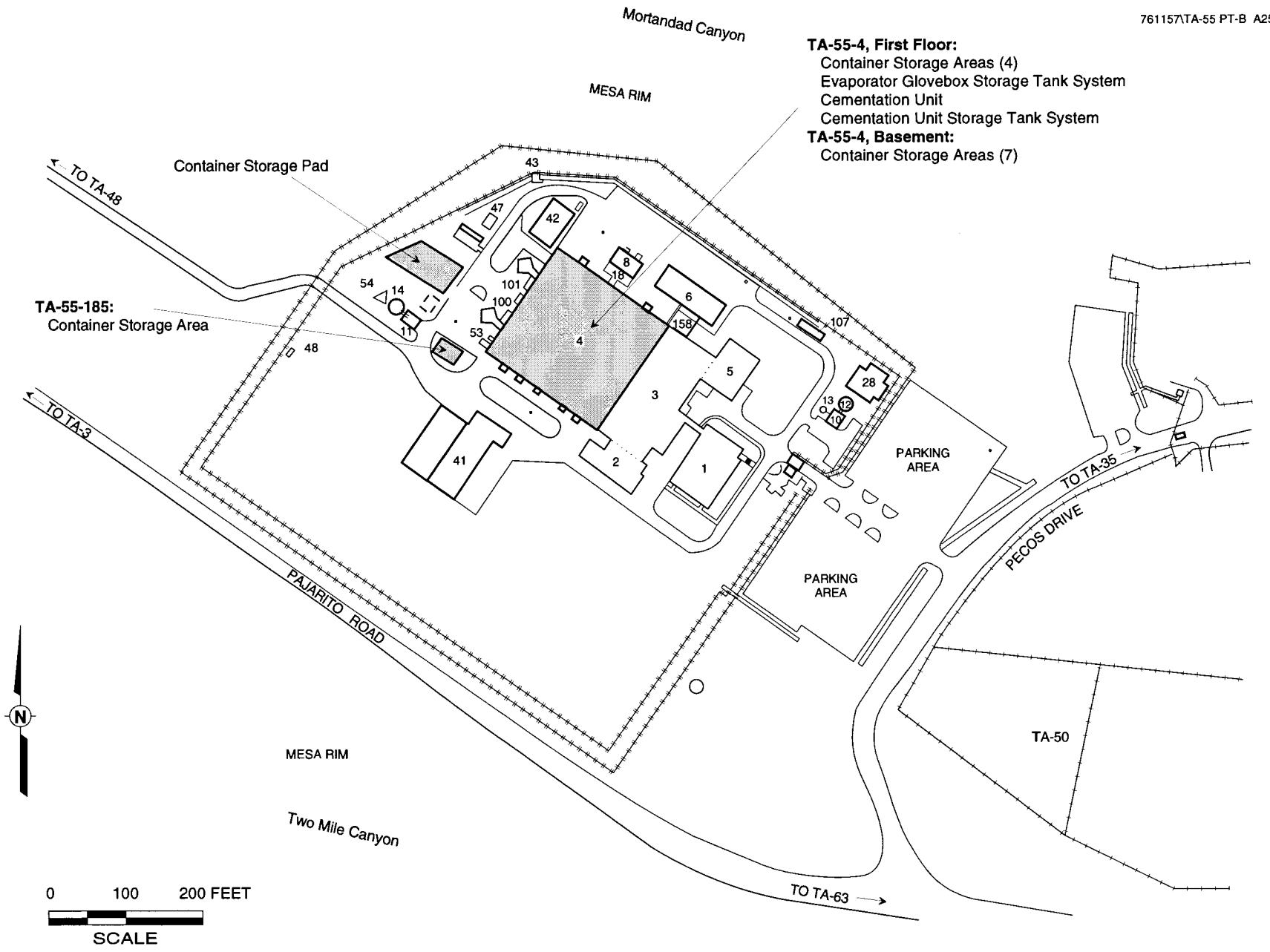
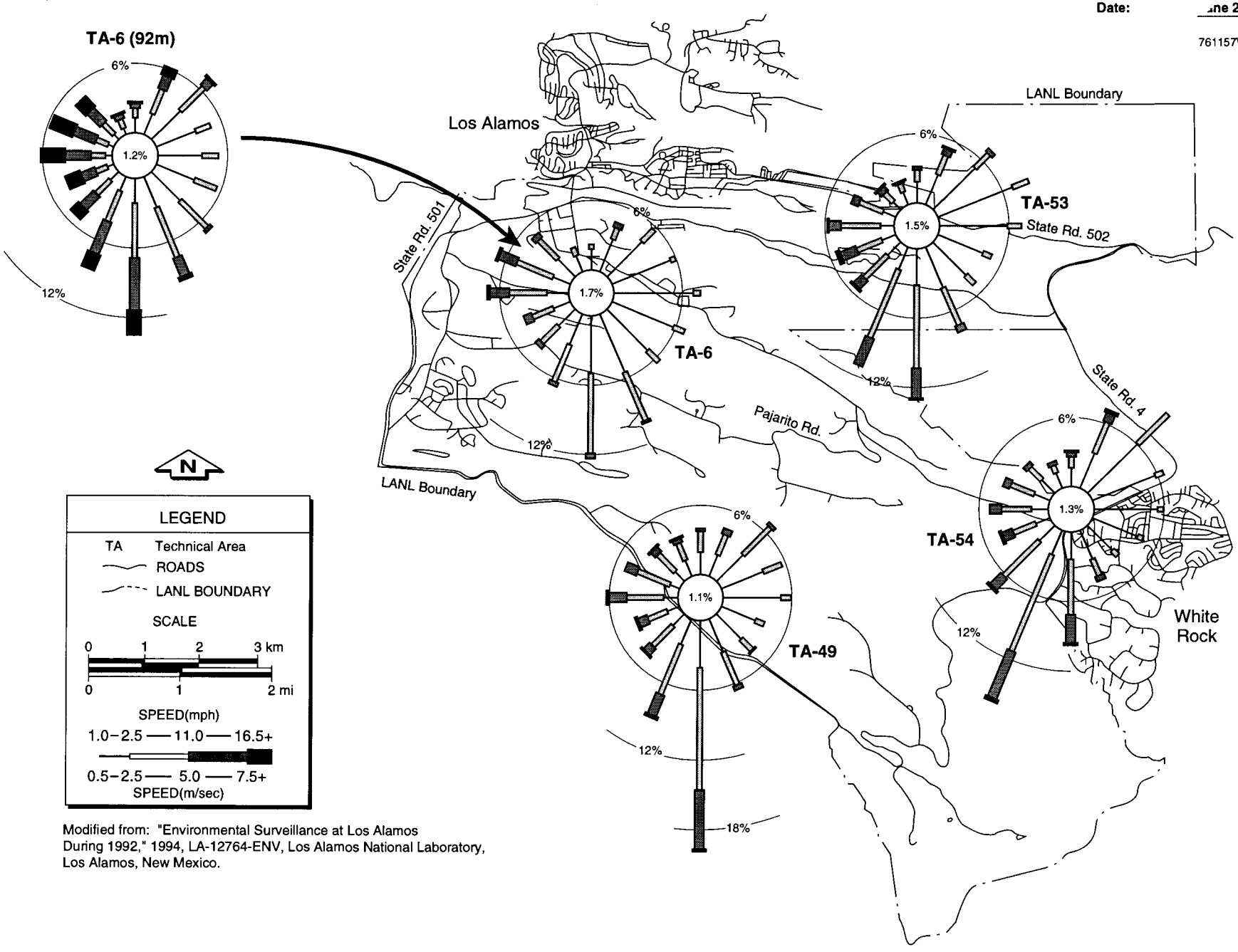
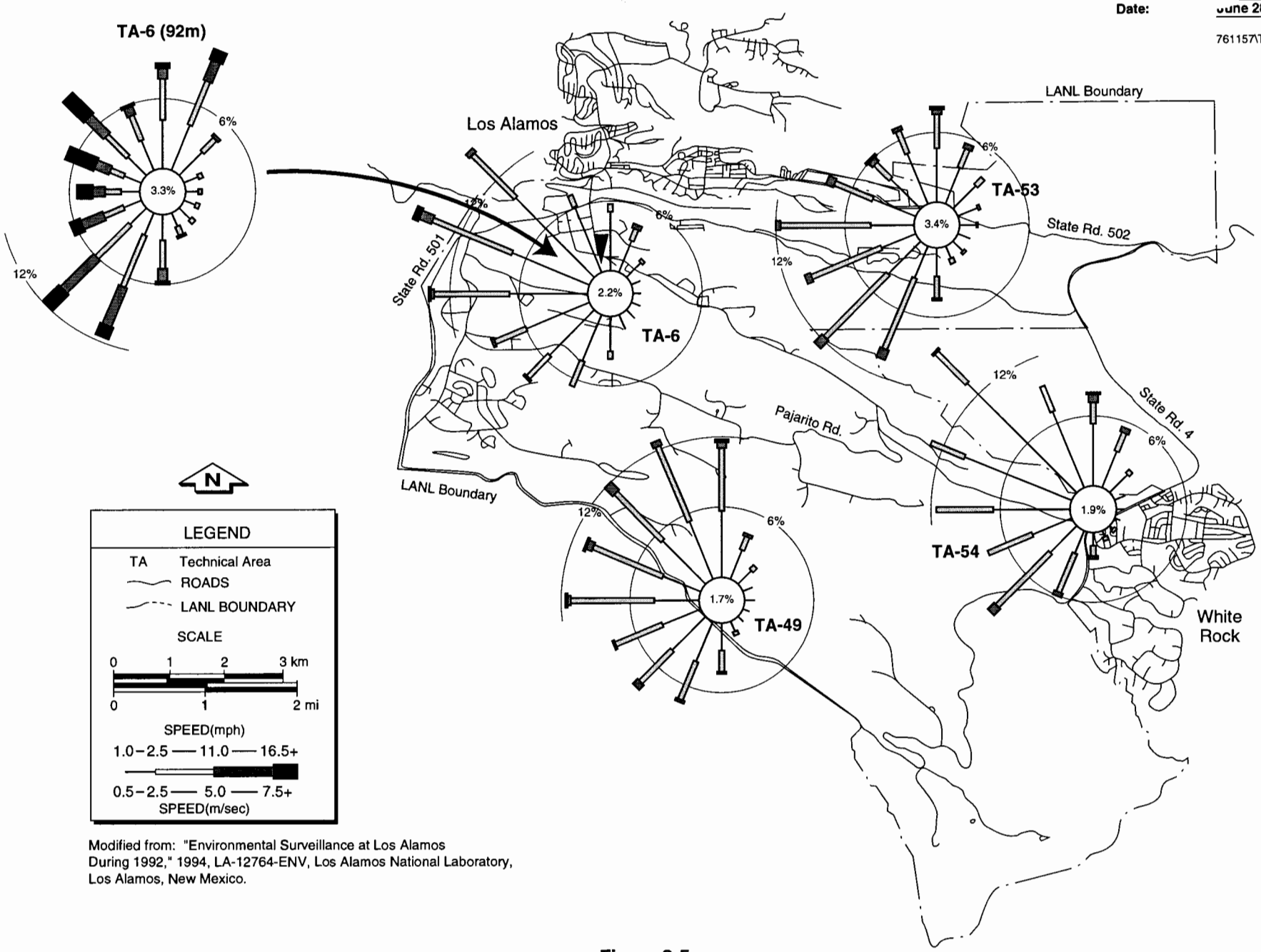


Figure 2-3
Locations of Waste Management Units at Technical Area (TA) 55



Modified from: "Environmental Surveillance at Los Alamos During 1992," 1994, LA-12764-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure 2-4
Annual Wind Roses for Los Alamos National Laboratory (LANL)—Day



Modified from: "Environmental Surveillance at Los Alamos During 1992," 1994, LA-12764-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure 2-5

Annual Wind Roses for Los Alamos National Laboratory (LANL)—Night

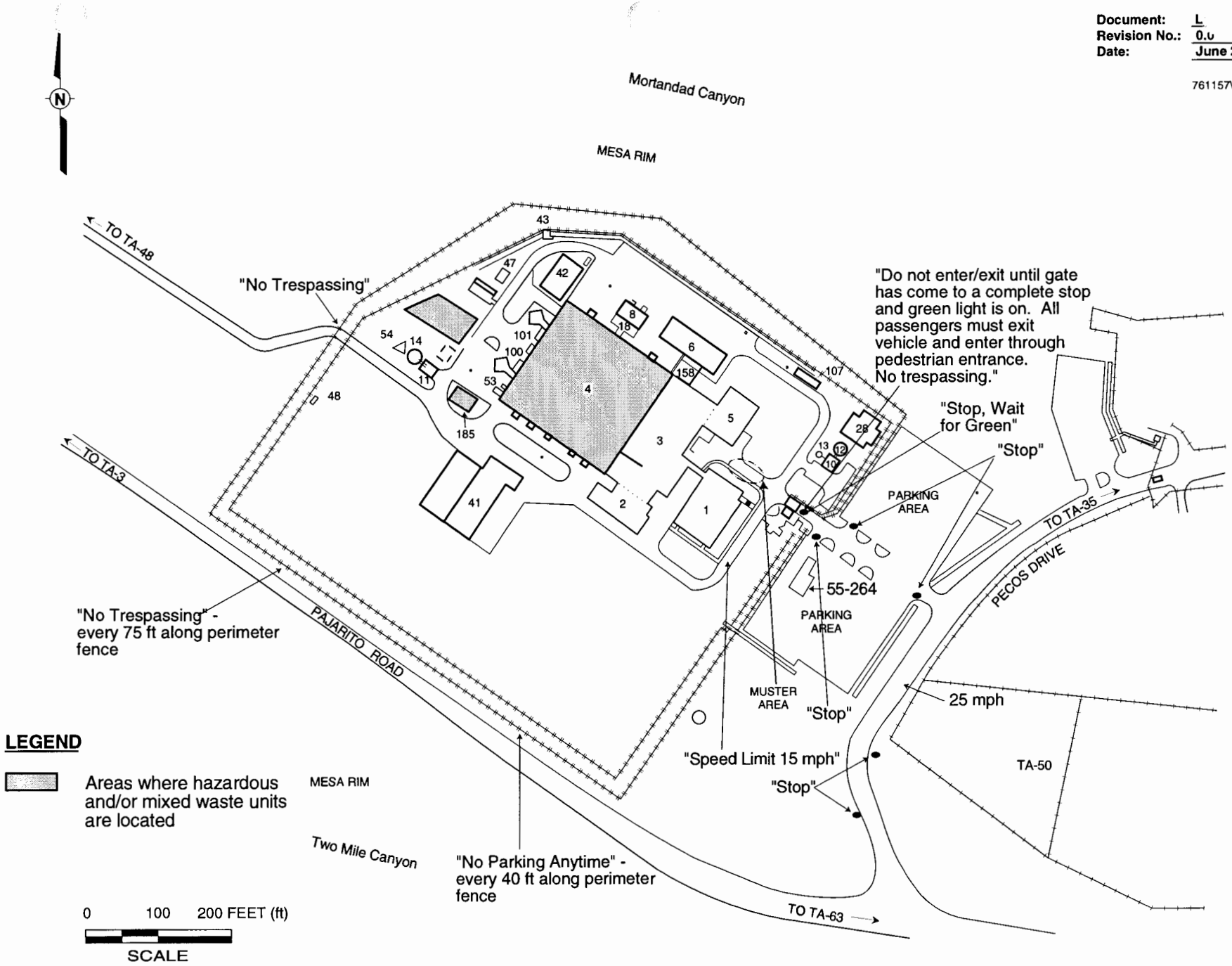
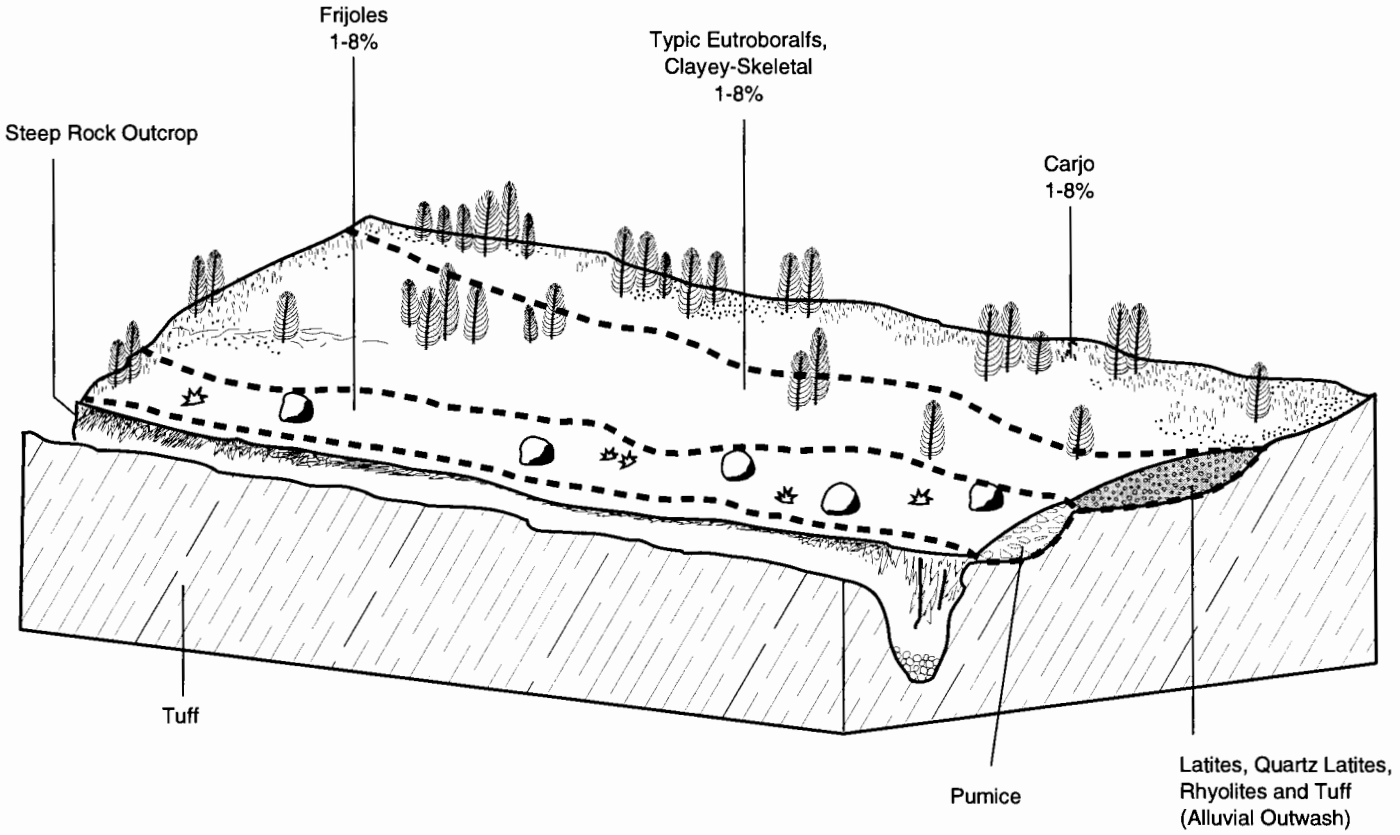
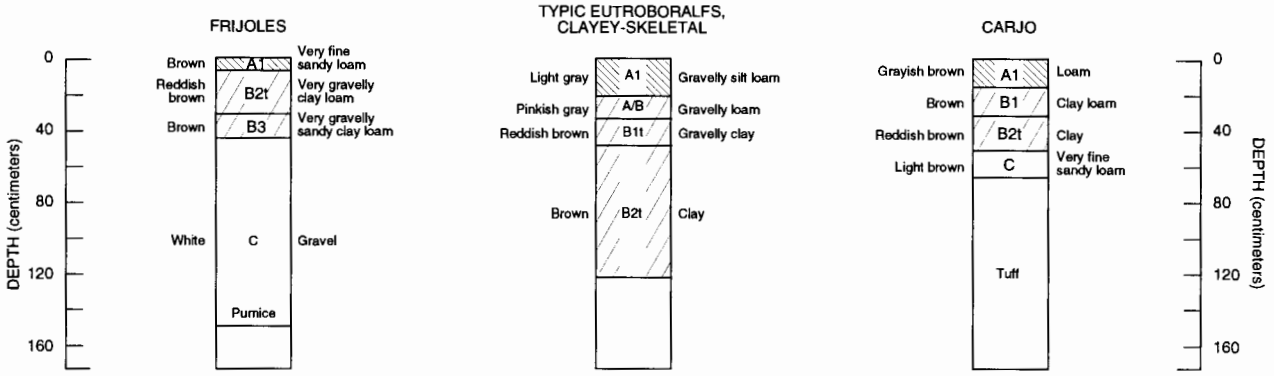


Figure 2-6

Location Map of Access Roads and Traffic Control Signs in the Vicinity of Technical Area (TA) 55

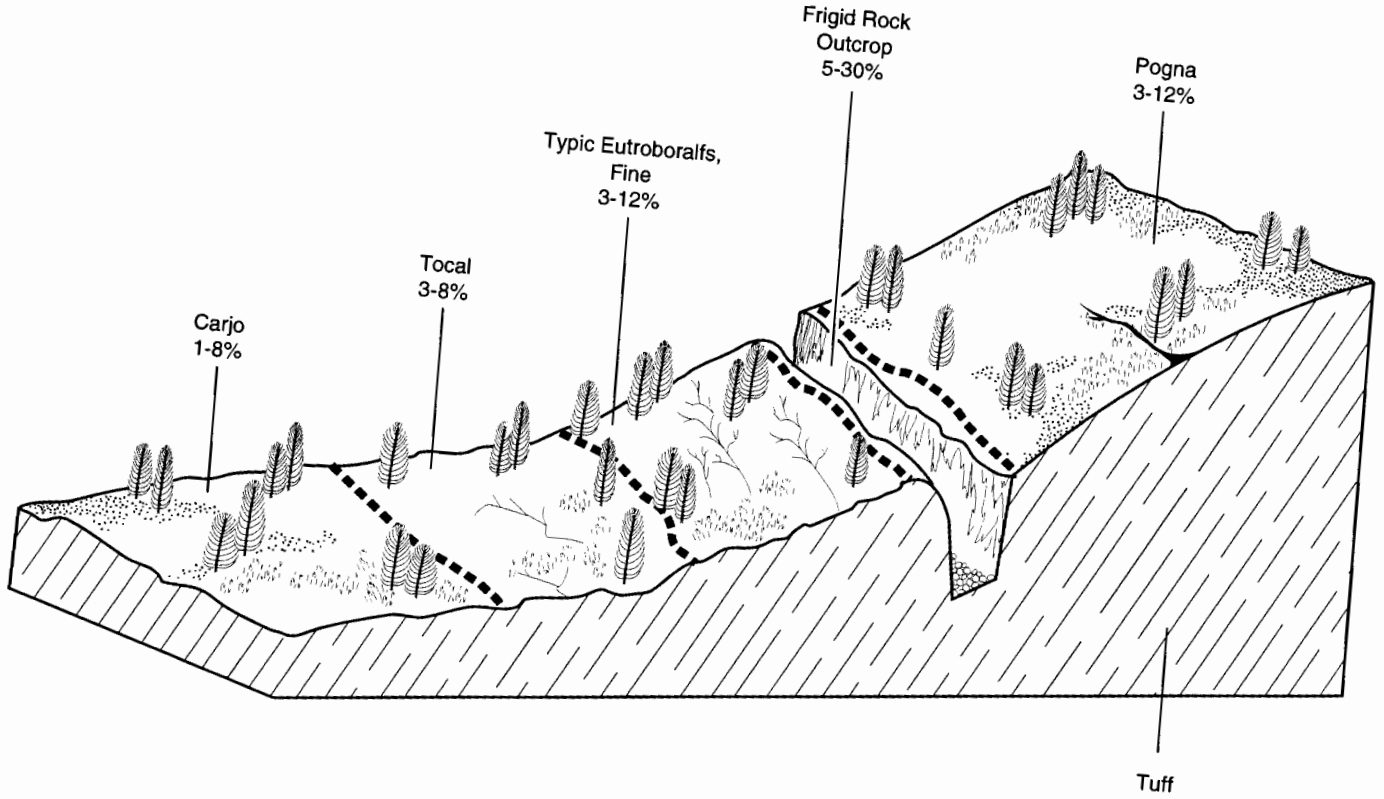


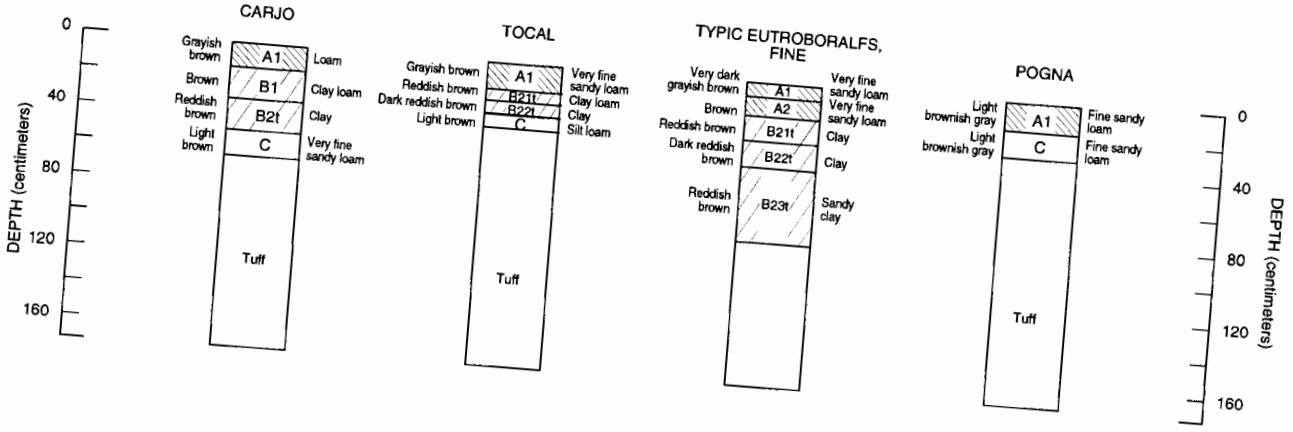


Reference: Nyhan et al., 1978, "Soil Survey of Los Alamos County, New Mexico," LA-6779-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure 2-7

Relationship of Slope, Vegetation, and Parent Material to Frijoles, Typic Eutroboralfs, Clayey-Skeletal, and Carjo Soils





Reference: Nyhan et al., 1978, "Soil Survey of Los Alamos County, New Mexico," LA-6779-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure 2-8
Relationship of Slope and Parent Material
to Carjo, Tocal, Typic Eutroboralfs, Fine, and Pogna Soils

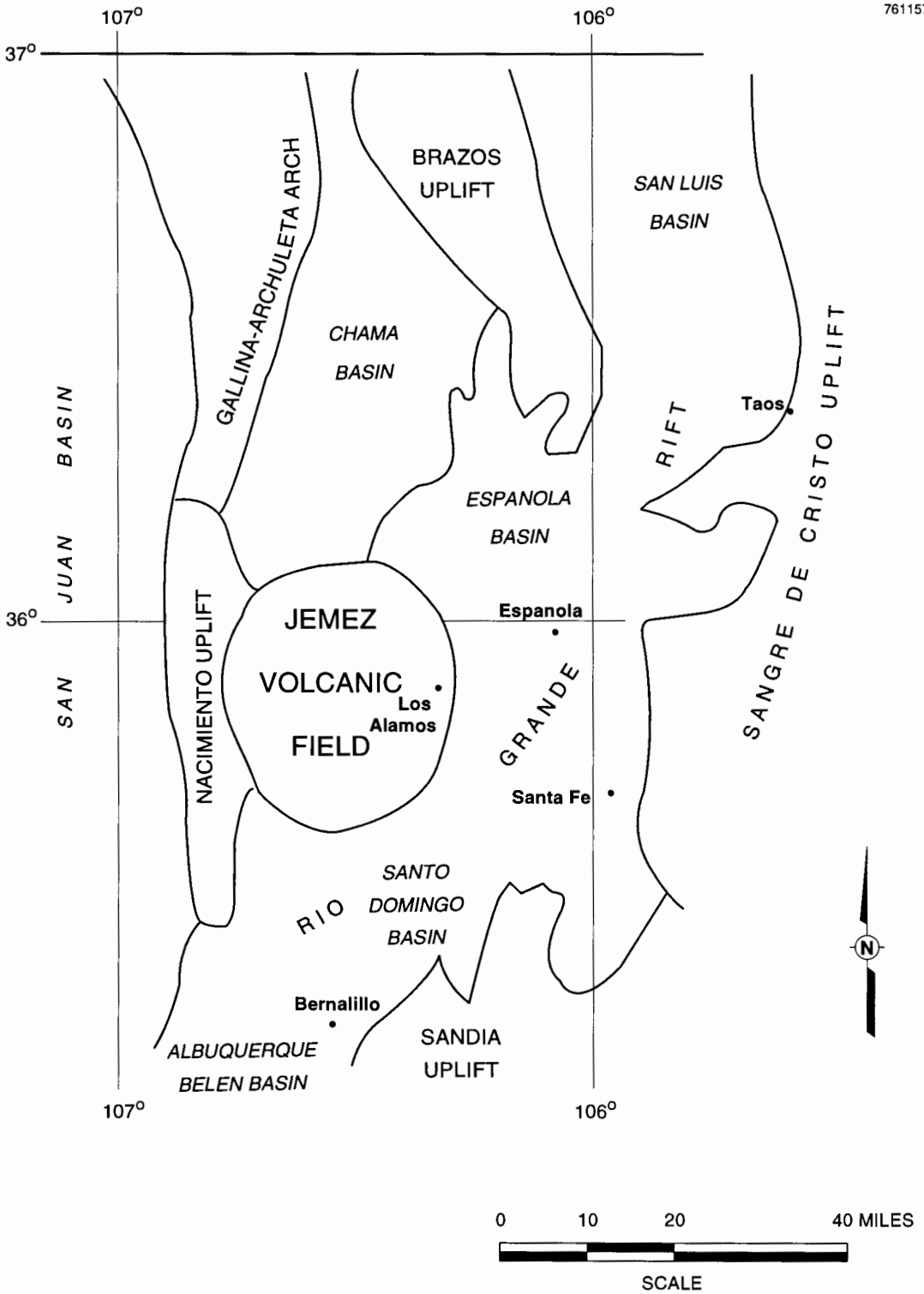
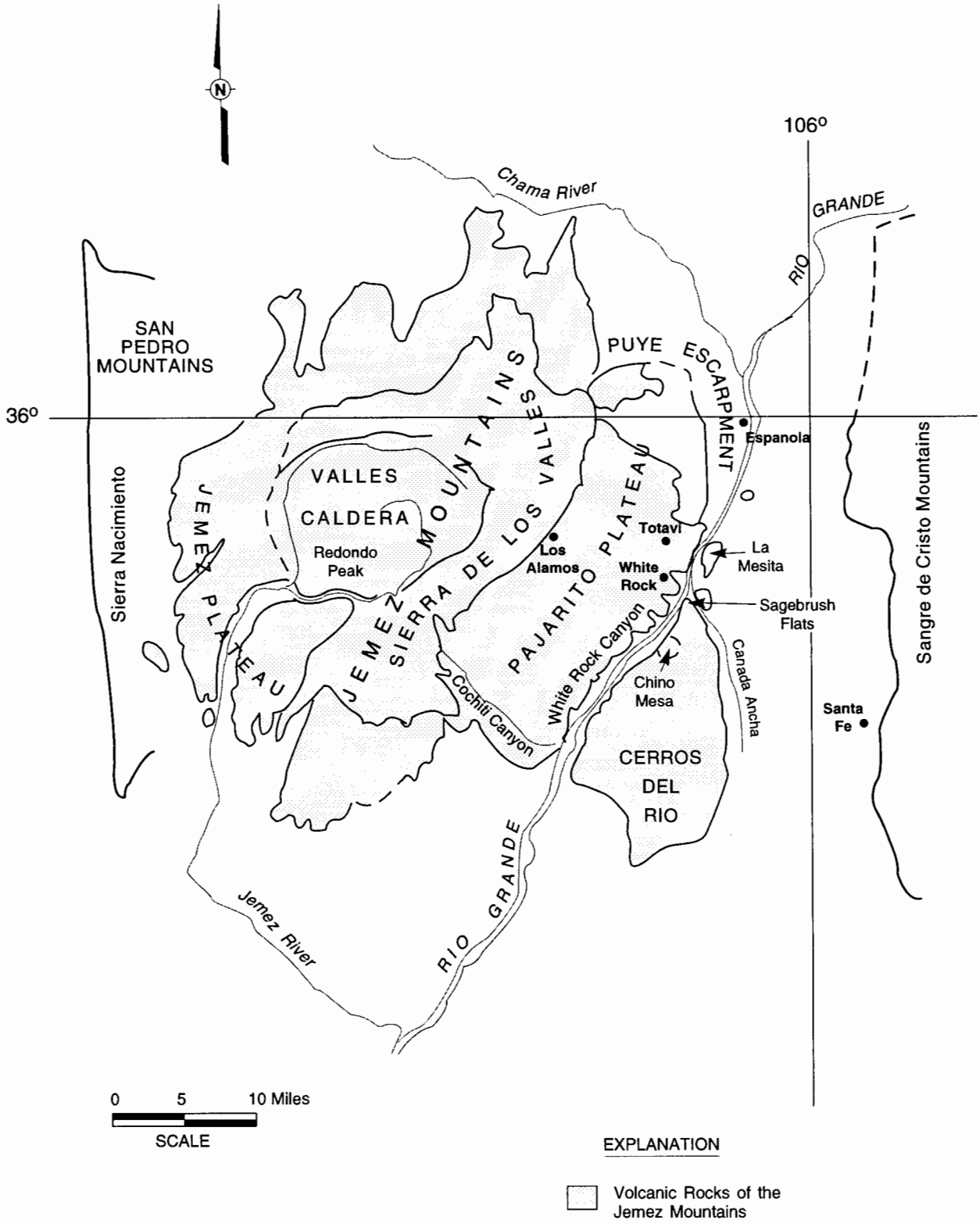
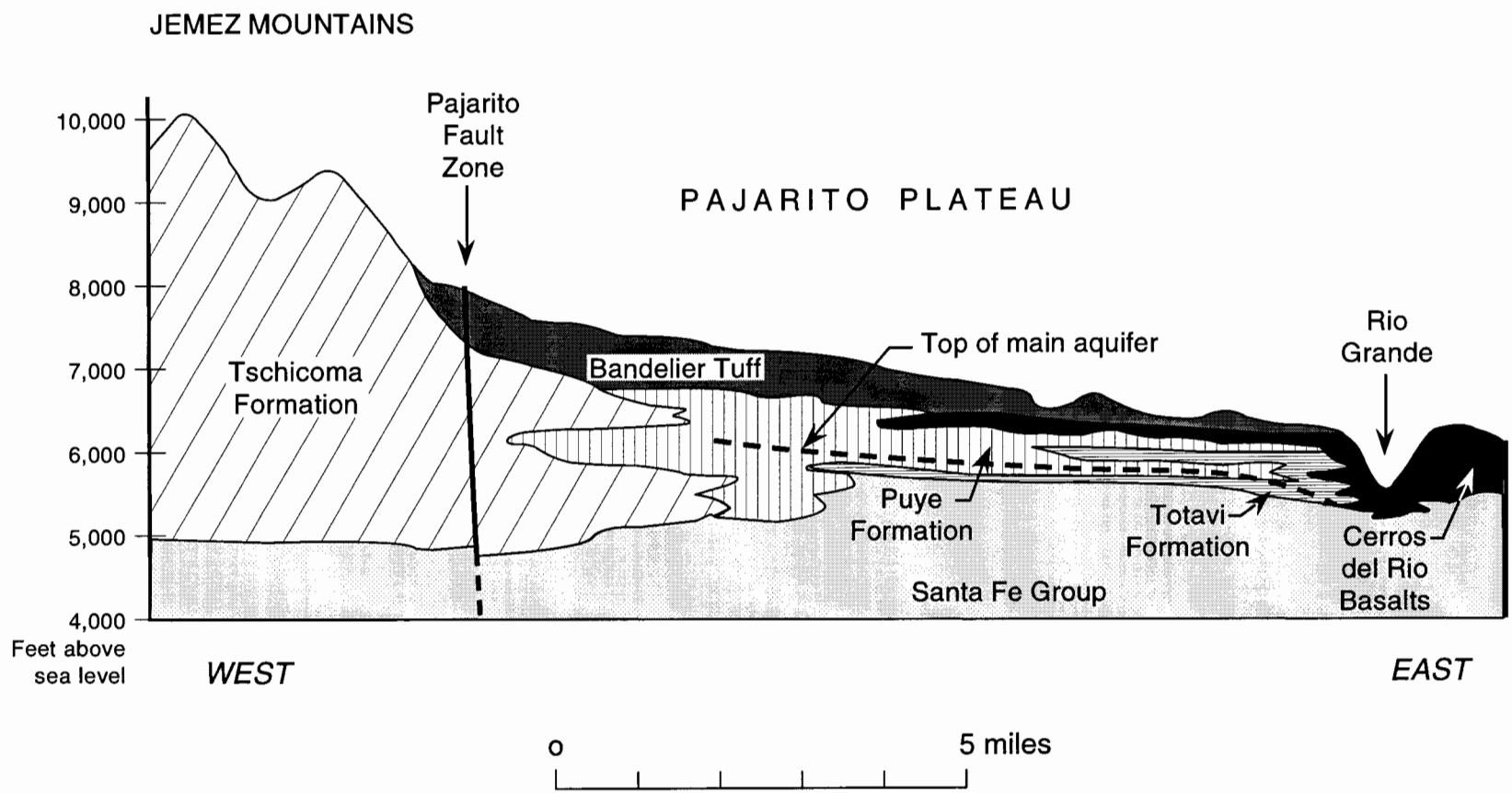


Figure 2-9
Index Map Showing Major Tectonic Elements of North-Central New Mexico



Reference: Griggs and Hem, 1964, "Geology and Ground-Water Resources of the Los Alamos Area, New Mexico," U.S. Geological Survey Water Supply Paper 1753, Albuquerque, New Mexico.

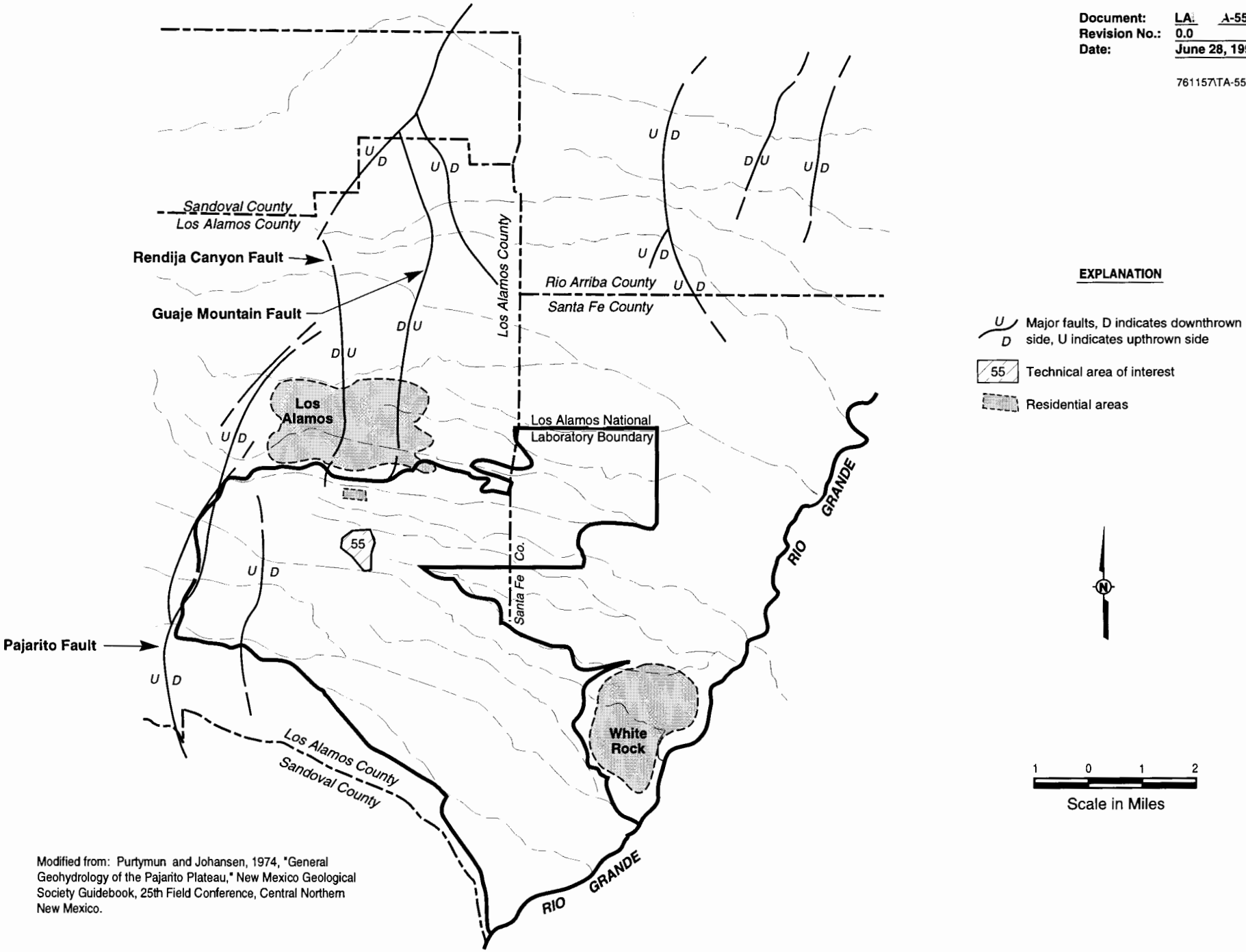
Figure 2-10
Physiographic Features of the Jemez Mountains



Reference: Los Alamos National Laboratory, 1993, "Installation Work Plan for Environmental Restoration," Rev. 3, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure 2-11

East-West Geologic Section Showing Stratigraphy and Structure from the Sierra de Los Valles across the Pajarito Plateau to the Rio Grande



Modified from: Purtymun and Johansen, 1974, "General Geohydrology of the Pajarito Plateau," New Mexico Geological Society Guidebook, 25th Field Conference, Central Northern New Mexico.

Figure 2-12

Location Map of Los Alamos National Laboratory Facilities Relative to Nearby Active or Potentially Active Fault Traces

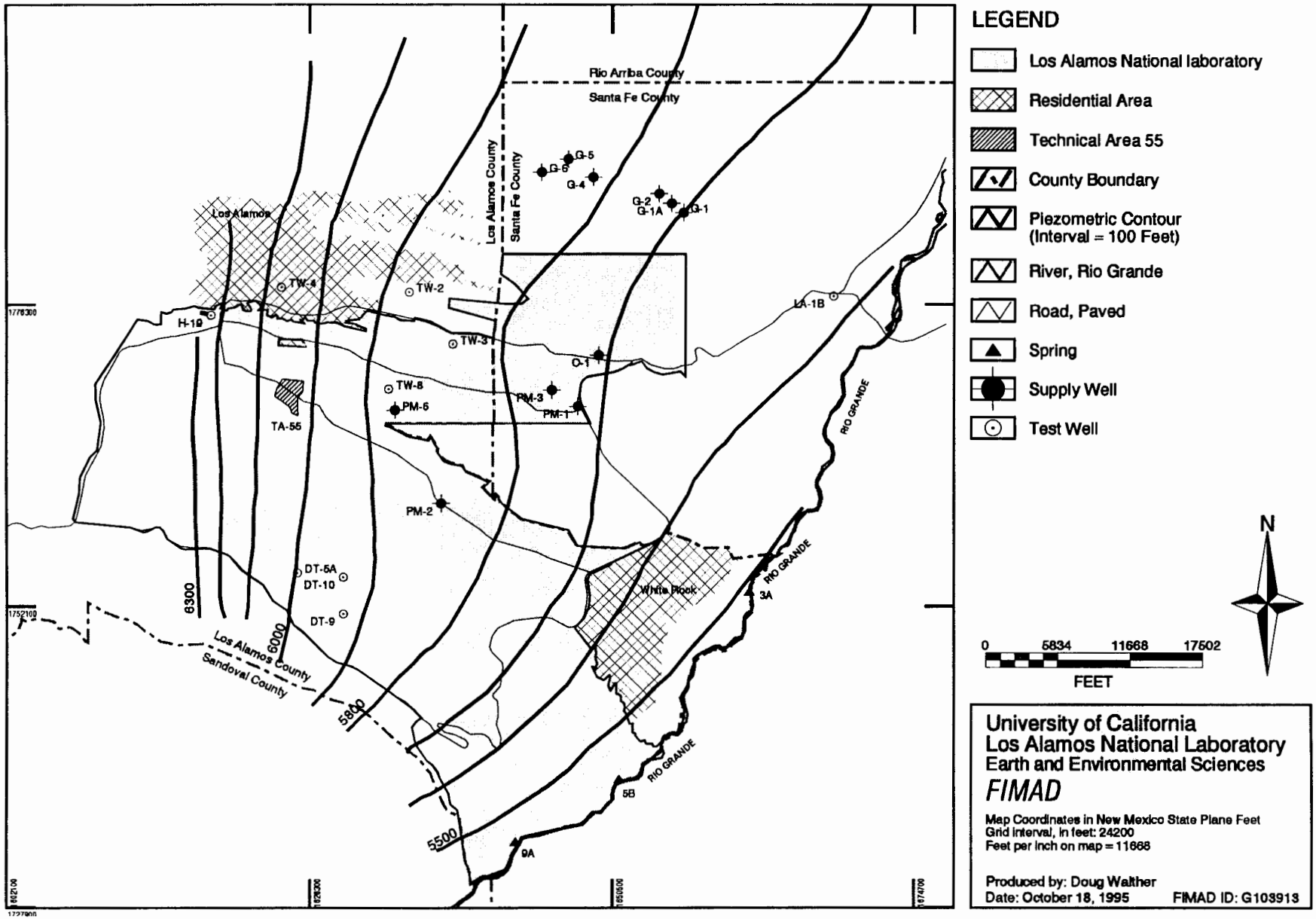


Figure 2-13
Generalized Piezometric Surface of Main Aquifer

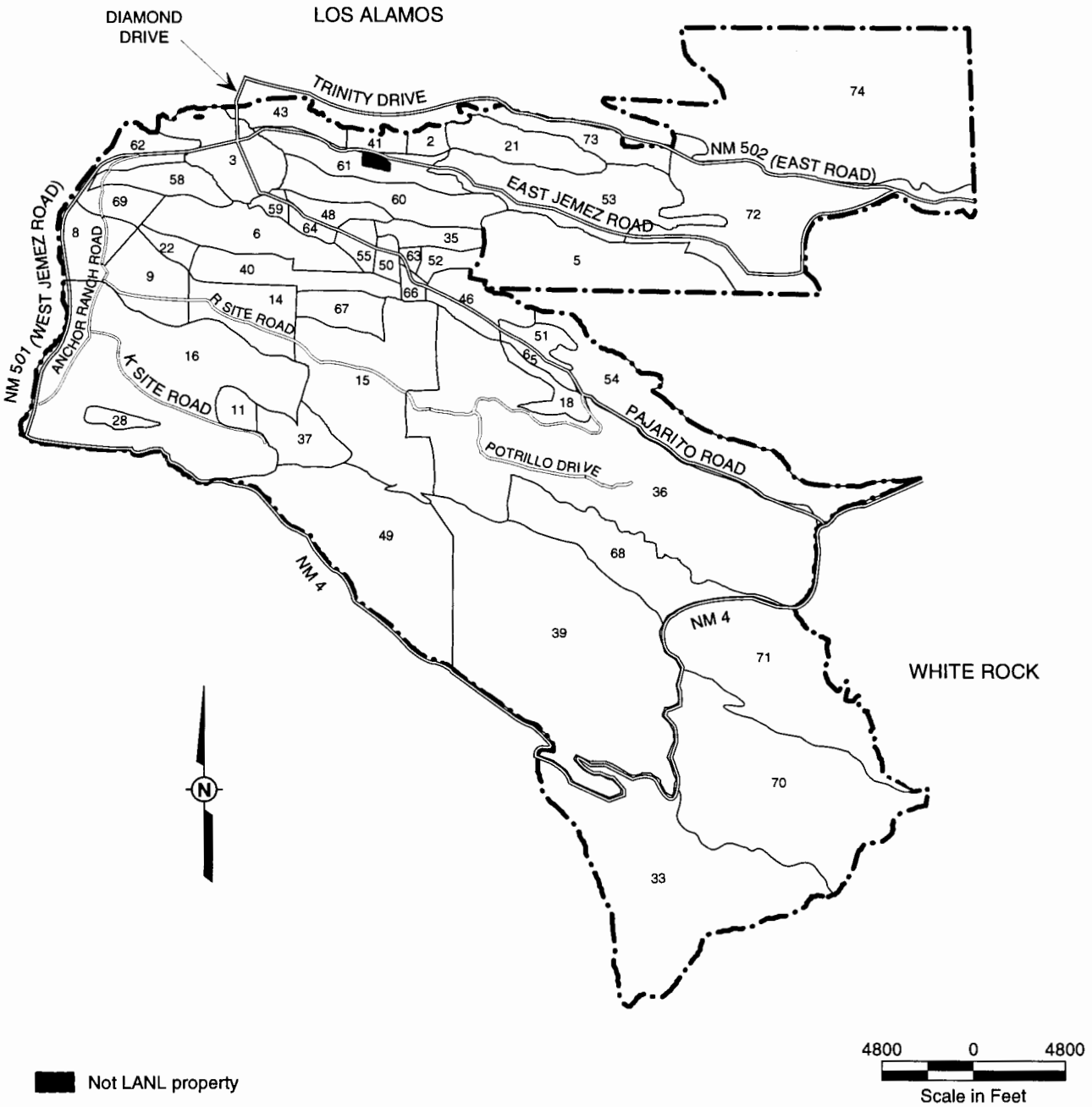


Figure 2-14
Major Roads and Primary Traffic Routes at Los Alamos National Laboratory (LANL)

Note to Reviewers:

This waste analysis plan (WAP) is similar to the "Los Alamos National Laboratory RCRA Waste Analysis Plan," Rev. 0.0 (LANL, 1995a), submitted to the New Mexico Environment Department in March 1995. Changes to this WAP will be made to be consistent with responses and resolutions to the Notice of Deficiency for the 1995 WAP, when available.

LIST OF DEFINITIONS

Acceptable knowledge - A term broadly defined to include process knowledge, supplemental waste analysis data, and/or facility records of analysis.

Existing (or currently generated) transuranic (TRU) mixed waste - TRU mixed waste streams characterized using Los Alamos National Laboratory's (LANL) Waste Profile Form (WPF) (the WPF has been used since May 1991).

Future TRU mixed waste - TRU mixed waste streams that will be characterized through the use of both LANL's WPF and a radioactive and mixed waste certification program.

Hazardous waste - The criteria for establishing a waste as a hazardous waste are provided in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart II, revised November 1, 1995. A waste is considered hazardous if it meets the definition of a solid waste described in 20 NMAC 4.1, Subpart II, Part 261.2, revised November 1, 1995; is not exempt from regulation; and exhibits one or more of the characteristics described in 20 NMAC 4.1, Subpart II, Part 261, Subpart C, revised November 1, 1995, or is listed in 20 NMAC 4.1, Subpart II, Part 261, Subpart D, revised November 1, 1995.

Heterogeneous waste - Waste that is of dissimilar or diverse composition.

Homogeneous waste - Waste that is of uniform composition.

Liquid waste - Any waste stream in a liquid physical form.

Low-level liquid mixed waste - Liquid waste that has both a hazardous waste component (see definition) and a low-level waste component (see definition).

Low-level solid mixed waste - Solid waste that has both a hazardous waste component and a low-level waste component.

LIST OF DEFINITIONS
(Continued)

Low-level waste - Low-level waste is defined in U.S. Department of Energy (DOE) Order 5820.2A (DOE, 1988) as "waste that contains radioactivity and is not classified as high-level waste, transuranic waste, spent nuclear fuel, or 11(e)(2) by-product material as defined by this Order. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level, provided that the concentration of transuranics is less than 100 nanocuries per gram of waste." By-product material, as defined in Section 11(e)(2) of the Atomic Energy Act of 1954, as amended, consists of uranium and thorium mill tailings. Section 11(e)(2) by-product material is not generated at LANL.

Mixed waste - Waste that has both a hazardous waste component (see definition) and a radioactive waste component.

Process knowledge - Described in 20 NMAC 4.1, Subpart V, 264.13(a)(2), revised November 1, 1995, as data developed under Subpart II and existing published or documented data on a specific hazardous waste or hazardous waste generated from similar processes.

Solid physical form waste - Any waste stream in a solid physical form. In this document, use of the generic term "solid physical form waste" has no additional regulatory meaning.

Solid waste - Any waste stream that meets the definition of a "solid waste" as specified in 20 NMAC 4.1, Subpart II, 261.2, revised November 1, 1995.

TRU mixed waste - Waste that has both a hazardous waste component (see definition) and a TRU waste component (see definition).

TRUPACT-II Content (TRUCON) Code - A waste identification system developed by DOE to provide a consistent waste description for TRU and TRU mixed waste generated throughout all of DOE's facilities. These codes are intended to assist DOE in establishing the characteristics of TRU and TRU mixed waste to be certified for transportation to the Waste Isolation Pilot Plant.

LIST OF DEFINITIONS
(Continued)

TRU waste - Waste defined as follows: "Without regard to source or form, waste that is contaminated with alpha-emitting transuranic radionuclides with half-lives greater than 20 years and concentrations greater than 100 nanocuries per gram at the time of assay and has atomic numbers greater than 92. Heads of Field Elements can determine that other alpha contaminated waste, peculiar to a specific site, must be managed as TRU waste" (DOE, 1988).

Waste Profile Form - A form used by hazardous/mixed waste generators to document waste characterization information for each waste stream. Specific information documented on this form may include process knowledge, information from Material Safety Data Sheets, results of chemical/physical analysis, and/or any additional information used for acceptable knowledge.

LIST OF REGULATORY REFERENCES AND CORRESPONDING WASTE ANALYSIS PLAN LOCATION

Regulatory Reference 20 NMAC 4.1[a], Subparts V, VIII, and IX	Description of Requirement	Location in the Waste Analysis Plan
264.13(a)(1)	Analysis information adequate to meet 20 NMAC 4.1, Subparts V and VIII, revised November 1, 1995, storage requirements	3.2.2, 3.2.3, 3.3.2, 3.3.3, 3.4.2, 3.4.3, 3.5.2, and 3.5.3
264.13(a)(2)	Waste analysis data	3.2.3.2, 3.3.3.1, 3.4.3.1, and 3.5.3.1
264.13(a)(3)	Repeat analysis	3.2.3.1, 3.2.4, 3.3.4, 3.4.4, 3.5.3.1, and 3.5.4
264.13(a)(4)	Inspection and analysis after each movement of hazardous waste received from off-site	Not applicable (NA)
264.13(b)	Written waste analysis plan	Entire plan
264.13(b)(1)	Parameters and rationale for selection	3.2.2.1, 3.2.2.2, 3.3.2.1, 3.3.2.2, 3.4.2.1, 3.4.2.2, 3.5.2.1, 3.5.2.2, and Tables 3-2, 3-3, and 3-4
264.13(b)(2)	Test methods	3.1.4, 3.2.3, 3.2.3.3, 3.2.3.3.1, 3.3.3, 3.3.3.2, 3.4.3, 3.4.3.2, 3.5.3, 3.5.3.2, and Tables 3-2, 3-3, and 3-4
264.13(b)(3)	Representative sample collection method	3.2.3.3, 3.2.3.3.2, 3.3.3.2.1, 3.3.3.2.2, 3.4.3.2, and 3.5.3.2
264.13(b)(4)	Frequency for review or repeat of initial analysis	3.2.3.1, 3.4.3.2, 3.5.3.1, 3.5.3.2, and 3.5.4
264.13(b)(5)	Waste analysis information agreed upon for waste sent to off-site facilities	3.2.3.1, 3.2.3.2, 3.3.3.1, 3.4.3.1, 3.5.3.1, and Figure 3-2
264.13(b)(6)	Additional waste analysis requirements	3.1.5
264.13(b)(7)	Surface impoundments exempted under 20 NMAC 4.1, Subpart VIII, 268.4(a), revised November 1, 1995	NA
264.13(c)	Inspection and analysis procedures for off-site facilities	NA
264.13(c)(1)	Procedures for identification of each movement of waste at off-site facilities	NA

Refer to footnote at end of table.

LIST OF REGULATORY REFERENCES AND CORRESPONDING WASTE ANALYSIS PLAN LOCATION (Continued)

Regulatory Reference 20 NMAC 4.1[a], Subparts V, VIII, and IX	Description of Requirement	Location in the Waste Analysis Plan
264.13(c)(2)	Sampling method for the waste to be identified at off-site facilities	NA
264.13(c)(3)	For off-site landfills: procedures to determine whether a biodegradable sorbent has been added to containers	NA
268.7(a)	Determination of whether waste is restricted from land disposal	3.1.5.3
268.7(b)	Testing requirements for treatment facilities	3.1.5.3, 3.3.3, 3.3.3.2.1, 3.3.3.2.2, and 3.3.4
268.7(b)(1)	Testing of treatment residues or extract of the waste having concentration-based treatment standards specified in 20 NMAC 4.1, Subpart VIII, 268.41, revised November 1, 1995	3.1.5.3
268.7(b)(2)	Testing of treatment residues pursuant to 20 NMAC 4.1, Subpart VIII, 268.32, revised November 1, 1995	NA
268.7(b)(3)	Testing of treatment residues of waste with concentration-based treatment standards specified in 20 NMAC 4.1, Subpart VIII, 268.43, revised November 1, 1995	3.1.5.3
268.7(b)(4)	Notice requirements	3.1.5.3 and Figure 3-1
268.7(b)(5)	Certification of compliance with 20 NMAC 4.1, Subpart VIII, revised November 1, 1995	3.1.5.3
268.7(b)(6)	Notice and certification requirements for treatment facilities that ship treatment residues to a different treatment, storage, or disposal facility	3.1.5.3
268.7(b)(7)	Notice requirement for recycling facilities using materials in a manner constituting disposal	NA
268.7(c)(1)	Record-keeping requirements for land disposal facilities	NA
268.7(c)(2)	Testing requirements for land disposal facilities	NA

Refer to footnote at end of table.

LIST OF REGULATORY REFERENCES AND CORRESPONDING WASTE ANALYSIS PLAN LOCATION (Continued)

Regulatory Reference 20 NMAC 4.1[a], Subparts V, VIII, and IX	Description of Requirement	Location in the Waste Analysis Plan
268.7(d)(1)	Notification requirements for excluded debris (i.e., pursuant to 20 NMAC 4.1, Subpart II, 261.3, revised November 1, 1995)	NA
268.7(d)(2)	Updated notification requirements for debris	NA
268.7(d)(3)	Documentation and certification requirements for debris excluded under 20 NMAC 4.1, Subpart II, 261.3(e)(1), revised November 1, 1995	NA
270.14(b)(2)	Chemical and physical analyses	3.2.2.1, 3.2.3, 3.2.3.1, 3.2.3.2, 3.2.3.3, 3.2.3.3.1, 3.3.2.1, 3.3.3, 3.3.3.1, 3.3.3.2, 3.4.2.1, 3.4.3, 3.4.3.1, 3.4.3.2, 3.5.2.1, 3.5.3, 3.5.3.1, 3.5.3.2, Figure 3-2, and Tables 3-2, 3-3, and 3-4
270.14(b)(3)	Waste analysis plan	Entire plan

[a] New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), revised November 1, 1995, which adopts, with a few limited exceptions, Title 40 of the Code of Federal Regulations (40 CFR), Parts 260–266, Part 268, and Part 270 (1995). 20 NMAC 4.1, Subparts V, VIII, and IX, revised November 1, 1995, contain regulations equivalent to 40 CFR Parts 264, 268, and 270, respectively.

3.0 WASTE ANALYSIS PLAN FOR HAZARDOUS AND MIXED WASTE STORAGE AND TREATMENT AT TECHNICAL AREA 55

This waste analysis plan (WAP) presents information on the chemical and physical nature of hazardous and mixed waste generated and general waste characterization methods used at Los Alamos National Laboratory's (LANL) Technical Area (TA) 55. The waste analysis information contained within this WAP is specific to storage and treatment requirements for hazardous and mixed waste. Waste analysis requirements are specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart IX, 270.14(b)(2), revised November 1, 1995; in 20 NMAC 4.1, Subpart V, 264.13, revised November 1, 1995, "General Waste Analysis"; and in 20 NMAC 4.1, Subpart VIII, 268.7, revised November 1, 1995, "Waste Analysis and Recordkeeping." The "List of Regulatory References and Corresponding Waste Analysis Plan Location" is provided at the front of this section. The content of this WAP generally follows the guidance provided in "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes - A Guidance Manual" (U.S. Environmental Protection Agency [EPA], 1994b).

Hazardous waste is defined and regulated by 20 NMAC 4.1, revised November 1, 1995. Mixed waste contains both a hazardous waste component and a radioactive waste component. This WAP addresses *hazardous waste, transuranic (TRU) mixed waste, and low-level solid and liquid mixed waste* (as provided in the List of Definitions) identified as wastewaters and nonwastewaters pursuant to land disposal restriction (LDR) regulations specified in 20 NMAC 4.1, Subpart VIII, Part 268, revised November 1, 1995.

This WAP is organized as follows. Section 3.1 addresses general waste analysis requirements including a description of the facility and the waste management units; sample handling, preservation, and storage requirements; analytical laboratory selection and analytical methods; and special procedural requirements (e.g., for ignitable, reactive, and incompatible wastes and for compliance with LDR requirements). Sections 3.2, 3.3, 3.4, and 3.5 address specific waste analysis requirements for TRU mixed waste storage, TRU mixed waste treatment, low-level mixed waste storage, and hazardous waste storage, respectively. Specific waste analysis requirements include the following:

- Waste-generating processes and activities
- Identification of hazardous or mixed waste managed
- Waste parameters
- Waste characterization
- Hazardous or mixed waste verification analysis.

3.1 GENERAL WASTE ANALYSIS REQUIREMENTS

General waste analysis requirements applicable to hazardous, TRU mixed, and low-level mixed waste types managed at TA-55's storage and treatment units to be permitted are described in the following sections.

3.1.1 Facility Description

LANL is located in Los Alamos County in north-central New Mexico. It is approximately 60 miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe. LANL, which is divided into 49 TAs, and the associated residential and commercial areas of Los Alamos County are situated on the Pajarito Plateau. The principal missions of LANL include the research, design, development, and analysis of weapons components for the nation's nuclear arsenal; supporting research programs; energy research and environmental missions; and environmental management programs. LANL is owned by the U.S. Department of Energy (DOE) and is operated jointly by DOE and the University of California, DOE's management and operating contractor.

TA-55 is a world leader in plutonium processing technology and is the only facility in the United States capable of processing numerous actinides in their pure and impure forms as well as materials bearing plutonium and other special nuclear materials. Consequently, TA-55's mission is to maintain core capabilities and to develop new technologies, as necessary, for the processing of nuclear materials, which may include the treatment of TRU mixed wastes currently inventoried at other sites within the DOE complex. TA-55's expertise in these areas may be required for future mixed wastes to be generated at other DOE sites (from activities such as environmental restoration and decontamination and decommissioning [D&D]). Waste streams that may require either treatability studies or treatment at TA-55 include, but are not limited to, those wastes described in DOE's annual "Mixed Waste Inventory Report." It is anticipated that this permit application may be modified in the future as treatment processes are developed for TRU mixed wastes generated at LANL or at other DOE facilities.

3.1.2 Description of Hazardous and Mixed Waste Management Units

The hazardous/mixed waste management units addressed herein are described fully in Sections 2.0 and 4.0 of this Part B permit application and in Revision 1.0 of the Technical Area 55 Part A Permit Application (LANL, 1996), and include the following:

- Container storage areas for hazardous waste, TRU mixed waste, and low-level mixed waste (TA-55, Building 4 [TA-55-4], Basement; Areas 1 through 5)
- A container storage area for TRU mixed waste (TA-55-4, Basement; Area 6)
- A container storage area for hazardous waste, TRU mixed waste, and low-level mixed waste (TA-55-4, north end of Basement; Area 7)
- Container storage areas for TRU mixed waste and low-level mixed waste (TA-55-4, Room 401 [TA-55-4-401], Areas 8 and 9)
- A container storage area for TRU mixed waste and low-level mixed waste (TA-55-4-433, Area 10)
- A container storage area for TRU mixed waste (TA-55-4-432, Area 11)
- A container storage pad for hazardous waste, TRU mixed waste, and low-level mixed waste near TA-55-4
- A container storage area for hazardous waste, TRU mixed waste, and low-level mixed waste (TA-55-185)
- A storage tank system consisting of glovebox GB-438 and associated ancillary equipment, collectively referred to as the "evaporator glovebox storage tank system" (TA-55-4-401)
- A storage tank system, consisting of five storage tanks and associated ancillary equipment, collectively referred to as the "cementation unit storage tank system" (TA-55-4-401)
- A cementation unit (TA-55-4-401) in glovebox GB-454.

3.1.3 Sample Handling, Preservation, and Storage

Table 3-1 presents requirements regarding sample containers, preservation techniques, and holding times associated with sample collection, as specified in the EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846) (EPA, 1994c). Adherence to these requirements will ensure that sampling and analysis meet quality objectives for data.

3.1.4 Analytical Laboratory Selection and Analytical Methods [20 NMAC 4.1, Subpart V, 264.13(b)(2)]

Analytical laboratories at LANL and/or approved subcontractor laboratories will perform the qualitative and quantitative chemical analyses specified in Tables 3-2, 3-3, and 3-4 of this WAP. These laboratories must have:

- The capability of handling hazardous waste and/or radioactive material/waste
- A documented comprehensive quality assurance (QA)/quality control (QC) program
- Technical analytical expertise
- A document control/records management plan
- The capability to perform data reduction, validation, and reporting.

The selection and development of analytical testing methods for hazardous and mixed waste streams were based on the following considerations:

- The physical form of the waste
- Analytes of interest
- Required detection limits (e.g., regulatory thresholds)
- Information requirements (e.g., verify compliance with LDR treatment standards and waste classification).

Collectively, these factors contributed to the selection of the analytical methods specified in Tables 3-2, 3-3, and 3-4. Qualified analytical laboratories at LANL or approved subcontractor laboratories that meet the above criteria will analyze hazardous and mixed waste samples for Resource Conservation and Recovery Act (RCRA)-regulated hazardous constituents (i.e., volatile organic compounds [VOC], semivolatile organic compounds [SVOC], and metals) and characteristics[1], according to SW-846, or documented equivalent methods.

[1]Use of the terms "RCRA-regulated hazardous constituents and characteristics," "RCRA-regulated metals," "RCRA-regulated VOCs," "RCRA-regulated SVOCs," "RCRA F-listed and/or K-listed waste," and "RCRA P-listed and U-listed waste" refers to hazardous waste or hazardous constituents as defined in 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995.

3.1.5 Special Procedural Requirements [20 NMAC 4.1, Subpart V, 264.13(b)(6)]

Additional waste management requirements specific to ignitable, reactive, and incompatible wastes, as well as for compliance with LDR, are described below.

3.1.5.1 Procedures for Ignitable and Reactive Wastes

Specific waste management methods for ignitable and reactive hazardous and mixed wastes are implemented pursuant to 20 NMAC 4.1, Subpart V, 264.17, revised November 1, 1995. These waste management methods vary depending on the physical form and type of waste managed. TRU mixed waste in Area 6 is stored by mass of radionuclides due to the "as low as reasonably achievable" (ALARA) principle, established by the Atomic Energy Act, and because of criticality concerns. Some container storage areas only contain wastes in a solid physical form that minimizes the potential for commingling to occur. To ensure that ignitable and reactive wastes are managed safely and properly, their characteristics are identified and documented, the wastes are labeled appropriately, and the waste types are physically segregated within each container storage area. Currently, the mixed waste storage tank systems and the cementation unit do not manage ignitable or reactive mixed waste.

3.1.5.2 Procedures for Incompatible Wastes

Pursuant to 20 NMAC 4.1 Subpart V, 264.17, revised November 1, 1995, specific waste management procedures for incompatible wastes are described as follows. By utilizing the information provided by the generator, incompatible wastes are identified, segregated, and separated by distance or by secondary containment where appropriate. Containers storing hazardous and mixed wastes are segregated according to the following compatibility group scheme: (1) flammables/ignitables; (2) oxidizers; (3) corrosive acids; (4) reactives (those reactive with water); (5) corrosive bases; (6) other reactives; and (7) other wastes. TRU mixed waste in Area 6 is stored by mass of radionuclides due to the ALARA principle and because of criticality concerns. Waste contained within the mixed waste storage tank systems is generated from a single administratively-controlled process and thereby is not expected to be incompatible. This same waste stream (i.e., evaporator bottoms solutions) is the only mixed waste stream routinely treated in the cementation unit, which is also administratively-controlled. These procedures ensure that incompatible wastes will not mix in the event of a release while in storage or will not commingle during other waste management activities.

3.1.5.3 Procedures to Ensure Compliance with LDR Requirements [20 NMAC 4.1, Subpart VIII, 268.7(a), 268.7(b)(1), (3), (4), and (5) and 268.9(b), (c), and (d)]

In accordance with LDR requirements, waste shipped off site may need to be analyzed to determine whether it meets the applicable LDR treatment standards in 20 NMAC 4.1, Subpart VIII, Part 268, Subpart D, revised November 1, 1995. Treatment standards are expressed in two ways:

- As constituent concentrations in the waste (from either an extract of the waste, as determined by the toxicity characteristic leaching procedure (TCLP), or from the total volume of the waste referred to as total waste analysis)
- As specified treatment technologies.

If, (1) it is known whether the waste meets applicable LDR treatment standards based on acceptable knowledge, or (2) the waste is transported to a permitted hazardous waste management facility operating in conformance with a no-migration determination pursuant to 20 NMAC 4.1, Subpart VIII, 268.6, revised November 1, 1995, then sampling and analysis to certify LDR compliance are not necessary for the affected waste. Sampling and analysis are conducted in accordance with 20 NMAC 4.1, Subpart VIII, Part 268, revised November 1, 1995, only to certify that the waste meets LDR treatment standards. Each waste for which a treatment standard has been established is evaluated for the applicable parameters in 20 NMAC 4.1, Subpart VIII, Part 268, Subpart D, revised November 1, 1995. All analytical results completed in support of LDR requirements are retained within TA-55's operating record. Hazardous wastes and low-level mixed wastes that do not meet the applicable treatment standards may be sent to a permitted off-site treatment facility. LDR notifications, with information required under 20 NMAC 4.1, Subpart VIII, 268.7 and 268.9, revised November 1, 1995, are supplied for every shipment of waste sent to an off-site treatment facility. Additional data for the waste stream (e.g., Waste Profile Form [WPF], analytical data) may be required by the designated treatment facility in addition to the LDR notification. LDR determinations are documented on LANL's Land Disposal Restrictions Notification Form (Figure 3-1), or a similar form if this form is revised.

3.2 WASTE ANALYSIS REQUIREMENTS FOR THE STORAGE OF TRU MIXED WASTE

Specific waste analysis requirements for the storage of TRU mixed waste are provided in the following sections.

3.2.1 Facility Waste-Generating Processes, Activities, and Identification of TRU Mixed Wastes Stored

TRU mixed waste currently in storage at TA-55 is generated primarily during research and development (R&D) activities, processing and recovery operations, D&D projects, and general facility operations. Additional information on TRU mixed waste-generating processes is provided in Section 3.2.1.1.

For waste characterization purposes, TRU mixed waste at LANL has been subdivided into groups based on the timeframe for generation of the waste: *existing (or currently generated)* and *future*. These groups are defined in the List of Definitions. In addition to grouping TRU mixed waste based on the time of generation, TRU mixed waste streams at TA-55 are divided into two broad categories referred to as *matrix parameter codes*, which are used to define waste characterization groupings for the Federal Facilities Compliance Act. These matrix parameter codes are based upon the physical and chemical forms of the waste and are identified as follows:

- Matrix Parameter Code S3000 - homogeneous solids
- Matrix Parameter Code S5000 - debris wastes.

Matrix parameter code descriptions are provided in "DOE Waste Treatability Group Guidance" (DOE, 1995a). Sampling and analytical procedures, discussed in Section 3.2.3.3, are based on the physical characteristics of these broad categories.

Matrix parameter codes are applied to TRU mixed waste streams as a general categorization scheme to distinguish waste types. An additional waste identification system is used for supplementary purposes as part of waste management operations for TRU mixed waste generated at TA-55. Table 3-5 cross references the matrix parameter codes with the waste identification system, known as the TRUPACT-II Content (TRUCON) Code system, described below.

TRUCON codes were developed by DOE to provide a consistent waste description for TRU and TRU mixed waste generated throughout all of DOE's facilities. The TRUCON codes are intended to assist DOE in establishing the characteristics of TRU and TRU mixed waste to be certified for transportation to the Waste Isolation Pilot Plant (WIPP). LANL TRUCON codes consist of a three-digit number preceded by the letters "LA" and are followed by a letter that further defines the

waste packaging, source, or waste type. Proposed TRUCON codes for TRU mixed waste generated at TA-55 are provided in Section 3.2.1.1. These TRUCON codes are provided for informational purposes only and are updated periodically to reflect the most current characteristics of the waste package (e.g., packaging layers). However, these updates do not reflect a change in waste stream generation.

Each matrix parameter code includes a number of TRUCON codes. TRUCON codes currently generated at TA-55 and listed in LANL's TRU mixed waste inventory are described below. The basis for hazardous waste classification for each TRUCON code is provided in Table 3-6. Because TRUCON codes were not developed to provide hazardous waste characterization information, potential EPA Hazardous Waste Numbers (as referenced by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995) and hazardous constituents shown in Table 3-6 represent a conservative approach used to identify potential hazardous constituents for existing TRU mixed waste streams. Waste characterization, as discussed in Section 3.2.3, is used to confirm hazardous constituents present in individual waste streams. The potential EPA Hazardous Waste Numbers and potential hazardous constituents shown in Table 3-6 are the result of the most recent iteration of this process and may be updated upon further evaluation.

3.2.1.1 LANL TRUCON Codes

This section provides a brief description of the TRUCON-coded TRU mixed waste streams currently stored at TA-55. All existing (i.e., currently generated) TRU mixed waste at TA-55 is assigned a TRUCON code.

TRUCON Code LA 114

TRUCON code LA 114 consists of solidified inorganic process solids and liquids. At TA-55, this waste is generated as a result of plutonium-processing operations. This waste stream includes process residue from evaporator bottoms and other compatible discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines. These process solids are solidified with cement in the cementation unit at TA-55-4 to form a noncorrosive solid matrix.

TRUCON Code LA 116

TRUCON code LA 116 is comprised of combustible waste. These combustible solids consist primarily of paper, rags, plastic, and rubber. A small fraction of noncombustible solids, such as scrap metals, may also be contained in this waste form.

TRUCON Code LA 117

TRUCON code LA 117 is comprised of noncombustible metal waste. Metal waste consists of motors, pumps, tools, process equipment, and glass with a small fraction of combustible waste, such as plastics (mainly packaging).

TRUCON Code LA 118

TRUCON code LA 118 consists of glass waste generated from plutonium-processing activities at TA-55. This glass waste consists of discarded laboratory glassware, windows, bottles, and metal with a small fraction of combustible waste, such as plastic (mainly packaging).

TRUCON Code LA 123

TRUCON code LA 123 is comprised of leaded gloves with a small fraction of noncombustible waste such as motors and tools generated from plutonium-processing activities at TA-55.

TRUCON Code LA 125

TRUCON code LA 125 is comprised of mixtures of combustible and noncombustible waste. These solids include paper, rags, plastic, rubber, leaded glovebox gloves, glass, motors, pumps, tools, and miscellaneous metal waste.

TRUCON Code LA 126

TRUCON code LA 126 consists of solidified organic process solids and liquids. At TA-55, this waste is generated as a result of plutonium-processing operations and includes inorganic and organic process solids and liquids which, together with plastic packaging, result in >5% and normally ≤10% organics. Solidified process solids may include process residue from evaporator bottoms and other compatible discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines. These process solids are solidified with cement in the cementation unit at TA-55-4 to form a noncorrosive solid matrix.

3.2.2 Waste Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)]

Characterization is performed prior to storing TRU mixed waste to meet the requirements of 20 NMAC 4.1, Subpart V, 264.13, revised November 1, 1995. Waste parameters are selected to ensure that this characterization contains all necessary information to properly store waste in accordance with general facility standards and LDR requirements.

3.2.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)]

Proposed analytical parameters and characterization methods for TRU mixed waste stored at TA-55 are summarized in Table 3-2. Some or all of the parameters listed below may be used to determine the regulatory status of TRU mixed waste.

- Physical waste form characterization through visual examination to verify waste container contents
- Hazardous constituent sampling to determine the presence and concentrations of:
  - RCRA-regulated metals
  - RCRA-regulated VOCs
  - RCRA-regulated SVOCs[2]
- Sampling to determine the presence of characteristic hazardous waste
  - ignitability
  - corrosivity

3.2.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)]

Waste analysis parameters are selected to characterize TRU mixed waste in conformance with 20 NMAC 4.1, Subpart II, revised November 1, 1995, and to ensure that all criteria for disposition at WIPP will be met. Waste characterization procedures for WIPP are specified in the "TRU Waste Characterization Quality Assurance Program Plan" (QAPP) (DOE, 1995b) and are based on knowledge of raw materials and physical/chemical processes of waste-generating activities and may be supported by analytical data. The analytical parameters and the rationale for these parameters are identified in Table 3-7.

[2]Refer to Footnote 1.

3.2.3 Characterization of TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)]

All TRU mixed waste stored at TA-55 is characterized using acceptable knowledge, which in certain instances is supported by sampling and analysis. As provided in the List of Definitions, *existing (or currently generated)* TRU mixed waste is characterized using LANL's WPF (i.e., waste generated since May 1991). *Future* TRU mixed waste will be characterized using both LANL's WPF (see Section 3.2.3.1) and a radioactive and mixed waste certification program.

The TRU mixed waste types described include homogeneous solids and debris wastes. As discussed in Section 3.2.1, these types are categorized by *matrix parameter codes* based on the physical and chemical form of the waste. The homogeneous solids waste streams stored at TA-55 (Matrix Parameter Code S3000) may contain RCRA-regulated metals[3] (see Table 3-2). These homogeneous waste streams are periodically sampled and analyzed for the toxicity characteristic (TC) metal contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995. Analysis for total concentration of TC contaminants may be performed on samples in a screening step. If total concentrations are used in the waste characterization process, analytical data is compared to the TC regulatory levels expressed as total values. These total values are considered the regulatory threshold limit (RTL) values for the determination of whether a particular solid waste exhibits a TC. RTL values are obtained by calculating the weight/weight concentration (in the solid) of a TC contaminant that would give the regulatory weight/volume concentration in the TCLP extract.

Debris waste streams stored at TA-55 (Matrix Parameter Code S5000) consist of heterogeneous materials. As such, it is difficult to obtain representative samples, and the waste type is best characterized through examination of the original materials from which the waste was generated. Therefore, debris waste is characterized for the presence of hazardous constituents (i.e., VOCs, SVOCs, and metals) using process knowledge and visual inspection, which support acceptable knowledge as defined on page 3-ii. TRU heterogeneous debris wastes are visually inspected by Nuclear Materials Technology (NMT) Division waste management personnel prior to placement in a waste container.

---

[3]Refer to Footnote 1.

Determinations of hazardous constituents present in each waste stream are based on process knowledge, with waste sampling and analysis performed as necessary to obtain qualitative and quantitative data for hazardous constituents (i.e., VOCs, SVOCs, and metals). Table 3-7 summarizes characterization methods by matrix parameter code. Waste characterization techniques for specific hazardous parameters are presented in Table 3-2. The following discussion presents the approach to characterization used for each of these waste groups, integrating the time of generation and the physical form of the waste.

Existing TRU mixed waste stored at TA-55 is characterized using process knowledge provided by individual waste generators on LANL's WPF. (For a detailed description of the WPF, refer to Section 3.2.3.1.) Further characterization of existing TRU mixed waste will be performed at other appropriate LANL facilities (LANL, 1995a). This additional characterization of homogeneous existing waste will use statistically-based sampling and analysis and may consist of headspace gas analysis, real-time radiography (RTR), and visual examination. Heterogeneous existing TRU mixed waste is characterized using process knowledge, which may be supplemented with headspace gas sampling, RTR, and visual examination performed at other appropriate LANL facilities (LANL, 1995a).

Future homogeneous TRU mixed waste will be characterized through the use of LANL's WPF and a radioactive and mixed waste certification program. Sampling and analysis will be conducted for characterization only when required to fully document or verify the waste stream. Documented and auditable acceptable knowledge will be used to determine whether the waste stream is hazardous, as defined by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995. If available information regarding acceptable knowledge is insufficient for waste characterization, additional information will be obtained using the sampling procedures identified in Section 3.2.3.3. Heterogeneous waste will be characterized using acceptable knowledge, which may be supported by some waste analysis data.

For future TRU mixed waste, knowledge of the waste-generating process will be strictly controlled by a QA/QC program that addresses management of specific waste streams. This approach will provide a rigid definition for the acceptable knowledge applicable to specific waste streams. For example, the QA/QC program may include procedures for controlling chemical inputs to the waste-generating process as well as procedures for confirming the types of waste placed in

different waste containers. These measures will provide knowledge of the types and concentrations of chemical constituents in individual waste streams.

3.2.3.1 Waste Profiling System [20 NMAC 4.1, Subpart V, 264.13(a)(3), 264.13(b)(4) and (5), and Subpart IX, 270.14(b)(2)]

In an effort to maintain detailed and accurate waste characterization information, TA-55 uses a generator waste-profiling program for existing (i.e., currently generated) waste. The waste-profiling effort requires each waste generator to provide a detailed written description of the waste on a standardized WPF, Form 1346 (Figure 3-2) or a similar form if this form is revised. The waste description can be based on generator process knowledge, the use of appropriate Material Safety Data Sheets (MSDS), results of a chemical/physical analysis of the specific waste, and/or any additional information for acceptable knowledge. By completing the WPF, waste generators supply information that allows for the proper storage or treatment (if applicable) of hazardous or mixed waste at TA-55. A generator may initiate a request for the sampling and analysis of unknown or incompletely characterized waste streams by marking the designated box on the WPF. Specific information that is requested on the WPF includes:

- Point of generation
- Method of characterization
- Waste categories
- Waste description
- Waste origination
- Classification of radioactivity (if applicable)
- Presence of toxic metals and an estimate of concentration
- Presence of organic compounds and an estimate of concentration (if applicable)
- Identification of hazardous constituents
- Identification of hazardous characteristics
- Identification of the radiological characteristics of the waste (if applicable).

A WPF contains sufficient information to allow NMT to classify the waste type, class, category, source, matrix, and matrix type (Figure 3-2). The accuracy of information provided on the WPF as well as the resulting waste characterization is reviewed by waste management personnel. Ultimately, the waste profile is used by NMT in conjunction with other required TRU waste documentation to determine the proper procedures for managing the waste.

All waste generators must certify, based on their knowledge of the waste, that the information on the WPF is complete and accurate. Knowingly providing false information can result in

administrative action by LANL. Additionally, the owner and/or operators of LANL could be subject to potential significant civil or criminal penalties by a state or federal regulatory agency.

Waste generators must provide new profiles when a significant process change results in a change in waste composition or when a new waste is generated; otherwise, WPFs are reevaluated annually. This annual reevaluation complies with the characterization frequency requirement in 20 NMAC 4.1, Subpart V, 264.13(b)(4), revised November 1, 1995.

3.2.3.2 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2), 264.13(b)(5), and Subpart IX, 270.14(b)(2)]

Acceptable knowledge is relied upon to characterize TRU mixed waste forms for storage at TA-55 because all TRU mixed wastes are generated by administratively-controlled processes. Health and safety risks to personnel from exposure to radioactive materials during sampling and analysis of certain TRU mixed waste forms and the limited number of analytical laboratories make the collection and analysis of TRU mixed waste samples difficult. For generation of future TRU mixed waste, LANL is in the process of implementing a radioactive and mixed waste certification program to ensure that information used for mixed waste characterization is documented and auditable.

According to EPA guidance, *acceptable knowledge* is broadly defined to include process knowledge, supplemental waste analysis data, and/or facility records of analysis (EPA, 1994b). *Process knowledge* is described in 20 NMAC 4.1, Subpart V, 264.13(a)(2), revised November 1, 1995, as data developed under 20 NMAC 4.1, Subpart II, revised November 1, 1995, and existing published or documented data on a specific hazardous waste or hazardous waste generated from similar processes. *Supplemental waste analysis data* may provide concentration(s) of regulated hazardous constituents and/or results of tests for hazardous characteristics. These data are used to determine if wastes are regulated and to determine their LDR status. EPA guidance suggests that acceptable knowledge may be appropriate for wastes meeting the following descriptions.

- Wastes containing hazardous constituents from specific processes that are well documented, such as RCRA F-listed and/or K-listed waste[4] code descriptions.

[4]Refer to Footnote 1.

- Wastes consisting of discarded unused commercial chemical products, reagents or chemicals containing known physical, and chemical constituents. Several of these wastes fall into the RCRA P-listed and U-listed waste[5] code descriptions.

- Waste (e.g., radioactive mixed waste) containing levels of radioactivity such that health and safety risks to personnel do not justify sampling and analysis due to quantified and documented radiological concerns.

- Wastes containing heterogeneous materials, where the physical nature of the waste does not lend itself to taking a representative sample (e.g., laboratory trash and construction debris with surface contamination) (EPA, 1994b).

At LANL, waste generators will obtain, assemble, and prepare the acceptable knowledge documentation available for each waste stream in a separate auditable file or maintain a waste stream reference file that identifies the acceptable knowledge documents and their locations. The acceptable knowledge documentation will be explicitly relevant and traceable to a waste type and must not be merely a list of information sources for a particular operation or waste. There are many sources of applicable documentation at LANL that may be used to substantiate acceptable knowledge for a specific waste stream. This documentation includes the following:

- Process design documents (e.g., Title II Design).

- Final safety analysis reports (SAR), unreviewed safety question determinations (USQD), and technical safety requirements (TSR).

- Standard operating procedures and detailed operating procedures that list raw materials or reagents, describe the process/experiment that uses the materials, and describe how the waste streams are generated and handled.

- Waste packaging logs completed when controlled wastes are placed in containers.

- Test plans or research project reports that describe the reagents and other raw materials used in an experiment.

- Notebooks, process logs, and run sheets that detail the research processes and raw materials used in an experiment.

- Site databases (e.g., chemical inventory database for Superfund Amendments and Reauthorization Act Title III requirements).

- Documented site personnel interview information.

---

[5]Refer to Footnote 1.

- Standard industry practice documents (e.g., vendor information).
- Available studies that contain analytical data can be used to identify constituents of a specific "similar" process waste stream and to determine the regulatory status of the waste stream for common industrial or LANL processes. Such reports on a similar process should have a clear and documented connection to the waste stream being characterized.
- Previous analytical data relevant to the waste stream, such as fingerprint analysis, spot-check procedures, or routine waste verification sampling and analysis data.
- MSDSs, product labels, and other product package information.
- Documented visual inspections that can be used to identify or confirm the physical characteristics and packaging of a waste.

Sampling surrogate wastes (e.g., equivalent nonradioactive or low-level radioactive materials) may also be a means of obtaining acceptable knowledge for characterizing mixed wastes. In some cases, a low-level mixed waste stream may be chemically equivalent to a TRU mixed waste stream. Because data for a low-level mixed waste stream may be more readily attainable, it may be useful for characterizing the TRU mixed waste stream. Sampling nonradioactive inputs or outputs from processes may also provide data that are useful for characterizing a similar TRU mixed waste stream.

The physical nature of some heterogeneous TRU mixed waste forms (e.g., debris) makes the collection of representative samples difficult. These difficulties include:

- Waste streams that contain disparate elements
- Disparate elements may need to be segregated into similar forms
- Large objects cannot be made to fill standard size sample containers
- Laboratories may not have the capability to sample large objects (EPA, 1992).

Because of these limitations, debris wastes may exhibit highly variable concentrations of hazardous constituents, even for segregated materials. Consequently, analytical data generated from sampling debris waste may be unreliable. Therefore, acceptable knowledge is a reasonable approach to characterizing debris waste.

The acceptable knowledge approach to characterizing TRU mixed debris waste is supported by EPA guidance (EPA, 1994b). A conservative approach is used to determine if a waste is a

regulated hazardous/mixed waste. Process inputs (e.g., chemicals) are identified, and if the waste stream generated may contain hazardous constituents derived from process inputs, the waste is managed as a regulated hazardous/mixed waste. This type of process knowledge is used to characterize TRU mixed debris waste. Knowledge of the materials and operations that generate specific waste streams in the debris category is used to determine if these types of items are present in the waste and if the waste stream contains RCRA-regulated metals[6].

3.2.3.3 Sampling and Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2) and (3), and Subpart IX, 270.14(b)(2)]

This section discusses proposed sampling and analytical procedures and frequency of sampling applicable to TRU mixed wastes. The approach described for characterizing TRU mixed waste streams is based on radiological, physical/chemical, and hazardous properties of the waste. The sampling and analysis strategies presented here will be used to evaluate whether TRU mixed waste exhibits the characteristic of toxicity for metals, as described in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995. Determinations of whether a TRU mixed waste exhibits other characteristics (i.e., ignitability, corrosivity, or reactivity) or is listed will be made by applying acceptable knowledge, as described in Section 3.2.3.2. Homogeneous waste sampling and analysis (e.g., for VOCs, SVOCs, and metals) will be used to obtain the physical and chemical data necessary for TRU mixed waste characterization. Additionally, further characterization such as RTR, visual examination, and headspace gas sampling will be performed at other appropriate LANL facilities as confirmational sampling and analysis procedures (LANL, 1995a). These procedures, coupled with documented, auditable process knowledge, will result in accurate, defensible waste characterization of TRU mixed waste. Specific waste sampling methods and sample handling procedures are described below.

3.2.3.3.1 Visual Examination [20 NMAC 4.1, Subpart V, 264.13(b)(2), and Subpart IX, 270.14(b)(2)]

The contents of all TRU mixed waste containers are visually examined by NMT waste management personnel and certified (as part of a radioactive and mixed waste certification program) prior to storage.

[6]Refer to Footnote 1.

3.2.3.3.2 TRU Solid Mixed Waste Sampling and Analysis [20 NMAC 4.1, Subpart V, 264.13(b)(3)]

Sampling and analysis will be performed when a homogeneous solid TRU mixed waste lacks sufficient process information to adequately characterize the waste based on acceptable knowledge. Sampling and analysis can be initiated by the generator or waste management group through the WPF. To ensure that proper procedures and considerations for sample collection, preservation, and shipping; QA/QC; and occupational safety and health are followed, personnel involved in sampling and analysis of TRU solid mixed waste will comply with LANL-specific protocol consistent with SW-846 (EPA, 1994c). Sampling is conducted according to LANL sampling procedures to ensure that a representative sample is collected. Specific information relative to sampling, parameters, and analytical methods is outlined in Tables 3-1 and 3-2.

For purposes of collecting a representative sample of TRU solid mixed waste, the sample will be collected and handled by means that will preserve its original physical form and composition and will prevent contamination or changes in concentration of the parameters to be analyzed (EPA, 1994c). The two major approaches used to collect a representative sample are authoritative and random sampling as defined in SW-846.

3.2.4 Verification Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3)]

Verification analysis may be performed for one or more of the following reasons: to verify the accuracy of the initial waste characterization; to verify that applicable treatment standards have been met; when there is a significant change in a waste-generating process; when the generator requests a review; or when analytical results indicate a change in a waste stream. Verification analysis for TRU mixed waste will be conducted at LANL's or an approved subcontractor's laboratory facilities. All verification analyses will be conducted in conformance with appropriate methods.

LANL homogeneous TRU mixed waste streams will undergo verification sampling and analysis at a frequency of at least 1 percent of the waste streams per year. This verification will be used to support waste characterization information provided on the WPF and the radioactive and mixed waste certification information. Analytical results that show regulated constituents present at concentrations outside the ranges specified on the existing WPF are cause for rejection of the existing WPF and will require additional characterization (i.e., a new WPF will be generated and

submitted to waste management personnel prior to acceptance of a routinely generated waste stream in question). The recharacterization will include sampling and analysis sufficient to establish the range of regulated constituents potentially present in the waste stream (to the extent possible).

3.3 WASTE ANALYSIS REQUIREMENTS FOR THE TREATMENT OF TRU MIXED WASTE

Specific waste analysis requirements for the treatment of TRU mixed waste are provided in the following sections.

3.3.1 Facility Waste-Generating Processes, Activities, and Identification of TRU Mixed Wastes Managed

TRU mixed waste treated in the cementation unit by solidification is generated primarily from R&D activities and processing and recovery operations. Specifically, TRU mixed waste that may be treated by solidification at TA-55 consists of liquids (i.e., evaporator bottoms solutions) and inorganic and organic process solids. Once these wastes are treated, they are classified as homogeneous solids (Matrix Parameter Code S3000).

3.3.1.1 TRUCON Codes

The TRUCON-coded TRU mixed waste streams generated and subsequently treated at TA-55 are LA 114 and LA 126. These TRUCON codes are fully described in Section 3.2.1.1. The EPA Hazardous Waste Numbers that potentially apply to these TRUCON-coded wastes are listed in Table 3-6.

3.3.2 Waste Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)]

Characterization is performed prior to treating TRU mixed waste, as required by 20 NMAC 4.1, revised November 1, 1995. Waste parameters are selected to ensure that this characterization contains all necessary information to properly treat the waste in accordance with general facility standards.

3.3.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)]

Proposed analytical parameters for characterization of TRU mixed waste and for verification of effective treatment (i.e., to confirm the physical form of the waste) include the parameters previously mentioned in Section 3.2.2.1 and are summarized in Table 3-2.

3.3.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)]

Waste analysis parameters are selected to characterize TRU mixed waste in conformance with 20 NMAC 4.1, revised November 1, 1995; to ensure that all criteria for disposition at WIPP will be met; and to verify treatment effectiveness (i.e., solidification). The analytical parameters and the rationale for the selected parameters are identified in Table 3-7.

3.3.3 Characterization of Treated TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)]

Chemical and physical characterization is performed prior to treatment of TRU mixed waste at TA-55, in accordance with 20 NMAC 4.1, Subpart V, 264.13, revised November 1, 1995. Characterization of TRU mixed waste is accomplished by applying process knowledge and by obtaining chemical analytical data from representative samples of TRU liquid waste (i.e., evaporator bottoms solutions) to be treated by solidification. Preliminary TRU mixed waste characterizations are developed using process knowledge and through the use of a radioactive and mixed waste certification program. Documented and auditable acceptable knowledge, as described in Section 3.3.3.1, is used to determine whether the waste stream is regulated as a hazardous waste. If a homogeneous TRU mixed waste cannot be adequately characterized because of insufficient process information, sampling and analysis are performed.

Homogeneous solids and liquids are the only TRU mixed waste types treated at TA-55. Waste streams generated at TA-55 in the homogeneous solids (Matrix Parameter Code S3000) category may contain RCRA-regulated metals[7] (see Table 3-2). These homogeneous waste streams are periodically sampled and analyzed for the TC metal contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995, as previously discussed in Section 3.2.3. For liquids (i.e., evaporator bottoms solutions), the total values are directly correlated to the maximum concentration of contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995.

Initial predictions of hazardous constituents present in each treated waste stream will be based on process knowledge, with waste sampling and analysis performed as necessary to obtain qualitative and quantitative data for hazardous constituents (i.e., metals). Table 3-7 summarizes

[7]Refer to Footnote 1.

characterization methods by matrix parameter code. Parameters and analytical methods for specific hazardous constituents are presented in Table 3-2.

Sampling of TRU mixed waste treated at TA-55 may be performed at other appropriate LANL facilities. For this additional sampling effort, LANL will use statistically-based sampling and analysis, along with RTR, visual examination, and headspace gas analysis (LANL, 1995a).

For future TRU mixed waste, knowledge of the waste-generating process will be strictly controlled by a QA/QC program that will address management of specific waste streams. This program is briefly described in Section 3.2.3.

3.3.3.1 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2), 264.13(b)(5), and Subpart IX, 270.14(b)(2)]

TRU mixed waste currently generated and treated at TA-55 is characterized primarily by using acceptable knowledge because TRU mixed wastes treated at TA-55 are generated by administratively-controlled processes. Health and safety risks to personnel from exposure to radioactive materials during sampling and analysis of certain TRU mixed waste forms and the limited number of analytical laboratories capable of accepting and analyzing TRU mixed waste makes the collection and analysis of TRU mixed waste samples difficult. For additional information regarding the use and sources of acceptable knowledge, refer to Section 3.2.3.2.

3.3.3.2 Sampling and Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2) and (3), and Subpart IX, 270.14(b)(2)]

This section discusses proposed sampling and analytical procedures applicable to TRU mixed wastes. The approach described for characterizing TRU mixed waste streams is based on radiological, physical/chemical, and hazardous properties of the waste. The sampling and analysis strategies presented here will be used to evaluate whether TRU mixed waste exhibits the characteristic of toxicity for metals, as described in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995. Determinations of whether a TRU mixed waste exhibits other characteristics (i.e., ignitability, corrosivity, or reactivity) or is listed are made by applying acceptable knowledge, as described in Section 3.3.3.1. Homogeneous waste sampling and analysis for metals is used to obtain the physical and chemical data necessary for TRU mixed waste characterization prior to treatment.

3.3.3.2.1 TRU Solid Mixed Waste Sampling and Analysis [20 NMAC 4.1, Subpart V, 264.13(b)(3)]

Sampling and analysis will be performed when a homogeneous solid TRU mixed waste lacks sufficient process information to adequately characterize the waste based on acceptable knowledge. Sampling and analysis can be initiated by the generator or waste management group through the WPF. Waste sampling methods and sample handling procedures are described in Section 3.2.3.3.2.

3.3.3.2.2 TRU Liquid Mixed Waste Sampling and Analysis

TRU liquid mixed waste (i.e., evaporator bottoms solutions) is routinely sampled and analyzed for total metal content. Additionally, the evaporator bottoms solutions will be periodically sampled for VOCs and SVOCs. To ensure that proper procedures and considerations for sample collection and preservation, QA/QC, and occupational safety and health are followed, personnel involved in sampling and analysis of the evaporator bottoms solutions comply with LANL-specific protocol consistent with SW-846 (EPA, 1994c). For purposes of collecting a representative sample of evaporator bottoms solutions, the sample will be collected and handled in a manner that preserves its original physical form and composition and prevents contamination or changes in concentration of the parameters to be analyzed (EPA, 1994c). Sampling of evaporator bottoms solutions is conducted according to the sampling procedure described in NMT's procedure number 485-REC. Specific information relative to sampling, parameters, and analytical methods is outlined in Tables 3-1 and 3-2.

3.3.4 Verification Analysis for TRU Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3)]

Analysis may be performed to verify the accuracy of the initial waste characterization, to verify that applicable treatment standards have been met, when there is a significant change in a waste-generating process, when the generator requests a review, or when analytical results indicate a change in a waste stream. Verification analysis for TRU mixed waste will be conducted at LANL's or an approved subcontractor's laboratory facilities. All verification analyses will be conducted in conformance with appropriate methods.

At LANL, homogeneous TRU mixed waste streams will undergo verification sampling and analysis at a frequency of at least 1 percent of the waste streams per year. This verification will be used

to support waste characterization information provided on the WPF and the radioactive and mixed waste certification information.

3.4 WASTE ANALYSIS REQUIREMENTS FOR THE STORAGE OF LOW-LEVEL MIXED WASTE

Specific waste analysis requirements for the storage of low-level mixed waste are provided in the following sections.

3.4.1 Facility Waste-Generating Processes, Activities, and Identification of Low-Level Mixed Wastes Managed

Low-level mixed waste generated and stored at TA-55 is primarily from R&D activities, processing and recovery operations, general facility operations, and D&D activities conducted in radiological areas. Table 3-8 provides information on potential low-level mixed waste streams generated and stored at TA-55 including brief waste descriptions and waste-generating processes. The characterization basis for hazardous waste designation (i.e., acceptable knowledge and/or sampling and analysis), potential EPA Hazardous Waste Number(s), potential hazardous constituents in and/or characteristics of the waste, and regulatory limits are also listed in Table 3-8. Descriptions of the low-level mixed wastes and their waste-generating processes are provided below. These descriptions were extracted primarily from LANL's "Report for the Characterization Review of Low-Level Mixed Waste, Final Draft," (LANL, 1995b) and supplemented with information from NMT's WPF database.

3.4.1.1 Homogeneous Low-Level Solid Mixed Wastes

The homogeneous (i.e., uniform composition) low-level solid mixed waste stream generated and subsequently stored at TA-55 is described generally in the following paragraph.

Unused Solid Reagent Chemicals

Many different types of discarded off-specification unused reagent powders and crystalline materials generated at TA-55 comprise this waste stream. Most of these items are in the original manufacturer's containers. Many of these containers are unopened but are suspected to have radioactive surface contamination.

3.4.1.2 Heterogeneous Low-Level Solid Mixed Wastes

Heterogeneous (i.e., dissimilar or diverse composition) low-level solid mixed waste streams generated and subsequently stored at TA-55 are described generally in the following paragraphs.

Contaminated Bulk Lead Shielding and Scrap

Contaminated bulk lead shielding, metal debris, and contaminated scrap metals generated at TA-55 consist of radiation shielding used during laser applications, and D&D materials including, but not limited to, metal fittings, piping, and tools.

Discarded Bricks

Discarded bricks are generated at TA-55 and consist of lead bricks from radiation shielding and debris from D&D projects.

Organic-Contaminated Noncombustible Solids

This waste stream typically includes absorbed oils, laboratory debris, and discarded equipment. Absorbed oil waste is comprised of bulk drums containing rags or Kimwipes™ and vermiculite or corncob fractions used to absorb many different types of oil from spills, routine maintenance operations, and off-normal waste[8]. The oil generally originates from vacuum pumps and may be contaminated with mercury, lead, or cadmium. Absorbent is routinely added to those waste oils as required by standard operating procedures. The laboratory debris includes reagent bottles, broken glassware, and discarded disposable materials (e.g., drying dishes). Residual liquids or powders may have remained on some of the disposed material. Discarded equipment with heavy metals and solvents primarily includes equipment and broken glassware that may have contained residual solvents.

Mercury Waste

The mercury waste stream generated at TA-55 consists of free elemental mercury, mercuric compounds, gels containing mercuric compounds, and discarded instruments or broken equipment containing liquid mercury. The instruments and equipment include broken

[8]Off-normal waste is any non-routinely generated waste and may include spill residues, D&D waste, and waste generated during environmental remediation/restoration activities.

thermometers, vacuum tubes from electronic applications, vacuum pumps with residual mercury, fluorescent light bulbs, and mercury absorbed into a paper or solid matrix.

Batteries

Battery wastes generated at TA-55 include discarded lead-acid, mercury, and rechargeable batteries from decommissioned equipment or routine maintenance operations. Some batteries may contain residual liquids. Many of the batteries were used as backup power supplies at locations where they were potentially subject to long-term radiological contamination.

3.4.1.3 Low-Level Liquid Mixed Wastes

Low-level liquid mixed waste streams generated and subsequently stored at TA-55 are described generally in the following paragraphs.

Spent Solvents and Contaminated Solvent Mixtures

This waste stream is comprised of spent solvents and spent solvent mixtures that may be contaminated with organic or inorganic compounds, heavy metals, oils, and other contaminants. Waste-generating activities at TA-55 include a wide variety of R&D and processing operations such as extraction operations, bench-scale experimental inorganic chemistry, environmental analysis, and radiochemistry.

Corrosive Liquid Wastes

Corrosive liquid wastes generated at TA-55 consist of acidic or alkaline solutions which may be contaminated with organics, inorganics, metals, oils, or other contaminants. Waste-generating activities at TA-55 include radiochemistry research, plutonium processing, and analytical chemistry.

Nonaqueous, Noncorrosive Liquids Contaminated with Heavy Metals

This waste stream consists of nonaqueous, noncorrosive solutions generated at TA-55 that are contaminated with heavy metals. Waste-generating activities at TA-55 include metal polishing operations and radiochemistry research.

Oil Wastes

Oil wastes are generated at TA-55 primarily during equipment maintenance operations. Possible contaminants include heavy metals and solvents.

Unused Liquid Reagent Chemicals

Many different types of discarded off-specification unused liquid reagent chemicals generated at TA-55 comprise this waste stream. Most of these items are in their original containers.

Photographic Processing and Photocopier Wastes

Photographic-processing wastes include spent or excess film developers, fixer solutions, and photo bleach solutions that may be contaminated with heavy metals. Photocopier wastes include kerosene-based toners and dispersants. Waste-generating activities at TA-55 include photographic film-processing and photocopier operations.

3.4.2 Waste Analysis Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)]

Chemical and physical characterization is performed prior to managing low-level mixed waste, as required by 20 NMAC 4.1, revised November 1, 1995. Waste analysis parameters are selected to ensure that the characterization contains all necessary information to properly store waste in accordance with general facility standards and LDR requirements. Characterization is performed by utilizing the procedures described in Section 3.4.3.

3.4.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)]

Proposed analytical parameters, characterization methods, and test methods for the storage of low-level mixed waste are summarized in Tables 3-3 and 3-9. The analytical parameters listed in Table 3-9 for the waste streams described in Section 3.4.1 were selected based on acceptable knowledge, as described in Section 3.4.3.1.

Documentation supporting acceptable knowledge for each waste stream is reviewed to identify the analytical parameters for potential hazardous constituents in the waste and any compatibility concerns associated with the waste. Table 3-3 indicates the proposed test methods for generating the data, pursuant to 20 NMAC 4.1, Subpart V, 264.13(b)(2), revised November 1, 1995.

3.4.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)]

Waste analysis parameters are selected to characterize low-level mixed waste in conformance with 20 NMAC 4.1, revised November 1, 1995. These parameters are based on knowledge of raw materials and the physical/chemical processes of waste-generating activities, and may be supported by analytical data. The rationale for the selected parameters are identified in Tables 3-3 and 3-9.

3.4.3 Characterization of Low-Level Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)]

Chemical and physical characterization is performed prior to storing any low-level mixed waste at TA-55, in accordance with 20 NMAC 4.1, Subpart V, 264.13, revised November 1, 1995. Characterization of low-level mixed waste is accomplished by applying process knowledge or obtaining chemical or physical analytical data from representative samples of the waste. Preliminary low-level mixed waste characterizations are developed using process knowledge, which is provided by waste generators. A secondary distinction between heterogeneous and homogeneous waste is then made to determine the availability and appropriateness of sampling procedures. If a homogeneous low-level mixed waste cannot be adequately characterized because of insufficient process information, sampling and analysis will be performed.

Characterization procedures are constrained by the physical nature of the waste stream (i.e., homogeneous or heterogeneous). Homogeneous low-level mixed waste may be characterized for the presence of hazardous constituents (i.e., VOCs, SVOCs, and metals) on the basis of process knowledge and/or sampling and analysis. Homogeneous waste streams may be sampled and analyzed for the TC contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995, as previously described in Section 3.2.3. For low-level liquid mixed waste, the total values are directly correlated to the maximum concentration of contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995. Because of the difficulty in obtaining representative samples and the lack of appropriate sampling methodology, heterogeneous low-level mixed waste will be characterized largely on the basis of process knowledge.

For waste streams characterized by process knowledge, LANL will implement a documented QA/QC program that will address management of these specific waste streams. This program is briefly described in Section 3.2.3 in the discussion of future TRU mixed waste.

3.4.3.1 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2), 264.13(b)(5), and Subpart IX, 270.14(b)(2)]

Low-level mixed wastes generated and stored at TA-55 are characterized primarily by using acceptable knowledge because many wastes stored at TA-55 are generated by well-defined and administratively-controlled processes. Health and safety risks to personnel from exposure to radioactive material during sampling and analysis activities and the limited number of analytical laboratories make the collection and analysis of low-level mixed waste samples difficult. In addition, the physical nature of some low-level mixed waste forms (e.g., debris, equipment, and instruments) makes the collection of representative samples difficult. These difficulties include:

- Waste streams which contain disparate elements
- Disparate elements may need to be segregated into similar forms
- Large objects cannot be made to fill standard-size sample containers
- Laboratories may not have the capability to sample large objects (EPA, 1992).

Obtaining a representative sample of debris waste, as required by 20 NMAC 4.1, Subpart V, 264.13(b)(3), revised November 1, 1995, is difficult. Because problems arise in collecting representative samples from irregularly shaped and indurated waste items, debris waste is expected to exhibit highly variable concentrations of hazardous constituents, even for segregated materials. This may potentially diminish the reliability of sampling and analytical data. Information collected as part of the radioactive and mixed waste certification program may support acceptable knowledge used for waste characterization. For additional information regarding the use and sources of acceptable knowledge, refer to Section 3.2.3.2.

3.4.3.2 Sampling and Analysis for Low-Level Solid Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3), 264.13(b)(2), (3), and (4), and Subpart IX, 270.14(b)(2)]

Sampling and analysis will be performed when a homogeneous low-level solid mixed waste lacks sufficient process information to adequately characterize the waste based on acceptable knowledge. Sampling and analysis can be initiated by the generator or waste management group through the WPF. To ensure that proper procedures and considerations for sample collection, preservation, and shipping; QA/QC; and occupational safety and health are followed, personnel

involved in sampling and analysis of low-level solid mixed waste comply with LANL-specific protocol consistent with SW-846 (EPA, 1994c). Sampling is conducted according to LANL sampling procedures to ensure that a representative sample is collected. Specific information relative to sampling, parameters, and analytical methods is outlined in Tables 3-1 and 3-3.

For purposes of collecting a representative sample of low-level solid mixed waste, the sample will be collected and handled by means that will preserve its original physical form and composition and will prevent contamination or changes in concentration of the parameters to be analyzed (EPA, 1994c). The two major approaches used to collect a representative sample are authoritative and random sampling as defined in SW-846. The following sampling equipment may be used for collection of homogeneous low-level solid mixed waste:

- A spade, scoop, or trowel for surface soil or drummed soil
- A hand auger and thin-walled tube sampler for subsurface soil or drummed soil
- A scoop for sludge or sediment samples
- A grain thief, trier, or scoop for bulk material.

Further characterization of low-level solid mixed waste will be performed at other appropriate LANL facilities and may consist of RTR and visual examination (LANL, 1995a).

Visual examination is used to verify process knowledge for those waste streams amenable to visual confirmation. This visual examination may include comparing waste stream information against container type, weight, and labeling. These examinations are performed by trained NMT waste management personnel. If a visual examination indicates a discrepancy between the waste and its WPF, additional characterization of the waste will be performed. Verification analysis is discussed in detail in Section 3.4.4.

Significant changes in waste-generating processes will be verified through an annual recharacterization evaluation of WPFs. In addition, if a newly generated waste is of different composition than the stored waste or if waste verification inspections indicate a discrepancy between the waste and its WPF, additional characterization will be performed. Both homogeneous and heterogeneous wastes will undergo reevaluation through review of documentation supporting waste characterization activities.

3.4.3.3 Sampling and Analysis for Low-Level Liquid Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2), (3), and (4), and Subpart IX, 270.14(b)(2)]

Sampling and analysis will be performed when a low-level liquid mixed waste lacks sufficient process information to adequately characterize the waste based on acceptable knowledge. Sampling and analysis can be initiated by the generator or waste management group through the WPF. A glass tube or a composite liquid waste sampler (COLIWASA) may be used to collect a sample of low-level liquid mixed waste. Additional waste sampling methods and sample handling procedures are described in Section 3.4.3.2.

3.4.4 Verification Analysis for Low-Level Mixed Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3)]

Verification analyses are performed for one or more of the following reasons: to verify the accuracy of the initial waste characterization based on acceptable knowledge; to verify that applicable treatment standards have been met; when there is a significant change in a waste-generating process; when the generator or waste management group requests an analysis; or when analytical results indicate a change in the composition of a waste stream. Verification analyses for low-level mixed waste are conducted at LANL's or an approved subcontractor's laboratory facilities. All verification analyses are conducted in conformance with appropriate EPA-approved methods. The type of verification analysis performed to obtain waste characterization information depends upon the physical form of the waste (i.e., homogeneous solids, heterogeneous solids, or liquids). Verification analysis methodologies for these different types of waste are presented below.

Homogeneous low-level mixed waste streams that have been characterized using LANL's WPF and a radioactive and mixed waste certification program will undergo verification sampling and analysis at a frequency of at least 1 percent of the waste streams per year. Waste streams are randomly selected for verification analysis. Factory-sealed containers and original containers of unused chemicals will not be included in this analysis. Lab-packed chemicals in original containers that have been accepted by an off-site disposal or treatment facility need not be verified unless rejected by the off-site facility. Verification information will be used to support waste characterization information based on acceptable knowledge for the waste stream.

Process knowledge documentation applicable to heterogeneous low-level mixed waste streams are qualitatively verified through visual examination of the contents of all waste containers and by reviewing supporting documentation.

Analytical results showing regulated hazardous constituents present at concentrations outside of the ranges specified on the WPF are cause for rejection of the existing WPF and will require additional characterization (i.e., a new WPF will be generated and submitted to waste management personnel prior to acceptance of a routinely generated waste stream in question). The recharacterization will include sampling and analysis sufficient to establish the range of regulated hazardous constituents potentially present in the waste stream. In addition, any time a significant process change occurs affecting a waste stream, verification analysis will be repeated to determine the regulatory status of the waste stream.

Low-level liquid mixed waste streams will undergo additional qualitative verification through review of documentation as part of the radioactive and mixed waste certification program.

3.5 WASTE ANALYSIS REQUIREMENTS FOR THE STORAGE OF HAZARDOUS WASTE

Specific waste analysis requirements for the storage of hazardous waste at TA-55 are provided in the following sections.

3.5.1 Facility Waste-Generating Processes, Activities, and Identification of Hazardous Wastes Managed

Hazardous waste is generated at TA-55 primarily from R&D activities, general facility operations, and D&D projects.

TA-55's R&D activities generate a variety of hazardous wastes, most in relatively small quantities. The composition of each R&D waste stream is unique to the activity, but typically consists of laboratory reagents, solvents, test samples, analytical wastes, and laboratory containers and equipment (e.g., glass, ceramic, plastic, and metal) contaminated with these wastes. Other hazardous wastes, consisting of small quantities of acids, bases, organics, inorganics, and miscellaneous chemicals, are also generated.

Table 3-10 provides information on hazardous waste streams generated and stored at TA-55 including brief waste descriptions and waste-generating processes. The characterization basis for hazardous waste designation (i.e., acceptable knowledge and/or sampling and analysis), potential EPA Hazardous Waste Number(s), potential hazardous constituents in and characteristics of the waste, and regulatory limits are also listed in Table 3-10. Descriptions of the hazardous wastes and their waste-generating processes at TA-55 are provided below. These descriptions are based primarily on information from NMT's WPF database, which contains process and waste information that has been reviewed for quality and accuracy.

3.5.1.1 Hazardous Wastes Managed

Hazardous waste streams generated and stored at TA-55 are described generally in the following paragraphs.

Spent Solvents and Contaminated Solvent Mixtures

This waste stream consists of liquid spent solvents and spent solvent mixtures that may be contaminated with organic or inorganic compounds, heavy metals, oils, and other contaminants. Waste-generating activities at TA-55 include R&D activities, laser research, organic and inorganic chemical research, cleaning, and degreasing.

Contaminated Solid Wastes

Contaminated solid wastes are typically heterogeneous mixtures of rags, spill cleanup materials, Kimwipes™, gloves, filters, plastic and paper products, personal protective equipment, and disposable equipment contaminated with organic or inorganic compounds, heavy metals, oils, and other contaminants. Waste-generating activities at TA-55 include machining operations, chemical research, D&D projects, metal finishing operations, and general maintenance operations.

Paint and Paint-Related Wastes

Paint and paint-related wastes consist of excess paint, aerosol paints, paint strippers/thinners, and sludges of paints and thinners, etc. Possible contaminants include heavy metals used as paint pigments and solvents contained in thinners and lacquers. Waste-generating activities at TA-55 include painting and finishing operations and general facility maintenance. The waste matrices may be homogeneous or heterogeneous depending on the specific waste-generating process.

Photographic Processing and Photocopier Wastes

Photographic-processing wastes include spent or excess film developers, fixer solutions, and photo bleach solutions that may be contaminated with heavy metals. Photocopier wastes include kerosene-based toners and dispersants. Waste-generating activities at TA-55 include photographic film-processing and photocopier operations.

Corrosive Liquid Wastes

Corrosive liquid wastes consist of acidic or alkaline solutions contaminated with organics, inorganics, metals, oils, and other contaminants. Waste-generating activities at TA-55 include analytical chemistry research, electroetching, and electropolishing.

Solid Metals and Metallic Compounds

This waste stream consists of homogeneous wastes including metal chips and turnings from machining and cutting operations; metal powders; metal salts; metal sheets; reactive metals used in synthesis reactions; solders from electronic manufacturing, repair, and brazing operations; and grinding operations at TA-55.

Contaminated Noncorrosive, Aqueous and Nonaqueous Solutions and Sludges, Including Oils

This waste stream consists of noncorrosive, aqueous and nonaqueous solutions and sludges that are contaminated with hazardous constituents. These wastes are typically homogeneous. Waste-generating activities at TA-55 include vacuum pump maintenance, analytical spectrometry, equipment cleaning and maintenance, vehicle maintenance, synthesis reactions, metal-polishing operations, and chemical research.

Mercury Wastes

Mercury wastes include free elemental mercury, mercuric compounds, articles and instruments containing mercury, fluorescent light fixtures, and gels containing mercuric compounds. Waste-generating activities at TA-55 include lamp replacement, chemical research, mercury spill cleanup, and equipment cleaning and maintenance.

Used Batteries and Battery Fluids

This waste stream consists of used batteries and battery fluids that may be contaminated with heavy metals such as cadmium, lead, mercury, and silver. Waste-generating activities at TA-55 include routine equipment maintenance.

Unused/Off-Specification Commercial Chemical Products

This waste stream consists of discarded solid or liquid chemical reagents generated at TA-55 that are off-specification, unused, or outdated. This waste stream may also include spill residues and empty containers containing original product residues that are unused.

3.5.2 Waste Analysis Parameters [20 NMAC 4.1, Subpart V, 264.13(a)(1)]

Chemical and physical characterization is performed prior to managing hazardous waste, as required by 20 NMAC 4.1, revised November 1, 1995. Waste analysis parameters are selected to ensure that the characterization contains all necessary information to properly store waste in accordance with general facility standards and LDR requirements. Characterization is performed using the procedures described in Section 3.5.3.

3.5.2.1 Proposed Analytical Parameters and Characterization Methods [20 NMAC 4.1, Subpart V, 264.13(b)(1), and Subpart IX, 270.14(b)(2)]

Proposed analytical parameters, characterization methods, and test methods for hazardous waste stored at TA-55 are summarized in Tables 3-4 and 3-11. The analytical parameters listed in Table 3-11 for the waste streams described in Section 3.5.1.1 were selected based on acceptable knowledge, as described in Section 3.5.3.1.

Documentation supporting acceptable knowledge for each waste stream is reviewed to identify the analytical parameters for potential hazardous constituents in the waste and any compatibility concerns associated with the waste. Table 3-4 provides the proposed test methods for generating the data, pursuant to 20 NMAC 4.1, Subpart V, 264.13(b)(2), revised November 1, 1995.

3.5.2.2 Criteria and Rationale for Parameter Selection [20 NMAC 4.1, Subpart V, 264.13(b)(1)]

Waste analysis parameters are selected to characterize hazardous waste in conformance with 20 NMAC 4.1, revised November 1, 1995. These parameters are based on knowledge of raw

materials and the physical/chemical processes of waste-generating activities, and may be supported by analytical data. The rationale for the selected parameters are identified in Tables 3-4 and 3-11.

3.5.3 Characterization of Hazardous Waste [20 NMAC 4.1, Subpart V, 264.13(a)(1), 264.13(b)(2), and Subpart IX, 270.14(b)(2)]

Chemical and physical characterization is performed prior to storing any hazardous waste at TA-55, in accordance with 20 NMAC 4.1, Subpart V, 264.13, revised November 1, 1995. Characterization of hazardous waste is accomplished primarily by either applying acceptable knowledge or obtaining chemical or physical analytical data from representative samples of the waste. Preliminary hazardous waste characterizations are developed using process knowledge, which is provided by waste generators. A secondary distinction between heterogeneous and homogeneous waste is made to determine the availability and appropriateness of sampling procedures. If a homogeneous hazardous waste cannot be adequately characterized because of insufficient process information, sampling and analysis are performed.

Characterization procedures are constrained by the physical nature of some hazardous waste streams (i.e., debris waste or equipment). Because of the difficulty in obtaining representative samples and the lack of appropriate sampling methodology, heterogeneous hazardous waste will be characterized solely on the basis of acceptable knowledge. Homogeneous hazardous waste may be characterized for the presence of hazardous constituents (e.g., VOC, SVOC, and metals) using acceptable knowledge, sampling and analysis, or both. Homogeneous waste streams may be sampled and analyzed for the TC contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995, as previously discussed in Section 3.2.3. For liquid hazardous waste streams, the total values are directly correlated to the maximum concentration of contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995.

For waste streams characterized by acceptable knowledge, LANL will implement a documented QA/QC program that will address management of specific waste streams. This program is briefly discussed in Section 3.2.3 in the discussion of future TRU mixed waste.

3.5.3.1 Acceptable Knowledge [20 NMAC 4.1, Subpart V, 264.13(a)(2) and (3), 264.13(b)(4) and (5), and Subpart IX, 270.14(b)(2)]

Hazardous wastes generated and stored at TA-55 are characterized primarily by using acceptable knowledge because many wastes stored at TA-55 are generated by well-defined and administratively-controlled processes. The physical nature of some hazardous solid waste forms (e.g., debris, equipment, and instruments) precludes the collection of representative samples. These difficulties include:

- Waste streams which contain disparate elements
- Disparate elements may need to be segregated into similar forms
- Large objects cannot be made to fill standard-size sample containers
- Laboratories may not have the capability to sample large objects (EPA, 1992).

For additional information regarding the use and sources of acceptable knowledge, refer to Section 3.2.3.2.

3.5.3.2 Sampling and Analysis for Hazardous Waste [20 NMAC 4.1, Subpart V, 264.13(b)(2), (3), and (4), and Subpart IX, 270.14(b)(2)]

Sampling and analysis will be performed when a homogeneous hazardous waste lacks sufficient process information to adequately characterize the waste based on acceptable knowledge. Sampling and analysis can be initiated by the generator or waste management group through the WPF. To ensure that proper procedures and considerations for sample collection, preservation, and shipping; QA/QC; and occupational safety and health are followed, personnel involved in sampling and analysis of hazardous waste will comply with LANL-specific protocol consistent with SW-846 (EPA, 1994c). Sampling is conducted according to LANL sampling procedures to ensure that a representative sample is collected. Specific information relative to sampling, parameters, and analytical methods is outlined in Tables 3-1, 3-4, and 3-11.

For purposes of collecting a representative sample of homogeneous hazardous waste, the sample will be collected and handled in a manner that preserves its original physical form and composition and prevents contamination or changes in concentration of the parameters to be analyzed (EPA, 1994c). The two major approaches used to collect a representative sample are authoritative and random sampling. The following sampling equipment may be used for collection of homogeneous solid hazardous waste samples.

- A spade, scoop, or trowel for surface soil or drummed soil
- A hand auger and thin-walled tube sampler for subsurface soil or drummed soil
- A scoop for sludge or sediment samples
- A grain thief, trier, or scoop for bulk material.

A glass tube or COLIWASA may be used to collect a sample of liquid hazardous waste.

Visual examination may be used to verify acceptable knowledge for those heterogeneous solid hazardous wastes amenable to visual confirmation. If a visual examination indicates a discrepancy between the waste and its WPF, additional characterization of the waste will be performed. Verification analysis is discussed in detail in Section 3.5.4.

Significant changes in waste-generating processes will be verified through an annual recharacterization evaluation. In addition, if the newly generated waste is of different composition than the stored waste or if waste verification inspections indicate a discrepancy between the waste and its WPF, additional characterization will be performed. The recharacterization will include sampling and analysis sufficient to establish the range of regulated constituents potentially present in the waste. Both homogeneous and heterogeneous wastes will undergo reevaluation through review of documentation supporting waste characterization activities.

3.5.4 Verification Analysis for Hazardous Waste [20 NMAC 4.1, Subpart V, 264.13(a)(3) and (b)(4)]

Verification analyses are performed for one or more of the following reasons: to verify the accuracy of the initial waste characterization based on acceptable knowledge; to verify that applicable treatment standards have been met; when there has been a significant change in a waste-generating process; when the generator requests an analysis; or when analytical results indicate a change in the composition of a waste stream. Verification analyses for hazardous waste are conducted at an on-site laboratory or at an approved subcontractor's laboratory facilities. All verification analyses are conducted in conformance with appropriate EPA-approved methods. The type of verification analysis that will be performed to obtain waste characterization information depends upon the physical form of the waste (i.e., homogeneous or heterogeneous). Verification analysis methodologies for these different types of waste are presented below.

Homogeneous waste streams initially characterized using acceptable knowledge will undergo verification sampling and analysis at a frequency of at least 1 percent of the waste streams per year. Waste streams are randomly selected for verification analysis. Factory-sealed containers and original containers of unused chemicals will not be included in this analysis. Lab-packed chemicals in original containers that have been accepted by an off-site disposal or treatment facility need not be verified unless rejected by the off-site facility. Verification information will be used to support waste characterization information based on acceptable knowledge for the waste stream.

Acceptable knowledge documentation applicable to heterogeneous waste streams are qualitatively verified through visual examination of the contents of select waste containers and by reviewing supporting documentation.

Analytical results showing regulated hazardous constituents present at concentrations outside of the ranges specified on the WPF are cause for rejection of the existing WPF and will require additional characterization (i.e., a new WPF will be generated and submitted to waste management personnel prior to acceptance of a routinely generated waste stream in question). The recharacterization will include sampling and analysis sufficient to establish the range of regulated hazardous constituents potentially present in the waste stream. In addition, any time a significant process change occurs affecting a waste stream, verification analysis will be repeated to determine the regulatory status of the waste stream.

Data provided in Tables 3-5, 3-6, 3-8, and 3-10 are subject to change as new information is obtained. The Waste Profile Form and the Land Disposal Restrictions Notification Form are subject to change as Los Alamos National Laboratory procedures are revised.

Table 3-1

Recommended Sample Containers[a], Preservation Techniques, and Holding Times[b]

Analyte Class and Sample Type	Container	Preservative	Holding Time
Volatile Organics			
Concentrated Waste Samples	250-milliliter [ml]) WM[c]-G[d] vial with Teflon™-lined lid	None	14 days
Liquid Samples			
No residual chlorine present	2 x 40-ml G vials with Teflon™-lined septum caps	Cool to 4 degrees Celsius (°C)[e].	14 days
Residual chlorine present	2 x 40-ml G vials with Teflon™-lined septum caps	Collect sample in a 4-oz soil volatile organic analyte (VOA) container that has been pre-preserved with 4 drops of 10 percent sodium thiosulfate. Gently mix sample and transfer to a 40-ml VOA vial. Cool to 4°C.	14 days
Acrolein and Acrylonitrile	2 x 40-ml G vials with Teflon™-lined septum caps	Adjust to pH[f] of 4-5. Cool to 4°C.	14 days
Soil/Sediments and Sludges	125 ml WM-G	Cool to 4°C.	14 days
Semivolatile Organics/Organochlorine Pesticides and Herbicides			
Concentrated Waste Samples	250 ml WM-G vial with Teflon™-lined lid	None	Samples must be extracted within 14 days and analyzed within 40 days following extraction.
Soil/Sediments and Sludges	250 ml WM-G vial with Teflon™-lined lid	Cool to 4°C.	Samples must be extracted within 14 days and analyzed within 40 days following extraction.

Refer to footnotes at end of table.

Table 3-1 (Continued)

Recommended Sample Containers[a], Preservation Techniques, and Holding Times[b]

Analyte Class and Sample Type	Container	Preservative	Holding Time
Liquid Samples			
No Residual Chlorine Present	4 x 1 liter (L) AG[g] container with Teflon™ lined lid	Cool to 4°C.	Samples must be extracted within 7 days and extracts analyzed within 40 days following extraction.
Residual Chlorine Present	4 x 1-L AG with Teflon™ lined lid	Add 3 ml 10% sodium thiosulfate solution per gallon.[h] Cool to 4°C.	Samples must be extracted within 7 days and extracts analyzed within 40 days following extraction.
Metals			
Liquid Samples (except hexavalent chromium and mercury)	1-L P[i] or G	Add nitric acid to pH of less than 2.	180 days
Hexavalent chromium	500-ml P or G	Cool to 4°C.	24 hours
Mercury	500-ml P or G	Add nitric acid to pH of less than 2, Cool to 4°C.	28 days
Soil/sediments and Sludges (except hexavalent chromium and mercury)	500-ml WM-P or G	Cool to 4°C.	180 days
Hexavalent chromium	500-ml WM-P or G	Cool to 4°C.	Not established - analyze as soon as possible.
Mercury	500-ml WM-P or G	Cool to 4°C.	28 days

Refer to footnotes at end of table.

Table 3-1 (Continued)

Recommended Sample Containers[a], Preservation Techniques, and Holding Times[b]

[a] Smaller sample containers may be required due to health and safety concerns associated with potential radiation exposure; transportation requirements; and waste management considerations.
[b] U.S. Environmental Protection Agency, 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.
[c] WM = Wide-mouth
[d] G = Glass
[e] Adjust to pH (see footnote f) of less than 2 with sulfuric acid, hydrochloric acid, or solid sodium bisulfate.
[f] A term used to describe the hydrogen-ion activity of a system.
[g] AG = Amber glass
[h] Pre-preservation may be performed in the laboratory prior to field use.
[i] P = Polyethylene

Table 3-2

Summary of Waste Characterization Techniques for Transuranic Mixed Waste

Parameter	Method Numbers	Test Methods	Rationale
	Storage		
Physical Waste Form		Waste inspection procedures Visual examination Process knowledge	Verify waste container contents
Volatile organic compounds (VOC) in waste matrix: Spent halogenated solvents Spent nonhalogenated solvents	ASTM Method D4547-91[a] U.S. EPA/540/4-91/001[b] SW-846 (1311, 8240B, 8260A)[c] or equivalent methods[d]	Total and/or toxicity characteristic leaching procedure (TCLP) VOC analysis by gas chromatography/mass spectrometry (GC/MS) Process knowledge for debris wastes	Determine the presence or absence of VOC in samples
Semivolatile organic compounds (SVOC) in waste	SW-846 (1311, 8250A, 8270B)[c] or equivalent methods	Total and/or TCLP SVOC analysis by GC/MS Process knowledge for debris waste	Determine the presence or absence of SVOC in samples
Metals in waste: Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	SW-846 (1311, 6010A, 7060A, 7061A)[c] (1311, 6010A, 7080A, 7081)[c] (1311, 6010A, 7130, 7131A)[c] (1311, 6010A, 7190, 7191)[c] (1311, 6010A, 7420, 7421)[c] (1311, 7470A, 7471A)[c] (1311, 6010A, 7740, 7741A, 7742)[c] (1311, 6010A, 7760A, 7761)[c] or equivalent methods	Total and/or TCLP metals analysis Inductively-coupled plasma spectroscopy Atomic absorption spectroscopy Cold vapor atomic absorption spectroscopy Process knowledge for debris wastes	Determine total or TCLP metals concentration in samples
Ignitability	SW-846 (1010 and 1020A)[c] or equivalent methods	Pensky-Martens closed cup Seta Flash closed cup	Determine ignitability
pH	SW-846 (9040B and 9041A)[c] or equivalent methods	pH electrometric measurement pH paper	Determine corrosivity
	Treatment		
Physical Waste Form		Waste inspection procedures Visual examination Process knowledge	Verify waste container contents
Metals in waste: Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	SW-846 (1311, 6010A, 7060A, 7061A)[c] (1311, 6010A, 7080A, 7081)[c] (1311, 6010A, 7130, 7131A)[c] (1311, 6010A, 7190, 7191)[c] (1311, 6010A, 7420, 7421)[c] (1311, 7470A, 7471A)[c] (1311, 6010A, 7740, 7741A, 7742)[c] (1311, 6010A, 7760A, 7761)[c] or equivalent methods	Total and/or TCLP metals analysis Inductively-coupled plasma spectroscopy Atomic absorption spectroscopy Cold vapor atomic absorption spectroscopy	Determine total or TCLP metals concentration in samples

Refer to footnotes at end of table.

Table 3-2 (Continued)

Summary of Waste Characterization Techniques for Transuranic Mixed Waste

Parameter	Method Numbers	Test Methods	Rationale
pH	SW-846 (9040B and 9041A)[c] or equivalent methods	pH electrometric measurement pH paper	Determine corrosivity

[a] American Society for Testing and Materials (ASTM), 1991, "Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds," *ASTM D4547-91*, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, American Society for Testing and Materials.
[b] U.S. Environmental Protection Agency (EPA), 1991, "Soil Sampling and Analysis for Volatile Organic Compounds," *EPA/540/4-91/001*, Office of Research and Development, U.S. Environmental Protection Agency.
[c] U.S. Environmental Protection Agency (EPA), 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.
[d] Equivalent methods, subject to EPA approval, may be substituted.

Table 3-3

Summary of Waste Characterization Techniques for Low-Level Mixed Waste

Parameter	Method Numbers	Test Method	Rationale
	Solid Wastes		
Volatile organic compounds (VOC) in waste matrix: Acetone Methyl ethyl ketone Methyl isobutyl ketone Spent halogenated solvents Spent nonhalogenated solvents 1,1,1-Trichloroethane Xylene	ASTM Method D4547-91[a] U.S. EPA/540/4-91/001[b] SW-846 (1311, 8240B, 8260A)[c] or equivalent methods[d]	Total and/or toxicity characteristic leaching procedure (TCLP) VOC analysis by gas chromatography/mass spectrometry (GC/MS) Process knowledge for heterogeneous wastes	Determine total or TCLP VOC concentration in samples of solid process residues and soils
Semivolatile organic compounds (SVOC) in waste: 1,4-Dichlorobenzene	SW-846 (1311, 8270B)[c] or equivalent methods	Total and/or TCLP SVOC analysis by GC/MS Process knowledge for heterogeneous waste	Determine total or TCLP SVOC concentration in samples of solid process residues and soils
Metals in waste: Arsenic Barium admium Chromium Lead Mercury Selenium Silver	SW-846 (1311, 6010A, 7060A, 7061A)[c] (1311, 6010A, 7080A, 7081)[c] (1311, 6010A, 7130, 7131A)[c] (1311, 6010A, 7190, 7191)[c] (1311, 6010A, 7420, 7421)[c] (1311, 7470A, 7471A)[c] (1311, 6010A, 7740, 7741A, 7742)[c] (1311, 6010A, 7760A, 7761)[c] or equivalent methods	Total and/or TCLP metals analysis Inductively-coupled plasma spectroscopy Atomic absorption spectroscopy Cold vapor atomic absorption spectroscopy Process knowledge for heterogeneous wastes	Determine total or TCLP metals concentration in samples of solid process residues and soils

Refer to footnotes at end of table.

Table 3-3 (Continued)

Summary of Waste Characterization Techniques for Low-Level Mixed Waste

Parameter	Method Numbers	Test Method	Rationale
	Liquid Wastes		
VOCs in waste matrix: Acetone Benzene Carbon disulfide Carbon tetrachloride Chlorobenzene Chloroform 1,4-Dichlorobenzene 1,2-Dichloroethane Ethyl acetate Hexachlorobutadiene Hexachloroethane Isobutanol Methanol Spent halogenated solvents Spent nonhalogenated solvents Methyl ethyl ketone Methylene chloride Nitrobenzene Pyridine Tetrachloroethylene oluene ,1,1-Trichloroethane Trichloroethylene Vinyl Chloride Xylene	ASTM Method D4547-91[a] EPA/540/4-91/001[b] SW-846 (1311, 8240B, 8260A)[c] or equivalent methods	Total and/or TCLP and VOC analysis by GC/MS	Determine total or TCLP VOC concentration in samples of liquid
SVOCs in waste: 2,4-Dinitrotoluene Hexachlorobenzene Hexachlorobutadiene Hexachloroethane 2,4,6-Trichlorophenol	SW-846 (1311, 8250A, 8270B)[c] or equivalent methods	Total and/or TCLP SVOC analysis by GC/MS	Determine total or TCLP SVOC concentration in samples of liquid
Metals in waste: Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	SW-846 (1311, 6010A, 7060A, 7061A)[c] (1311, 6010A, 7080A, 7081)[c] (1311, 6010A, 7130, 7131A)[c] (1311, 6010A, 7190, 7191)[c] (1311, 6010A, 7420, 7421)[c] (1311, 7470A, 7471A)[c] (1311, 6010A, 7740, 7741A, 7742)[c] (1311, 6010A, 7760A, 7761)[c] or equivalent methods	Total and/or TCLP metals analysis Inductively-coupled plasma spectroscopy Atomic absorption spectroscopy Cold vapor atomic absorption spectroscopy	Determine total or TCLP metals concentration in samples of liquid

Refer to footnotes at end of table.

Table 3-3 (Continued)

Summary of Waste Characterization Techniques for Low-Level Mixed Waste

Parameter	Method Numbers	Test Method	Rationale
Liquid Wastes (Continued)			
Ignitability	SW-846 (1010 and 1020A)[c] or equivalent methods	Pensky-Martens closed cup Setaflash closed cup	Determine ignitability
pH	SW-846 (9040B and 9041A)[c] or equivalent methods	pH electrometric measurement pH paper	Determine corrosivity

[a] American Society for Testing and Materials (ASTM), 1991, "Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds," *ASTM D4547-91*, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, American Society for Testing and Materials.
[b] U.S. Environmental Protection Agency (EPA), 1991, "Soil Sampling and Analysis for Volatile Organic Compounds," EPA/540/4-91/001, Office of Research and Development, U.S. Environmental Protection Agency.
[c] U.S. Environmental Protection Agency (EPA), 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C..
[d] Equivalent methods, subject to EPA approval, may be substituted.

Table 3-4

Summary of Waste Characterization Techniques for Hazardous Waste

Parameter[a]	Method Numbers	Test Methods	Rationale
Volatile organic compounds (VOC) in waste matrix: Acetone Benzene Carbon tetrachloride Chlorobenzene Chloroform 1,2-Dichloroethane F-listed solvents Methyl ethyl ketone Methylene chloride 1,1,1-Trichloroethane Trichloroethylene Tetrachloroethylene Xylene	ASTM Method D4547-91[b] U.S. EPA/540/4-91/001[c] SW-846 (1311, 8240B, 8260A)[d] or equivalent methods[e]	Total or toxicity characteristic leaching procedure (TCLP) VOC analysis by gas chromatography/ mass spectrometry (GC/MS) Acceptable knowledge for heterogeneous wastes	Determine total or TCLP VOC concentration in samples of solids or liquids
Semivolatile organic compounds (SVOC) in waste: 2,4-Dinitrotoluene Hexachlorobenzene Hexachlorobutadiene Hexachloroethane 'itrobenzene yridine 2,4,6-Trichlorophenol	SW-846 (1311, 8250A, 8270B)[d] or equivalent methods	Total or TCLP SVOC analysis by GC/MS Acceptable knowledge for heterogeneous wastes	Determine total or TCLP SVOC concentration in samples of solids or liquids
Metals in waste: Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	SW-846 (1311, 6010A, 7060A, 7061A)[d] (1311, 6010A, 7080A, 7081)[d] (1311, 6010A, 7130, 7131A)[d] (1311, 6010A, 7190, 7191)[d] (1311, 6010A, 7420, 7421)[d] (1311, 7470A, 7471A)[d] (1311, 6010A, 7740, 7741A, 7742)[d] (1311, 6010A, 7760A, 7761)[d] or equivalent methods	Total and/or TCLP metals analysis Inductively-coupled plasma spectroscopy Atomic absorption spectroscopy Cold vapor atomic absorption spectroscopy Acceptable knowledge for heterogeneous wastes	Determine total or TCLP metals concentration in samples of solids or liquids
Reactive Sulfide	SW-846, Test Method to Determine Hydrogen Sulfide Released from Wastes[f] SW-846 (9010A, 9012, 9013)[d] or equivalent methods	Colorimetric or titrametric measurement of hydrogen sulfide released from waste following reflux distillation under acidic conditions	Determine concentration of reactive sulfides
Ignitability	SW-846 (1010 and 1020A)[d] or equivalent methods	Pensky-Martens closed cup Setaflash closed cup	Determine ignitablity
pH	SW-846 (9040B and 9041A)[d] or equivalent methods	pH electrometric measurement pH paper	Determine corrosivity

[a] Information contained in this column is from the Los Alamos National Laboratory Chemical Science and Technology Division Waste Profile Form database.
[b] American Society for Testing and Materials (ASTM), 1991, "Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds," *ASTM D4547-91*, Annual Book of ASTM Standards, Philadelphia, Pennsylvania.

Table 3-4 (Continued)

Summary of Waste Characterization Techniques for Hazardous Waste

[c] U.S. Environmental Protection Agency (EPA), 1991, "Soil Sampling and Analysis for Volatile Organic Compounds," *EPA/540/4-9/001*, Office of Research and Development.

[d] U.S. Environmental Protection Agency (EPA), 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.

[e] Equivalent methods subject to EPA approval may be substituted.

[f] SW-846, Sections 7.3.3.2 and 7.3.4.2 contain specialized methods to determine if a cyanide- or sulfide-containing waste exhibits the reactivity characteristic.

Table 3-5

Cross Reference of Matrix Parameter Codes and TRUPACT-II Content Codes

Matrix Parameter[a] Code/ Description	TRUPACT-II Content (TRUCON) Codes	Waste Descriptions
S3000-Homogeneous Solids	LA 114	Solidified inorganic process solids and liquids
	LA 126	Solidified organic process solids and liquids
S5000-Debris Wastes	LA 116	Combustible waste
	LA 117	Noncombustible metal waste
	LA 118	Glass waste
	LA 123	Leaded gloves
	LA 125	Mixed combustible/noncombustible waste

[a] Information in this column was extracted from the U.S. Department of Energy (DOE), 1995, "TRU Waste Characterization Quality Assurance Program Plan," *CAO-94-1010*, Rev. 0, Carlsbad Area Office, Carlsbad, New Mexico.

Table 3-6

Transuranic Mixed Waste Characterization Matrix for Currently Generated Waste at Technical Area 55

Waste Description	TRUPACT-II Content (TRUCON) Codes	Process Generating the Waste	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[b] (milligrams per liter)
Solidified inorganic process solids and liquids	LA 114	Inorganic process solids and liquids may include process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines, generated as a result of plutonium (Pu) processing operations, that are solidified in cement.	Knowledge[c]/ Testing[d]	D007	Chromium	5.0
Combustible waste	LA 116	Combustible solids (e.g., paper, rags, plastic, rubber) and a small fraction of non-combustibles (e.g., metal scrap) generated from Pu processing activities.	Knowledge/ Testing	D004 D005 D006 D007 D008 D009 D010 D011 F001 F002 F003 F005	Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver Spent halogenated solvents	5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0 NA[e]
Noncombustible metal waste	LA 117	Noncombustible metal waste (e.g., motors, pumps, tools, process equipment) and glass with a small fraction of combustible waste (e.g., plastics) generated from Pu processing activities.	Knowledge/ Testing	D005 D006 D008 D009 D011	Barium Cadmium Lead Mercury Silver	100.0 1.0 5.0 0.2 5.0
Glass waste	LA 118	Glass waste (e.g., discarded laboratory glassware, windows, bottles), and metal with a small fraction of combustibles (e.g., plastics) generated from Pu processing activities.	Knowledge/ Testing	D008 D009	Lead Mercury	5.0 0.2
Leaded glove waste	LA 123	Leaded gloves discarded with a small fraction of noncombustible waste (e.g., motors, tools) generated from Pu processing activities.	Knowledge/ Testing	D008	Lead	5.0

Refer to footnotes at end of table.

Table 3-6 (Continued)

Transuranic Mixed Waste Characterization Matrix for Currently Generated Waste at Technical Area 55

Waste Description	TRUPACT-II Content (TRUCON) Codes	Process Generating the Waste	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[b] (milligrams per liter)
Mixed combustible/ noncombustible waste	LA 125	Mixtures of combustible and noncombustible waste including paper, rags, plastic, rubber, leaded glovebox gloves, glass, motors, pumps, tools, and miscellaneous metal waste generated from Pu processing activities.	Knowledge/ Testing	D004	Arsenic	5.0
				D005	Barium	100.0
				D006	Cadmium	1.0
				D007	Chromium	5.0
				D008	Lead	5.0
				D009	Mercury	0.2
				D010	Selenium	1.0
				D011	Silver	5.0
				F002	Spent halogenated solvents	NA
Solidified organic process solids and liquids	LA 126	Solidified organic process solids and liquids which, together with plastic packaging, result in >5% and normally ≤10% organics. These process solids may include process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines, generated as a result of Pu processing operations, that are solidified in cement.	Knowledge	D007	Chromium	5.0

[a] U.S. Environmental Protection Agency.
[b] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, Part 261, Subpart D, revised November 1, 1995.
[c] Knowledge indicates process knowledge used as the basis for hazardous waste designation.
[d] Testing: In reference to the basis for hazardous waste classification, indicates that sampling and analysis has been performed, but either (1) the documentation is not available or (2) the data exist but are not verifiable.
[e] Not applicable: Refers to the absence of regulatory limits for F-listed wastes.

Table 3-7

Parameters, Characterization Methods, and Rationale for Transuranic Mixed Waste Stored and Treated at Technical Area 55

Matrix Parameter[a] Code/Description	Waste Description	Analytical Parameters	Characterization Methods	Rationale
Storage				
S3000—Homogeneous Solids	– Solidified inorganic process solids and liquids – Solidified organic process solids and liquids	– Physical form of the waste	– Visual examination – Acceptable knowledge[b]	– Verify physical waste form
		– RCRA[c]–regulated metals	– Sampling and analysis	– Determine toxicity characteristic – Determine concentration of metals
		– Volatile organic compounds (VOC) and semivolatile organic compounds (SVOC)	– Gas chromatography/ mass spectrometry – Acceptable knowledge	– Determine toxicity characteristic – Determine concentration of organics
S5000—Debris Waste	– Combustible waste – Noncombustible metal waste – Glass waste – Leaded glove waste – Mixed combustible/ noncombustible waste	– Physical form of the waste	– Visual examination – Acceptable knowledge	– Verify physical waste form
		– RCRA-regulated metals	– Acceptable knowledge	– Determine compliance with land disposal restriction (LDR) treatment standards, if applicable
		– VOCs and SVOCs	– Acceptable knowledge	– Determine compliance with LDR treatment standards, if applicable
Treatment				
S3000—Homogeneous Solids	– Solidified inorganic process solids and liquids – Solidified organic process solids and liquids	– Physical form of the waste	– Visual examination – Acceptable knowledge	– Verify physical waste form
		– RCRA–regulated metals	– Sampling and analysis	– Determine toxicity characteristic – Determine concentration of metals

[a] Information in this column was extracted from the U.S. Department of Energy (DOE), 1995, "TRU Waste Characterization Quality Assurance Program Plan," *CAO-94-1010*, Rev. 0, Carlsbad Area Office, Carlsbad, New Mexico.

[b] Acceptable knowledge is broadly defined as process knowledge, waste analysis data (e.g., sampling and analysis) and/or facility records of analysis in U.S. Environmental Protection Agency (EPA), 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

[c] Resource Conservation and Recovery Act. Use of the term "RCRA-regulated metals" refers to toxicity characteristic hazardous waste metals as defined in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261.24, revised November 1, 1995.

Table 3-8

Descriptions of Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Basis for Characterization	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Homogeneous Solid Wastes					
Unused solid reagent chemicals	Discarded off-specification unused reagent powders and crystalline materials.	Knowledge[c]	D001 D002 D003 D004 D005 D006 D007 D008 D009 D011 All P- or U-listed waste codes	Ignitability Corrosivity Reactivity Arsenic Barium Cadmium Chromium Lead Mercury Silver	NA[d] NA NA 5.0 100.0 1.0 5.0 5.0 0.2 5.0 NA
Heterogeneous Solid Wastes					
Contaminated bulk lead shielding and scrap	Radiation shielding in laser applications and materials from demolition and decommissioning of research laboratories containing metal fittings, piping, and tools, with Uranium-238 contamination and/or heavy metal materials.	Knowledge	D006 D007 D008	Cadmium Chromium Lead	1.0 5.0 5.0
Discarded bricks	Lead bricks from radiation shielding and debris from decontamination and decommissioning projects.	Knowledge	D006 D008	Cadmium Lead	1.0 5.0

Refer to footnotes at end of table.

Table 3-8 (Continued)

Descriptions of Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Basis for Characterization	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
		Heterogeneous Solid Wastes (Continued)			
Organic-contaminated noncombustible solids	Absorbed oils, laboratory debris, and discarded equipment.	Knowledge	D004	Arsenic	5.0
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D010	Selenium	1.0
			D011	Silver	5.0
			D027	1,4-Dichlorobenzene	7.5
			D030	2,4-Dinitrotoluene	0.13[e]
			D032	Hexachlorobenzene	0.13[e]
			D033	Hexachlorobutadiene	0.5
			D034	Hexachloroethane	3.0
			D042	2,4,6-Trichlorophenol	2.0
			F001	1,1,1-Trichloroethane, Trichloroethylene[f]	NA
			F002	Chlorobenzene[f], Methylene chloride, Tetrachloroethylene[f], Trichloroethylene[f]	NA
			F004	Cresol[f], Nitrobenzene[f]	NA
			F005	Toluene, Methyl ethyl ketone[f], Benzene[f]	NA
Mercury waste	Free elemental mercury, mercuric compounds, gels containing mercuric compounds, old thermometers, hygrometers, vacuum tubes, fluorescent light bulbs, and other instruments and equipment containing unrecovered mercury.	Knowledge	D009	Mercury	0.2
			U151	Mercury	NA

Refer to footnotes at end of table.

Table 3-8 (Continued)

Descriptions of Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Basis for Characterization	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Heterogeneous Solid Wastes (Continued)					
Batteries	Discarded battery cores (with potential residual liquid), including lead-acid, rechargeable nickel-cadmium, and mercury.	Knowledge	D001	Ignitability	NA
			D002	Corrosivity	NA
			D003	Reactivity	NA
			D004	Arsenic	5.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
Liquid Wastes					
Spent solvents and contaminated solvent mixtures	Extraction operations, bench-scale experimental inorganic chemistry, environmental analysis, and radiochemistry.	Knowledge	D001	Ignitability	NA
			D002	Corrosivity	NA
			D004	Arsenic	5.0
			D005	Barium	100.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D010	Selenium	1.0
			D011	Silver	5.0
			D018	Benzene	0.5
			D019	Carbon tetrachloride	0.5
			D021	Chlorobenzene	100.0
			D022	Chloroform	6.0
			D027	1,4-Dichlorobenzene	7.5
			D028	1,2-Dichloroethane	0.5
			D030	2,4-Dinitrotoluene	0.13[c]
			D032	Hexachlorobenzene	0.13[c]
			D033	Hexachlorobutadiene	0.5
			D034	Hexachloroethane	3.0
			D036	Nitrobenzene	2.0

Refer to footnotes at end of table.

Table 3-8 (Continued)

Descriptions of Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Basis for Characterization	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
		Liquid Wastes (Continued)			
Spent solvents and contaminated solvent mixtures (Continued)	Extraction operations, bench-scale experimental inorganic chemistry, environmental analysis, and radiochemistry.	Knowledge	D042	2,4,6-Trichlorophenol	2.0
			D043	Vinyl chloride	0.2
			F001	Tetrachloroethylene[f], Trichloroethylene[f], Methylene chloride, 1,1,1-Trichloroethane, Carbon tetrachloride, Chlorinated fluorocarbons	NA
			F002	Tetrachloroethylene[f], Trichloroethylene[f], 1,1,1-Trichloroethane, 1,1,2-Trichloro-1,2,2-trifluoroethane	NA
			F003	Xylene, Acetone, Ethyl acetate, Ethyl ether, Methyl isobutyl ketone, n-Butyl alcohol, Methanol	NA
			F005	Toluene, Methyl ethyl ketone[f], Carbon disulfide, Isobutanol, Pyridine[f], Benzene	NA
Corrosive liquid wastes	Radiochemistry research, plutonium-processing operations, and analytical chemistry.	Knowledge	D001	Ignitability	NA
			D002	Corrosivity	NA
			D007	Chromium	5.0
			D009	Mercury	0.2
			D010	Selenium	1.0
			D011	Silver	5.0
			D036	Nitrobenzene	2.0

Refer to footnotes at end of table.

Table 3-8 (Continued)

Descriptions of Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Basis for Characterization	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Liquid Wastes (Continued)					
Nonaqueous, noncorrosive liquids contaminated with heavy metals	Metal polishing operations, and radiochemistry research.	Knowledge Sampling and analysis[g]	D001 D004 D005 D006 D007 D008 D009 D010 D011	Ignitability Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	NA 5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0
Oil wastes	Equipment maintenance operations.	Knowledge	D004 D005 D006 D007 D008 D009 D010 D028 F001 F002	Arsenic Barium Cadmium Chromium Lead Mercury Selenium 1,2-Dichloroethane Tetrachloroethylene[f], Trichloroethylene[f], Methylene chloride, 1,1,1-Trichloroethane, Carbon tetrachloride[f], Chlorinated fluorocarbons Tetrachloroethylene[f], Trichloroethylene[f], 1,1,1-Trichloroethane, 1,1,2-Trichloro-1,2,2-trifluoroethane	5.0 100.0 1.0 5.0 5.0 0.2 1.0 0.5 NA NA

Refer to footnotes at end of table.

Table 3-8 (Continued)

Descriptions of Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Basis for Characterization	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Liquid Wastes (Continued)					
Oil wastes (Continued)	Equipment maintenance operations.	Knowledge	F003	Xylene, Acetone, Ethyl acetate, Ethyl ether, Methyl isobutyl ketone, n-Butyl alcohol, Methanol	NA
			F005	Toluene, Methyl ethyl ketone[f], Carbon disulfide, Isobutanol, Pyridine[f], Benzene[f]	NA
Unused liquid reagent chemicals	Discarded off-specification unused liquid reagent chemicals.	Knowledge	D001	Ignitability	NA
			D002	Corrosivity	NA
			All P- and U-listed waste codes	Discarded commercial chemical products and off-specification species	NA
Photographic processing and photocopier wastes	Photographic film processing and photocopying operations.	Knowledge Sampling and analysis	D001	Ignitability	NA
			D002	Corrosivity	NA
			D007	Chromium	5.0
			D008	Lead	5.0
			D011	Silver	5.0

[a] U.S. Environmental Protection Agency.
[b] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart II, 261, Subpart D, revised November 1, 1995.
[c] Indicates process knowledge may be used as the basis for hazardous waste designation.
[d] Not applicable: Refers to the absence of regulatory limits for ignitable, corrosive, and reactive characteristic wastes and F-, P-, and U-listed wastes.
[e] The quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level (20 NMAC 4.1, Subpart II, 261.24, Table 1, revised November 1, 1995).
[f] Process knowledge provided information that these constituents may have been used as solvents. Toxicity Characteristic (TC) regulatory levels may also apply and will be evaluated.
[g] Indicates that sampling and analysis may be used to characterize the waste stream.

Table 3-9

Parameters, Characterization Methods, and Rationale for Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Analytical Parameter[a]	Characterization Method	Rationale
Homogeneous Solid Wastes			
Unused solid reagent chemicals	– RCRA[b]-regulated metals	– Acceptable knowledge[c] – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, reactivity, and toxicity – Determine presence of P- and/or U-listed unused commercial chemical products
Heterogeneous Solid Wastes			
Contaminated bulk lead shielding and scrap	– RCRA-regulated metals	– Acceptable knowledge	– Determine toxicity characteristic
Discarded bricks	– RCRA-regulated metals	– Acceptable knowledge	– Determine toxicity characteristic
Organic-contaminated noncombustible solids	– RCRA-regulated metals – Volatile organic compounds (VOC) – Semivolatile organic compounds (SVOC)	– Acceptable knowledge	– Determine toxicity characteristic – Determine the presence of F-listed solvents
Mercury waste	– RCRA-regulated metals	– Acceptable knowledge	– Determine toxicity characteristic – Determine presence of U-listed unused commercial chemical product
Batteries	– RCRA-regulated metals	– Acceptable knowledge	– Determine characteristic for ignitability, corrosivity, reactivity, and toxicity
Liquid Wastes			
– Spent solvents and contaminated solvent mixtures	– Flash point – pH – RCRA-regulated metals – VOCs – SVOCs	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, and toxicity – Determine concentration of F-listed solvents
– Corrosive liquid wastes	– Flash point – pH – RCRA-regulated metals – SVOCs	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, and toxicity – Determine concentration of F-listed solvents
– Nonaqueous, noncorrosive liquids contaminated with heavy metals	– Flash point – RCRA-regulated metals	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability and toxicity
– Oil wastes	– RCRA-regulated metals – VOCs – SVOCs	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for toxicity – Determine concentration of F-listed solvents

Refer to footnotes at end of table.

Table 3-9 (Continued)

Parameters, Characterization Methods, and Rationale for Low-Level Mixed Waste Stored at Technical Area 55

Waste Description	Analytical Parameter[a]	Characterization Method	Rationale
Liquid Wastes (Continued)			
– Unused liquid reagent chemicals	– Flash point – pH	– Acceptable knowledge	– Determine characteristic for ignitability and corrosivity – Determine the presence of P- and U-listed unused commercial chemical product
– Photographic processing and photocopier wastes	– Flash point – pH – RCRA-regulated metals	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, and toxicity

[a] Parameter selection is based on acceptable knowledge for each waste stream. Additional parameters may be selected for each waste stream as necessary.

[b] Resource Conservation and Recovery Act. Use of the term "RCRA-regulated metals" refers to hazardous waste as defined in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261.24, revised November 1, 1995.

[c] Acceptable knowledge is broadly defined as process knowledge, waste analysis data (e.g., sampling and analysis), and/or facility records of analysis in U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste - A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

Table 3-10

Descriptions of Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Spent solvents and contaminated solvent mixtures	Research and development activities; laser research; organic and inorganic chemistry research (e.g., solvent extractions, liquid chromatography solvents, polymer synthesis, and distillations); cleaning; and degreasing operations.	Acceptable knowledge[d] Sampling and analysis[e]	D001	Ignitability	NA[f]
			D002	Corrosivity	NA
			D003	Reactivity	NA
			D004	Arsenic	5.0
			D005	Barium	100.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D010	Selenium	1.0
			D011	Silver	5.0
			D018	Benzene	0.5
			D019	Carbon tetrachloride	0.5
			D021	Chlorobenzene	100.0
			D022	Chloroform	6.0
			D028	1,2-Dichloroethane	0.5
			D030	2,4-Dinitrotoluene	0.13[g]
			D032	Hexachlorobenzene	0.13[g]
			D035	Methyl ethyl ketone	200.0
			D036	Nitrobenzene	2.0
			D038	Pyridine	5.0[g]
			D040	Trichloroethylene	0.5
			D043	Vinyl chloride	0.2
			F001	Tetrachloroethylene, Trichloroethylene, Methylene chloride, 1,1,1- Trichloroethane, Carbon tetrachloride, Chlorofluorocarbons	NA
			F002	Tetrachloroethylene, Trichloroethylene, 1,1,1-Trichloroethane, 1,1,2-Trichloro-1,2,2-trifluoroethane	NA

Refer to footnotes at end of table.

Table 3-10 (Continued)

Descriptions of Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Spent solvents and contaminated solvent mixtures (Continued)	Research and development activities; laser research; organic and inorganic chemistry research (e.g., solvent extractions, liquid chromatography solvents, polymer synthesis, distillations); cleaning; and degreasing operations.	Acceptable knowledge Sampling and analysis	F003	Xylene, Acetone, Ethyl acetate, Ethyl ether, Methanol Methyl isobutyl ketone, n-Butyl alcohol	NA
			F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene	NA
Contaminated solid wastes	Machining operations, chemistry research, decontamination and decommissioning projects, metal finishing operations, and general maintenance operations.	Acceptable knowledge	D001	Ignitability	NA
			D003	Reactivity	NA
			D004	Arsenic	5.0
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D010	Selenium	1.0
			D011	Silver	5.0
			D018	Benzene	0.5
			D022	Chloroform	6.0
			D030	2,4-Dinitrotoluene	0.13[g]
			D032	Hexachlorobenzene	0.13[g]
			D033	Hexachlorobutadiene	0.5
			D034	Hexachloroethane	3.0
			D036	Nitrobenzene	2.0
			D039	Tetrachloroethylene	0.7
			D040	Trichloroethylene	0.5
			D042	2,4,6-Trichlorophenol	2.0

Refer to footnotes at end of table.

Table 3-10 (Continued)

Descriptions of Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Contaminated solid wastes (Continued)	Machining operations, chemistry research, decontamination and decommissioning projects, metal finishing operations, photographic film processing, and general maintenance operations.	Acceptable knowledge	F001	1,1,1-Trichloroethane, Carbon tetrachloride	NA
			F002	1,1,1-Trichloroethane	NA
			F003	Acetone, Methanol	NA
			F005	Toluene, Benzene	NA
Paint and paint-related wastes	Painting and finishing operations, and general facility maintenance.	Acceptable knowledge Sampling and analysis	D001	Ignitability	NA
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D011	Silver	5.0
			F003	Xylene	NA
			F005	Toluene	NA
Photographic processing and photocopier wastes	Photographic film processing and photocopying operations.	Acceptable knowledge Sampling and analysis	D001	Ignitability	NA
			D002	Corrosivity	NA
			D007	Chromium	5.0
			D008	Lead	5.0
			D011	Silver	5.0

Refer to footnotes at end of table.

Table 3-10 (Continued)

Descriptions of Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Corrosive liquid wastes	Analytical research and operations, electroetching, and electropolishing.	Acceptable knowledge Sampling and analysis	D001	Ignitability	NA
			D002	Corrosivity	NA
			D004	Arsenic	5.0
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D010	Selenium	1.0
			D011	Silver	5.0
			D038	Pyridine	5.0[g]
			F002	Tetrachloroethylene, Methylene chloride, Trichloroethylene, 1,1,1-Trichloroethane, Chlorobenzene, 1,1,2-Trichloro-1,2,2-trifluoroethane, Ortho-dichlorobenzene, Trichlorofluoromethane, 1,1,2-Trichloroethane	NA
			F003	Methanol	NA
			F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene, 2-Ethoxyethanol, 2-Nitropropane	NA

Refer to footnotes at end of table.

Table 3-10 (Continued)

Descriptions of Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Solid metals and metallic compounds	Machining and cutting operations; synthesis reactions; solder from electronic manufacturing, repair, and brazing operations; and grinding operations.	Acceptable knowledge Sampling and analysis	D001 D003 D004 D005 D006 D007 D008 D009 D010 D011	Ignitability Reactivity Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	NA NA 5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0
Contaminated noncorrosive, aqueous and nonaqueous solutions and sludges, including oils	Vacuum pump maintenance, spectrometric operations, equipment cleaning and maintenance, synthesis reactions, analytical operations, metal polishing operations, and vehicle maintenance.	Acceptable knowledge Sampling and analysis	D001 D003 D004 D005 D006 D007 D008 D009 D010 D011 D018 D038 D040	Ignitability Reactivity Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver Benzene Pyridine Trichloroethylene	NA NA 5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0 0.5 5.0[g] 0.5

Refer to footnotes at end of table.

Table 3-10 (Continued)

Descriptions of Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Contaminated noncorrosive, aqueous and nonaqueous solutions and sludges, including oils (Continued)	Vacuum pump maintenance, spectrometric operations, equipment cleaning and maintenance, synthesis reactions, analytical operations, metal polishing operations, and equipment maintenance.	Acceptable knowledge Sampling and analysis	F002	Tetrachloroethylene, Methylene chloride, Trichloroethylene, 1,1,1-Trichloroethane, Chlorobenzene, 1,1,2-Trichloro-1,2,2-trifluoroethane, Ortho-dichlorobenzene, Trichlorofluoromethane, 1,1,2-Trichloroethane	NA
			F003	Xylene, Acetone, Ethyl acetate, Ethyl benzene, Ethyl ether, Methyl isobutyl ketone, n-Butyl Alcohol, Cyclohexanone, Methanol	NA
			F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene, 2-Ethoxyethanol, 2-Nitropropane	NA
Mercury wastes	Lamp replacement, laboratory operations, mercury spill clean-up, and equipment cleaning and maintenance.	Acceptable knowledge Sampling and analysis	D009 U151	Mercury Mercury	0.2 NA
Used batteries and battery fluids	Equipment maintenance.	Acceptable knowledge	D002 D006 D007 D008 D009 D011	Corrosivity Cadmium Chromium Lead Mercury Silver	NA 1.0 5.0 5.0 0.2 5.0

Refer to footnotes at end of table.

Table 3-10 (Continued)

Descriptions of Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Unused/off-specification commercial chemical products	Laboratory research and spill residues.	Acceptable knowledge Sampling and analysis	D001 D002 D003 D004 through D043	Ignitability Corrosivity Reactivity Toxicity characteristic leaching procedure wastes	NA NA NA -[c]
			All P- and U-listed waste codes	Discarded commercial chemical products and off-specification species	NA

[a] Denotes information from the Los Alamos National Laboratory Chemical Science and Technology Division Waste Profile Form database.
[b] U.S. Environmental Protection Agency.
[c] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed (D004-D043) at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart II, Part 261, Subpart D, revised November 1, 1995.
[d] Indicates that acceptable knowledge may be used as the basis for the hazardous waste designation.
[e] Indicates that sampling and analysis may be used to characterize the waste stream.
[f] Not applicable: Refers to the absence of regulatory limits for ignitable, corrosive, and reactive characteristic wastes and F-, P-, and U-listed wastes.
[g] The quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level (20 NMAC 4.1, Subpart II, 261.24, Table 1, revised November 1, 1995).

Table 3-11

Parameters, Characterization Methods, and Rationale for Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Analytical Parameters[b]	Characterization Methods	Rationale
– Spent solvents and contaminated solvent mixtures	– Flash point (for liquid waste) – pH (for liquid waste) – RCRA[c]-regulated metals – Volatile organic compounds (VOC) – Semivolatile organic compounds (SVOC)	– Acceptable knowledge[d] – Sampling and analysis[e]	– Determine characteristic for ignitability, corrosivity, reactivity, and toxicity – Determine concentration of F-listed solvents
– Contaminated solid wastes	– RCRA-regulated metals – VOCs – SVOCs	– Acceptable knowledge	– Determine characteristic for ignitability, reactivity, and toxicity – Determine concentration of F-listed solvents
– Paint and paint-related wastes	– Flash point (for liquid waste) – RCRA-regulated metals – VOCs	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability and toxicity – Determine concentration of F-listed solvents
– Photographic processing and photocopier wastes	– Flash point (for liquid waste) – pH (for liquid waste) – RCRA-regulated metals	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, and toxicity
– Corrosive liquid wastes	– Flash point (for liquid waste) – pH (for liquid waste) – RCRA-regulated metals – VOCs – SVOCs	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, and toxicity – Determine concentration of F-listed solvents
– Solid metals and metallic compounds	– RCRA-regulated metals	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, reactivity, and toxicity
– Contaminated noncorrosive, aqueous and nonaqueous solutions and sludges, including oils	– Flash point – RCRA-regulated metals – VOCs – SVOCs	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, reactivity, and toxicity – Determine concentration of F-listed solvents
– Mercury wastes	– RCRA-regulated metal	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for toxicity – Determine the presence of a U-listed unused commercial chemical product
– Used batteries and battery fluids	– pH (for liquid waste) – RCRA-regulated metals	– Acceptable knowledge	– Determine characteristic for corrosivity and toxicity
– Unused/off-specification commercial chemical products	– Flash point (for liquid waste) – pH (for liquid waste) – RCRA-regulated metals – VOCs – SVOCs	– Acceptable knowledge – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, reactivity, and toxicity – Determine presence of P-listed or U-listed unused commercial chemical products

Refer to footnotes at end of table.

Table 3-11 (Continued)

Parameters, Characterization Methods, and Rationale for Hazardous Waste Stored at Technical Area 55

[a] Information contained in this column is from the Los Alamos National Laboratory Chemical Science and Technology Division Waste Profile Form database.

[b] Parameter selection is based on acceptable knowledge for each waste stream. Additional parameters may be selected for each waste stream as necessary.

[c] Resource Conservation and Recovery Act. Use of the term "RCRA-regulated metals" refers to hazardous waste as defined in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261.24, revised November 1, 1995.

[d] Acceptable knowledge is broadly defined as process knowledge, waste analysis data (e.g., sampling and analysis), and/or facility records of analysis in U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store and Dispose of Hazardous Waste - A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

• Indicates that sampling and analysis may be used to characterize the waste stream.

Los Alamos
National Laboratory

LAND DISPOSAL RESTRICTIONS NOTIFICATION FORM

A copy of this form must be attached to each Waste Profile Form and to each Uniform Hazardous Waste Manifest required to transport waste within LANL, pursuant to 40 CFR 268.7(a)(1).

Waste Profile Form No.	Chemical Waste/ Waste Disposal Record No.	Uniform Hazardous Waste Manifest No.	Date of Waste Pickup

Check only one.

☐ Non-wastewater
☐ Wastewater [as defined in 40 CFR 268.2(f)]

NOTIFICATION OF CALIFORNIA LIST APPLICABILITY

Check all that apply.

☐ Liquid hazardous waste containing PCBs at a concentration of ≥50 ppm.
☐ A D001 – D017 liquid waste containing ≥134 mg/L of nickel and/or ≥130 mg/L of thallium.
☐ A D001 – D011 waste containing Halogenated Organic Compounds (HOCs) listed in 40 CFR 268, Appendix III, at ≥1000 ppm.

NOTIFICATION OF "D" CHARACTERISTIC EPA WASTE CODES

Check all that apply.

EPA Waste Code	Waste Description and/or Subcategory (as needed)
☐ D001*	Ignitable characteristic wastes [except for the Section 261.21(a)(1) High TOC Subcategory] that are managed in non-CWA/non-CWA-equivalent/non-Class I SDWA systems.
☐ D001	High TOC Ignitable Characteristic Liquids Subcategory based on 40 CFR 261.21(a)(1) - Greater than 10% total organic carbon.
☐ D002*	Corrosive Characteristic Wastes that are managed in non-CWA/non-CWA-equivalent/non-Class I SDWA systems.
☐ D003	Reactive Sulfides Subcategory
☐ D003	Reactive Cyanides Subcategory
☐ D003	Water Reactive Subcategory
☐ D003	Other Reactives Subcategory [based on 261.23(a)(1)]
☐ D004	
☐ D005	
☐ D006	Wastes that exhibit the TC for cadmium
☐ D006	Cadmium Containing Batteries Subcategory
☐ D007	
☐ D008	Wastes that exhibit TC for lead
☐ D008	Lead Acid Batteries Subcategory
☐ D008	Radioactive Lead Solids Subcategory
☐ D009	High Mercury-Organic Subcategory (≥260 mg/kg Hg with organics and not incinerator residues)
☐ D009	High Mercury-Inorganic Subcategory (≥260 mg/kg Hg [with inorganics])
☐ D009	Low Mercury Subcategory (<260 mg/kg Hg)
☐ D009	All D009 wastewaters
☐ D009	Elemental mercury contaminated with radioactive materials.
☐ D009	Hydraulic oil contaminated with Mercury Radioactive Materials Subcategory
☐ D010	
☐ D011	

☐ D012*	☐ D020*	☐ D028*	☐ D036*
☐ D013*	☐ D021*	☐ D029*	☐ D037*
☐ D014*	☐ D022*	☐ D030*	☐ D038*
☐ D015*	☐ D023*	☐ D031*	☐ D039*
☐ D016*	☐ D024*	☐ D032*	☐ D040*
☐ D017*	☐ D025*	☐ D033*	☐ D041*
☐ D018*	☐ D026*	☐ D034*	☐ D042*
☐ D019*	☐ D027*	☐ D035*	☐ D043*

*All applicable Underlying Hazardous Constituents in these characteristic wastes must be checked in Table UTS.

Figure 3-1
Land Disposal Restrictions Notification Form

Los Alamos
National Laboratory

LAND DISPOSAL RESTRICTIONS NOTIFICATION FORM

NOTIFICATION FOR F001 – F005 SPENT SOLVENT WASTES

Check all that apply.

Spent solvent wastes with the following constituents only.

EPA Waste Code	Constituents in the waste	
☐ F001	☐ Acetone	☐ Isobutyl alcohol
☐ F002	☐ Benzene	☐ Methanol
☐ F003	☐ n-Butyl alcohol	☐ Methylene chloride
☐ F004	☐ Carbon disulfide (wastewater only)	☐ Methyl ethyl ketone
☐ F005	☐ Carbon tetrachloride	☐ Methyl isobutyl ketone
	☐ Chlorobenzene	☐ Nitrobenzene
	☐ o-cresol	☐ Pyridine
	☐ m-cresol	☐ Tetrachloroethylene
	☐ p-cresol	☐ Toluene
	☐ Cresol-mixed isomers (Cresylic acid)	☐ 1,1,1-Trichloroethane
	☐ Cyclohexanone (wastewater only)	☐ 1,1,2-Trichloroethane
	☐ o-Dichlorobenzene	☐ 1,1,2-Trichloro – 1,2,2-trifluoroethane
	☐ Ethyl acetate	☐ Trichloroethylene
	☐ Ethyl benzene	☐ Trichloromonofluoromethane
	☐ Ethyl ether	☐ Xylenes – mixed isomers (o-, m-, p-xylene)

Check all that apply.

EPA Waste Codes	Constituents in the waste
☐ F003	☐ Carbon disulfide
☐ F005	☐ Cyclohexanone
	☐ Methanol

Note: Treatment standards for these constituents apply to F001 – F005 wastes which contain only one, two, or all three of these constituents.

Check only one, if applicable.

EPA Waste Code	Constituents in the waste
☐ F005	☐ Containing 2-nitropropane as the only listed F001 – F005 solvent.
	☐ Containing 2-ethoxyethanol as the only listed F001 – F005 solvent.

NOTIFICATION FOR OTHER "F" WASTES

Check only one, if applicable.

- ☐ F006
- ☐ F007
- ☐ F008
- ☐ F009
- ☐ F027

Los Alamos
National Laboratory

LAND DISPOSAL RESTRICTIONS NOTIFICATION FORM

NOTIFICATION FOR "P" AND "U" LISTED WASTE CODES

☐ P001	☐ P057	☐ P115	☐ U041	☐ U092	☐ U144	☐ U194
☐ P002	☐ P058	☐ P116	☐ U042	☐ U093	☐ U145	☐ U196
☐ P003	☐ P059	☐ P118	☐ U043	☐ U094	☐ U146	☐ U197
☐ P004	☐ P060	☐ P119	☐ U044	☐ U095	☐ U147	☐ U200
☐ P005	☐ P062	☐ P120	☐ U045	☐ U096	☐ U148	☐ U201
☐ P006	☐ P063	☐ P121	☐ U046	☐ U097	☐ U149	☐ U202
☐ P007	☐ P064	☐ P122	☐ U047	☐ U098	☐ U150	☐ U203
☐ P008	☐ P065	☐ P123	☐ U048	☐ U099	☐ U151	☐ U204
☐ P009	☐ P066		☐ U049	☐ U101	☐ U152	☐ U205
☐ P010	☐ P067		☐ U050	☐ U102	☐ U153	☐ U206
☐ P011	☐ P068		☐ U051	☐ U103	☐ U154	☐ U207
☐ P012	☐ P069	☐ U001	☐ U052	☐ U105	☐ U155	☐ U208
☐ P013	☐ P070	☐ U002	☐ U053	☐ U106	☐ U156	☐ U209
☐ P014	☐ P071	☐ U003	☐ U055	☐ U107	☐ U157	☐ U210
☐ P015	☐ P072	☐ U004	☐ U056	☐ U108	☐ U158	☐ U211
☐ P016	☐ P073	☐ U005	☐ U057	☐ U109	☐ U159	☐ U213
☐ P017	☐ P074	☐ U006	☐ U058	☐ U110	☐ U160	☐ U214
☐ P018	☐ P075	☐ U007	☐ U059	☐ U111	☐ U161	☐ U215
☐ P020	☐ P076	☐ U008	☐ U060	☐ U112	☐ U162	☐ U216
☐ P021	☐ P077	☐ U009	☐ U061	☐ U113	☐ U163	☐ U217
☐ P022	☐ P078	☐ U010	☐ U062	☐ U114	☐ U164	☐ U218
☐ P023	☐ P081	☐ U011	☐ U063	☐ U115	☐ U165	☐ U219
☐ P024	☐ P082	☐ U012	☐ U064	☐ U116	☐ U166	☐ U220
☐ P026	☐ P084	☐ U014	☐ U066	☐ U117	☐ U167	☐ U221
☐ P027	☐ P085	☐ U015	☐ U067	☐ U118	☐ U168	☐ U222
☐ P028	☐ P087	☐ U016	☐ U068	☐ U119	☐ U169	☐ U223
☐ P029	☐ P088	☐ U017	☐ U069	☐ U120	☐ U170	☐ U225
☐ P030	☐ P089	☐ U018	☐ U070	☐ U121	☐ U171	☐ U226
☐ P031	☐ P092	☐ U019	☐ U071	☐ U122	☐ U172	☐ U227
☐ P033	☐ P093	☐ U020	☐ U072	☐ U123	☐ U173	☐ U228
☐ P034	☐ P094	☐ U021	☐ U073	☐ U124	☐ U174	☐ U234
☐ P036	☐ P095	☐ U022	☐ U074	☐ U125	☐ U176	☐ U235
☐ P037	☐ P096	☐ U023	☐ U075	☐ U126	☐ U177	☐ U236
☐ P038	☐ P097	☐ U024	☐ U076	☐ U127	☐ U178	☐ U237
☐ P039	☐ P098	☐ U025	☐ U077	☐ U128	☐ U179	☐ U238
☐ P040	☐ P099	☐ U026	☐ U078	☐ U129	☐ U180	☐ U239
☐ P041	☐ P101	☐ U027	☐ U079	☐ U130	☐ U181	☐ U240
☐ P042	☐ P102	☐ U028	☐ U080	☐ U131	☐ U182	☐ U243
☐ P043	☐ P103	☐ U029	☐ U081	☐ U132	☐ U183	☐ U244
☐ P044	☐ P104	☐ U030	☐ U082	☐ U133	☐ U184	☐ U246
☐ P045	☐ P105	☐ U031	☐ U083	☐ U134	☐ U185	☐ U247
☐ P046	☐ P106	☐ U032	☐ U084	☐ U135	☐ U186	☐ U248
☐ P047	☐ P108	☐ U033	☐ U085	☐ U136	☐ U187	☐ U249
☐ P048	☐ P109	☐ U034	☐ U086	☐ U137	☐ U188	☐ U328
☐ P049	☐ P110	☐ U035	☐ U087	☐ U138	☐ U189	☐ U353
☐ P050	☐ P111	☐ U036	☐ U088	☐ U140	☐ U190	☐ U359

Figure 3-1 (Continued)
Land Disposal Restrictions Notification Form

TABLE UTS—Universal Treatment Standards
(Check the applicable underlying hazardous constituents for D001, D002, and D012 –D043 characteristic wastes only.)

Regulated constituent—common name

- ☐ Acenaphthylene
- ☐ Acenaphthene
- ☐ Acetone
- ☐ Acetonitrile
- ☐ Acetophenone
- ☐ 2-Acetylaminofluorene
- ☐ Acrolein
- ☐ Acrylamide
- ☐ Acrylonitrile
- ☐ Aldrin
- ☐ 4-Aminobiphenyl
- ☐ Aniline
- ☐ Anthracene
- ☐ Aramite
- ☐ alpha-BHC
- ☐ beta-BHC
- ☐ delta-BHC
- ☐ gamma-BHC
- ☐ Benzene
- ☐ Benz(a)anthracene
- ☐ Benzal chloride
- ☐ Benzo(b)fluoranthene (difficult to distinguish from benzo(k)fluoranthene)
- ☐ Benzo(k)fluoranthene (difficult to distinguish from benzo(b)fluoranthene)
- ☐ Benzo(g,h,i)perylene
- ☐ Benzo(a)pyrene
- ☐ Bromodichloromethane
- ☐ Methyl bromide (Bromomethane)
- ☐ 4-Bromophenyl phenyl ether
- ☐ n-Butyl alcohol
- ☐ Butyl benzyl phthalate
- ☐ 2-sec-Butyl-4,6-dinitrophenol (Dinoseb)
- ☐ Carbon disulfide
- ☐ Carbon tetrachloride
- ☐ Chlordane (alpha and gamma isomers)
- ☐ p-Chloroaniline
- ☐ Chlorobenzene
- ☐ Chlorobenzilate
- ☐ 2-Chloro-1,3-butadiene
- ☐ Chlorodibromomethane
- ☐ Chloroethane
- ☐ bis(2-Chloroethoxy)methane
- ☐ bis(2-Chloroethyl)ether
- ☐ Chloroform
- ☐ bis(2-Chloroisopropyl)ether
- ☐ p-Chloro-m-cresol
- ☐ 2-Chloroethyl vinyl ether
- ☐ Chloromethane (Methyl chloride)
- ☐ 2-Chloronaphthalene
- ☐ 2-Chlorophenol
- ☐ 3-Chloropropylene
- ☐ Chrysene
- ☐ o-Cresol
- ☐ m-Cresol (difficult to distinguish from p-cresol)
- ☐ p-Cresol (difficult to distinguish from m-cresol)
- ☐ Cyclohexanone
- ☐ 1,2-Dibromo-3-chloropropane
- ☐ Ethylene dibromide (1,2-Dibromoethane)
- ☐ Dibromomethane
- ☐ 2,4-D (2,4-Dichlorophenoxyacetic acid)
- ☐ o,p′-DDD
- ☐ p,p′-DDD
- ☐ o,p′-DDE
- ☐ p,p′-DDE
- ☐ o,p′-DDT
- ☐ p,p′-DDT
- ☐ Dibenz(a,h)anthracene
- ☐ Dibenz(a,e)pyrene
- ☐ m-Dichlorobenzene
- ☐ o-Dichlorobenzene
- ☐ p-Dichlorobenzene
- ☐ Dichlorodifluoromethane
- ☐ 1,1-Dichloroethane
- ☐ 1,2-Dichloroethane
- ☐ 1,1-Dichloroethylene
- ☐ trans-1,2-Dichloroethylene
- ☐ 2,4-Dichlorophenol
- ☐ 2,6-Dichlorophenol
- ☐ 1,2-Dichloropropane
- ☐ cis-1,3-Dichloropropylene
- ☐ trans-1,3-Dichloropropylene
- ☐ Dieldrin
- ☐ Diethyl phthalate
- ☐ 2-4,Dimethyl phenol
- ☐ Dimethyl phthalate
- ☐ Di-n-butyl phthalate
- ☐ 1,4-Dinitrobenzene

TABLE UTS—Universal Treatment Standards
(Check the applicable underlying hazardous constituents for D001, D002, and D012 –D043 characteristic wastes only.)

Regulated constituent—common name

- ☐ 4,6-Dinitro-o-cresol
- ☐ 2,4-Dinitrophenol
- ☐ 2,4-Dinitrotoluene
- ☐ 2,6-Dinitrotoluene
- ☐ Di-n-octyl phthalate
- ☐ p-Dimethylaminoazobenzene
- ☐ Di-n-propylnitrosamine
- ☐ 1,4-Dioxane
- ☐ Diphenylamine (difficult to distinguish from diphenylnitrosamine)
- ☐ Diphenylnitrosamine (difficult to distinguish from diphenylamine)
- ☐ 1,2-Diphenylhydrazine
- ☐ Disulfoton
- ☐ Endosulfan I
- ☐ Endosulfan II
- ☐ Endosulfan sulfate
- ☐ Endrin
- ☐ Endrin aldehyde
- ☐ Ethyl acetate
- ☐ Ethyl cyanide (Propanenitrile)
- ☐ Ethyl benzene
- ☐ Ethyl ether
- ☐ bis(2-Ethylhexyl) phthalate
- ☐ Ethyl methacrylate
- ☐ Ethylene oxide
- ☐ Famphur
- ☐ Fluoranthene
- ☐ Fluorene
- ☐ Heptachlor
- ☐ Heptachlor epoxide
- ☐ Hexachlorobenzene
- ☐ Hexachlorobutadiene
- ☐ Hexachlorocyclopentadiene
- ☐ HxCDDs (All Hexachlorodibenzo-p-dioxins)
- ☐ HxCDFs (All Hexachlorodibenzofurans)
- ☐ Hexachloroethane
- ☐ Hexachloropropylene
- ☐ Indeno (1,2,3-c,d) pyrene
- ☐ Iodomethane
- ☐ Isobutyl alcohol
- ☐ Isodrin
- ☐ Isosafrole
- ☐ Kepone
- ☐ Methacrylonitrile
- ☐ Methanol
- ☐ Methapyrilene
- ☐ Methoxychlor
- ☐ 3-Methylcholanthrene
- ☐ 4,4-Methylene bis(2-chloroaniline)
- ☐ Methylene chloride
- ☐ Methyl ethyl ketone
- ☐ Methyl isobutyl ketone
- ☐ Methyl methacrylate
- ☐ Methyl methansulfonate
- ☐ Methyl parathion
- ☐ Naphthalene
- ☐ 2-Naphthylamine
- ☐ o-Nitroaniline
- ☐ p-Nitroaniline
- ☐ Nitrobenzene
- ☐ 5-Nitro-o-toluidine
- ☐ o-Nitrophenol
- ☐ p-Nitrophenol
- ☐ N-Nitrosodiethylamine
- ☐ N-Nitrosodimethylamine
- ☐ N-Nitroso-di-n-butylamine
- ☐ N-Nitrosomethylethylamine
- ☐ N-Nitrosomorpholine
- ☐ N-Nitrosopiperidine
- ☐ N-Nitrosopyrrolidine
- ☐ Parathion
- ☐ Total PCBs (sum of all PCB isomers, or all Aroclors)
- ☐ Pentachlorobenzene
- ☐ PeCDDs (All Pentachlorodibenzo-p-dioxins)
- ☐ PeCDFs (All Pentachlorodibenzofurans)
- ☐ Pentachloroethane
- ☐ Pentachloronitrobenzene
- ☐ Pentachlorophenol
- ☐ Phenacetin
- ☐ Phenanthrene
- ☐ Phenol
- ☐ Phorate
- ☐ Phthalic acid
- ☐ Phthalic anhydride
- ☐ Pronamide
- ☐ Pyrene
- ☐ Pyridine
- ☐ Safrole
- ☐ Silvex (2,4,5-TP)

Los Alamos
National Laboratory

LAND DISPOSAL RESTRICTIONS NOTIFICATION FORM

TABLE UTS—Universal Treatment Standards
(Check the applicable underlying hazardous constituents for D001, D002, and D012 –D043 characteristic wastes only.)

Regulated constituent—common name

- ☐ 2,4,5-T (2,4,5-Trichlorophenoxyacetic acid)
- ☐ 1,2,4,5-Tetrachlorobenzene
- ☐ TCDDs (All Tetrachlorodibenzo-p-dioxins)
- ☐ TCDFs (All Tetrachlorodibenzofurans)
- ☐ 1,1,1,2-Tetrachloroethane
- ☐ 1,1,2,2-Tetrachloroethane
- ☐ Tetrachloroethylene
- ☐ 2,3,4,6-Tetrachlorophenol
- ☐ Toluene
- ☐ Toxaphene
- ☐ Bromoform (Tribromomethane)
- ☐ 1,2,4-Trichlorobenzene
- ☐ 1,1,1-Trichloroethane
- ☐ 1,1,2-Trichloroethane
- ☐ Trichloroethylene
- ☐ Trichloromonofluoromethane
- ☐ 2,4,5-Trichlorophenol
- ☐ 2,4,6-Trichlorophenol
- ☐ 1,2,3-Trichloropropane
- ☐ 1,1,2-Trichloro-1,2,2-trifluoroethane
- ☐ tris-(2,3-Dibromopropyl) phosphate
- ☐ Vinyl chloride
- ☐ Xylenes-mixed isomers (sum of o-, m-, and p-xylene concentrations)
- ☐ Antimony
- ☐ Arsenic
- ☐ Barium
- ☐ Beryllium
- ☐ Cadmium
- ☐ Chromium (Total)
- ☐ Cyanides (Total)[1]
- ☐ Cyanides (Amenable)[1]
- ☐ Fluoride
- ☐ Lead
- ☐ Mercury—Nonwastewater from Retort
- ☐ Mercury—All Others
- ☐ Nickel
- ☐ Selenium
- ☐ Silver
- ☐ Sulfide
- ☐ Thallium
- ☐ Vanadium

[1] Both Cyanides (Total) and Cyanides (Amenable) for nonwastewaters are to be analyzed using Method 9010 or 9012, found in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA Publication SW-846, as incorporated by reference in 40 CFR 260.11, with a sample size of 10 grams and a distillation time of one hour and 15 minutes.

NOTIFICATION OF ADDITIONAL TREATMENT STANDARDS

EPA Waste Code	Waste Description and/or Subcategory (if applicable)

Figure 3-1 (Continued)
Land Disposal Restrictions Notification Form

Los Alamos
National Laboratory

WASTE PROFILE FORM

Account Information		Reference Number
	For rapid processing, complete **all sections** in black or blue ink and mail this form to Waste Services Group at MS J579	

Waste Generator's Name (Print)	Znumber	Waste Management Coordinator's Name (Print)	Znumber

Generator's Group	Generator's Telephone	Generator's Mail Stop	Waste Stream Technical Area	Building	Room

Waste Accumulation
Check as many as apply.

- ☐ Satellite accumulation area --> site no.: _____
- ☐ Less than 90 day accumulation area --> site no.: _____
- ☐ Radioactive Materials Management Area (RMMA) --> site no.: _____
- ☐ None of the above

Method of Characterization
Check as many as apply.

- ☐ Acceptable Knowledge (AK)
- ☐ Analysis attached --> sample/request no. _____
- ☐ MSDS attached
- ☐ Request for analysis

Section 1- Chemical and Physical Characteristics

For help in completing this section of the form, call 5-WAST or 5-4000.

Waste Type
Check only one.

- ☐ Unused/unspent chemical
  Check *Waste Classes* and *Associated Documentation* Only
- ☐ Process waste/spent chemical
  Complete all of Section 1.

Waste Classes
Check as many as apply.

- ☐ On-going generation
- ☐ One-time generation
- ☐ Radioactive (complete Sec. 2)
- ☐ Non-radioactive
- ☐ Wastewater (complete Sec. 3)
- ☐ Classified/Sensitive

Associated Documentation
Check as many as apply.

- ☐ Process SOP --> no.: _____
- ☐ RMMA OP --> no.: _____
- ☐ WM SOP --> no.: _____
- ☐ Other --> _____
- ☐ None --> describe below

Waste Category
Check as many as apply.

- ☐ Solvent
- ☐ Degreaser
- ☐ Dioxin
- ☐ Electroplating
- ☐ Treated hazardous waste residue
- ☐ Explosive process waste
- ☐ Infectious/biological waste
- ☐ Beryllium
- ☐ Asbestos-friable
- ☐ Asbestos-nonfriable
- ☐ Empty containers
- ☐ PCB (<50 ppm)
  - ☐ PCB (50 - 500 ppm)
  - ☐ PCB (> 500 ppm)
  - → id. no. : _____
- ☐ Not applicable --> describe below

Waste Sources
Check as many as apply.

- ☐ Research and development
- ☐ Maintenance
- ☐ Construction
- ☐ Material processing
- ☐ Decon/decom
- ☐ Investigation derived
- ☐ Remediation
- ☐ UST - petroleum
- ☐ UST - non-petroleum
- ☐ Generator treatment
- ☐ Interim/permitted treatment
- ☐ Industrial sludge
- ☐ Sanitary sludge
- ☐ Abatement

Waste Matrix
Check only one.

Gas
- ☐ ≤ 1.5 Atmospheres
- ☐ > 1.5 Atmospheres

Liquid
- ☐ Aqueous
- ☐ Organic
- ☐ Inorganic

Solid
- ☐ Powder/ash
- ☐ Solid
- ☐ Absorbed liquid

Matrix Type
Check only one.

- ☐ Homogeneous
- ☐ Heterogeneous --> describe below

Waste/Process Description

_____
_____
_____
_____
_____
_____
_____

Figure 3-2
Waste Profile Form

Section 1- Chemical and Physical Characteristics (continued)

Ignitability (degrees F.)
Check only one.

- ☐ < 73
- ☐ 73-99
- ☐ 100-139
- ☐ 140-200
- ☐ > 200
- ☐ Ignitable solid
- ☐ DOT oxidizer
- ☐ Not ignitable

Corrosivity (pH)
Check only one.

- ☐ ≤ 2.0
- ☐ 2.1-4.0
- ☐ 4.1-6.0
- ☐ 6.1-9.0
- ☐ 9.1-12.4
- ☐ ≥ 12.5
- ☐ Liquid corrosive to steel
- ☐ Not aqueous

Reactivity
Check as many as apply.

- ☐ Unstable
- ☐ Water reactive
- ☐ Pyrophoric
- ☐ Cyanide bearing
- ☐ Sulfide bearing
- ☐ Shock sensitive
- ☐ Explosive - class _____
- ☐ Non-reactive

Boiling Point (degrees F.)
Check only one.

- ☐ ≤ 95
- ☐ > 95
- ☐ Not applicable

Identify presence of contaminants.			Minimum		Maximum	Unit (ppm or % only)	Analytical method
Toxicity Characteristic Metals							
Arsenic	☐ None	☐ < 5.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Barium	☐ None	☐ < 100.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Cadmium	☐ None	☐ < 1.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Chromium	☐ None	☐ < 5.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Lead	☐ None	☐ < 5.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Mercury	☐ None	☐ < 0.2 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Selenium	☐ None	☐ < 1.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Silver	☐ None	☐ < 5.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Toxicity Characteristic Organic Compounds							
Benzene	☐ None	☐ < 0.5 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Carbon tetrachloride	☐ None	☐ < 0.5 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Chlorobenzene	☐ None	☐ < 100.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Chloroform	☐ None	☐ < 6.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Cresol	☐ None	☐ < 200.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
1,4-dichlorobenzene	☐ None	☐ < 7.5 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
1,2-Dichloroethane	☐ None	☐ < 0.5 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
1,1-Dichloroethylene	☐ None	☐ < 0.7 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
2,4-Dinitrotoluene	☐ None	☐ < 0.13 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Hexachlorobenzene	☐ None	☐ < 0.13 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Hexachlorobutadiene	☐ None	☐ < 0.5 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Hexachloroethane	☐ None	☐ < 3.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Methyl ethyl ketone	☐ None	☐ < 200.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Nitrobenzene	☐ None	☐ < 2.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Pentachlorophenol	☐ None	☐ < 100.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Pyridine	☐ None	☐ < 5.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Perchloroethylene or tetrachloroethylene	☐ None	☐ < 0.7 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Trichloroethylene	☐ None	☐ < 0.5 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
2,4,5-Trichlorophenol	☐ None	☐ < 400.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
2,4,6-Trichlorophenol	☐ None	☐ < 2.0 ppm	_____	to	_____	_____	☐ TCLP ☐ Total
Vinyl chloride	☐ None	☐ < 0.2 ppm	_____	to	_____	_____	☐ TCLP ☐ Total

Additional Chemical Constituents and Contaminants (for hazardous constituents, see AR 10-3, Appendix A)
List all other constituents (including inerts) not identified above and attach any applicable analyses.

Name of constituent	Cas no.(optional)	Minimum		Maximum	Unit (ppm or % only)
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____
_____	_____	_____	to	_____	_____

Figure 3-2 (Continued)
Waste Profile Form

Section 2- Radiological Characteristics

For help in completing this section of the form, call 5-WAST or 5-4000.

	Range minimum		Range maximum	Unit (Ci/g or Ci/l)
General				
☐ Alpha	_____	to	_____	_____
☐ Beta	_____	to	_____	_____
☐ Gamma	_____	to	_____	_____
TRU radionuclides				
☐ None present				
☐ Am-241	_____	to	_____	_____
☐ Am-243	_____	to	_____	_____
☐ Cf-249	_____	to	_____	_____
☐ Cf-251	_____	to	_____	_____
☐ Cm-243	_____	to	_____	_____
☐ Cm-245	_____	to	_____	_____
☐ Cm-247	_____	to	_____	_____
☐ Pu-238	_____	to	_____	_____
☐ Pu-239	_____	to	_____	_____
☐ Pu-240	_____	to	_____	_____
☐ Pu-242	_____	to	_____	_____
Fission products				
☐ None present				
☐ Ba-140	_____	to	_____	_____
☐ Ce-144	_____	to	_____	_____
☐ Cs-134	_____	to	_____	_____
☐ Cs-137	_____	to	_____	_____
☐ I-129	_____	to	_____	_____
☐ I-133	_____	to	_____	_____
☐ Kr-85	_____	to	_____	_____
☐ Nb-95	_____	to	_____	_____
☐ Ru-106	_____	to	_____	_____
☐ Sb-125	_____	to	_____	_____
☐ Sr-90	_____	to	_____	_____
☐ Tc-99	_____	to	_____	_____
☐ Zr-93	_____	to	_____	_____
☐ Zr-95	_____	to	_____	_____
Activation products				
☐ None present				
☐ As -74	_____	to	_____	_____
☐ Be-7	_____	to	_____	_____
☐ C-14	_____	to	_____	_____
☐ Co-56	_____	to	_____	_____
☐ Co-57	_____	to	_____	_____
☐ Co-58	_____	to	_____	_____
☐ Co-60	_____	to	_____	_____
☐ Cr-51	_____	to	_____	_____
☐ Eu-152	_____	to	_____	_____
☐ Mn-52	_____	to	_____	_____
☐ Mn-54	_____	to	_____	_____
☐ Nb-94	_____	to	_____	_____
☐ Ni-59	_____	to	_____	_____
☐ Ni-63	_____	to	_____	_____
☐ Rb-83	_____	to	_____	_____
☐ Rb-84	_____	to	_____	_____
☐ Se-75	_____	to	_____	_____
☐ Sr-82	_____	to	_____	_____
☐ Sr-85	_____	to	_____	_____
☐ V-48	_____	to	_____	_____
☐ Y-88	_____	to	_____	_____
☐ Zn-65	_____	to	_____	_____
☐ Zr-88	_____	to	_____	_____

	Range minimum		Range maximum	Unit (Ci/g or Ci/l)
Other				
☐ None present				
☐ Am-242	_____	to	_____	_____
☐ Bi-207	_____	to	_____	_____
☐ Bi-210	_____	to	_____	_____
☐ Cf-250	_____	to	_____	_____
☐ Cf-252	_____	to	_____	_____
☐ Cm-244	_____	to	_____	_____
☐ H-3	_____	to	_____	_____
☐ Pa-231	_____	to	_____	_____
☐ Pb-210	_____	to	_____	_____
☐ Po-210	_____	to	_____	_____
☐ Pu-236	_____	to	_____	_____
☐ Pu-241	_____	to	_____	_____
☐ Ra-226	_____	to	_____	_____
☐ Ra-228	_____	to	_____	_____
☐ Th-230	_____	to	_____	_____
☐ Th-232	_____	to	_____	_____
☐ U-232	_____	to	_____	_____
☐ U-233	_____	to	_____	_____
☐ U-234	_____	to	_____	_____
☐ U-235	_____	to	_____	_____
☐ U-236	_____	to	_____	_____
☐ U-238	_____	to	_____	_____
Add'l radionuclides				
☐ No additional radionuclides present				
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____
_____	_____	to	_____	_____

Contamination Type: *Check as many as apply.*

☐ Volume Contamination

☐ Surface Contamination

Figure 3-2 (Continued)
Waste Profile Form

Section 3 - Wastewater Characteristics

For help in completing this section of the form, call 7-4301.

Identify presence of contaminants			Minimum	Maximum	Unit (ppm or % only)	Analytical method
Aluminum	☐ None	☐ < 5.0 ppm	_____	to _____	_____	☐ TCLP ☐ Total
Boron	☐ None	☐ < 5.0 ppm	_____	to _____	_____	☐ TCLP ☐ Total
Cobalt	☐ None	☐ < 1.0 ppm	_____	to _____	_____	☐ TCLP ☐ Total
Copper	☐ None	☐ < 1.0 ppm	_____	to _____	_____	☐ TCLP ☐ Total
Vanadium	☐ None	☐ < 0.10 ppm	_____	to _____	_____	☐ TCLP ☐ Total
Zinc	☐ None	☐ < 95.4 ppm	_____	to _____	_____	☐ TCLP ☐ Total

Maximum daily flow when discharge occurs: _____ ☐ Gallons ☐ Liters

Average daily flow when discharge occurs: _____ ☐ Gallons ☐ Liters

Estimated number of days per year that discharge will occur: _____

Estimated total volume per year discharged to the Radioactive Liquid Waste Collection System at TA-50-1: _____ ☐ Gallons ☐ Liters

For TA-55 use only. Wastewater will be discharged through one of the following:

☐ Acid line ☐ Caustic line ☐ Industrial waste line

Section 4 - Additional Information

If additional information is available on the chemical, physical, or radiological character of the waste not covered on this form, provide it below:

WASTE GENERATOR CERTIFICATION: *Based on my knowledge of the waste and/or chemical/physical analysis, I certify that the information on this form is correct. I understand that this information will be made available to regulatory agencies and that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.*

Signature	Date

Figure 3-2 (Continued)
Waste Profile Form

Document:	LANL TA-55 Part B
Revision No.:	0.0
Date:	June 28, 1996

Technical Area 55
Part B Permit Application
Volume II

Building 4, Container Storage Areas 1–11
Storage Tank Systems
Cementation Treatment Unit

Container Storage Pad

Building 185, Container Storage Area

Los Alamos National Laboratory
Hazardous and Solid Waste Group (ESH-19)
Los Alamos, New Mexico 87545

June 1996

Notice

There are Unclassified Controlled Nuclear Information (UCNI) Documents included as part of this Part B Permit Application.

Document Security Requirements:

1. Maintain physical control when not in use.
2. Store in a locked drawer
3. Prevent unauthorized access or dissemination

Access:

Any authorized individual (a person who has a need to know the information in connection with the performance of official DOE-authorized activities) may have routine access to UCNI.

These documents are not to be released to civilian population. Violation of the security requirements of UCNI may result in a civil penalty of up to $100,000 Criminal penalties may also apply under section 223 of the Atomic Energy Act.

For access to these documents contact:
Ms. Barbara Hoditschek, RCRA Permits Management Program Manager
Mr. Robert S. (Stu) Dinwiddie, LANL Facility Manager

4.0 DESIGN, OPERATIONS, AND PROCESS INFORMATION

This Part B permit application addresses only those units at Los Alamos National Laboratory (LANL) Technical Area (TA) 55 currently identified as hazardous or mixed waste regulated units. Continuous initiatives are administered to ensure identification of additional units, if any, that may potentially be regulated under the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1). This section presents a brief description of each container storage area, the storage tank systems, and the cementation unit addressed in this permit application as well as an overview of the general operations and process information that are applicable to these hazardous and mixed waste management units. The information provided in this section is submitted to address the following requirements:

- Container storage requirements of 20 NMAC 4.1, Subpart IX, 270.15, revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264, Subpart I, revised November 1, 1995, as applicable;
- Tank system requirements specified in 20 NMAC 4.1, Subpart IX, 270.16, revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264, Subpart J, revised November 1, 1995, as applicable; and
- Miscellaneous unit requirements specified in 20 NMAC 4.1, Subpart IX, 270.23, revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264, Subpart X, revised November 1, 1995, as applicable.

4.1 CONTAINER STORAGE AREAS [20 NMAC 4.1, Subpart IX, 270.15; 20 NMAC 4.1, Subpart V, Part 264, Subpart I]

This section provides descriptions of the container storage areas at TA-55. The container storage areas addressed in this permit application include Areas 1 through 11 located in TA-55, Building 4 (TA-55-4); the container storage pad located west of TA-55-4; and the container storage area located in TA-55-185 (An index to selected buildings/structures at TA-55 is provided as Attachment 4-1.) Each description includes the location, the physical parameters, the materials of construction, the basic design features, the maximum storage capacity, and the types of containers used at the container storage area. In addition, for areas that store wastes that may potentially contain free liquids, information is provided on the design and capacity of the secondary containment system.

Engineering drawings (Figures 4-1 through 4-4) have been provided for the container storage areas included in this permit application; they are, however, provided under separate cover to comply with Unclassified Controlled Nuclear Information (UCNI) procedures.

4.1.1 Container Storage Areas 1, 2, and 3

Areas 1, 2, and 3 are used to store containers of hazardous waste, transuranic (TRU) mixed waste, and low-level mixed waste, any of which may potentially contain liquids. These container storage areas are located in the basement of TA-55-4, as shown on Figure 4-1. TA-55-4 was constructed in 1977. The basement is approximately 265 feet (ft) long by 284 ft wide. The entire basement floor is constructed of 10-inch-(in.-)thick concrete and is coated with a chemical and temperature-resistant epoxy primer and epoxy paint to effectively prevent the migration of any liquids into the concrete (manufacturer's information on the protective coating materials is included as Appendix C of this permit application).

The basement is divided into a north and a south section by a concrete wall. These two sections are further divided, approximately in half, by a combination of concrete, a metal fire wall, and metal sliding fire doors. Passageways exist between all four sections. Areas 1 and 3 are located in the southwest section of the basement as shown on Figure 4-1. Area 1 is L-shaped and is approximately 61.4 ft long by 54.9 ft wide. The total square footage of this area is 2,153.7 square ft. Area 3 is 26 ft long by 10 ft wide and is located just north of Area 1. Area 2 is located in the southeast section of the basement as shown on Figure 4-1. It is approximately 26.6 ft long by 11.3 ft wide. The total maximum storage capacity of the three areas is 27,500 gallons (gal), or the equivalent of 500, 55-gal drums. Waste containers holding mixed waste stored in Areas 1, 2, and 3 may include 30-, 55-, and 85-gal steel drums; large waste boxes; and standard waste boxes (SWB). (Section 4.2.1 and Appendix D of this permit application provide detailed information regarding the different types of waste containers currently used at TA-55. The container specifications may vary between different manufacturers.)

Containers holding mixed waste that may potentially contain or are known to contain free liquids may be stored in Areas 1, 2, and 3; therefore, the requirements of 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are applicable. (Tables 4-1 through 4-5 provide information on wastes that may be stored in Areas 1, 2, and 3.) Containers suspected or known to contain free liquids are stored in containment systems. (Section 4.2.1 provides additional

information on secondary containment units.) The containment units will hold at least 10 percent of the volume of the potential liquid-bearing containers or the volume of the largest potential liquid-bearing container that may be stored in each unit, whichever is greater, pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(3), revised November 1, 1995.

4.1.2 Container Storage Area 4

Area 4 is used to store containers of hazardous waste, TRU mixed waste, and low-level mixed waste, any of which may potentially contain liquids. The container storage area is located in the northwest section of the basement at TA-55-4, as shown on Figure 4-1. Area 4 is 16 ft long by 13 ft wide. The storage capacity of this area is 3,400 gal, or the equivalent of approximately 62, 55-gal drums. The types of waste containers holding hazardous or mixed waste that may be stored in Area 4 include but are not limited to steel cans; 30-, 55-, and 85-gal steel drums; and large waste boxes.

Containers holding hazardous or mixed waste that may potentially contain or are known to contain free liquids may be stored in Area 4; therefore, the requirements of 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are applicable. (Tables 4-1 through 4-5 provide information on wastes that may be stored in Area 4.) Containers suspected or known to contain free liquids are stored in a cabinet equipped with a leakproof sill, on self-containment pallets, or in secondary containment units. (Section 4.2.1 provides additional information on these containment systems.) The containment systems will hold at least 10 percent of the volume of the potential liquid-bearing containers or the volume of the largest potential liquid-bearing container that may be stored therein, whichever is greater, pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(3), revised November 1, 1995.

4.1.3 Container Storage Area 5

Area 5 is used to store hazardous waste, TRU mixed waste, and low-level mixed waste solids. The container storage area is located in the northeast section of the basement at TA-55-4, as shown on Figure 4-1. It is approximately 45.1 ft long by 17.6 ft wide. The storage capacity of this area is 3,400 gal, or the equivalent of approximately 62, 55-gal drums. Waste containers holding mixed waste stored in Area 5 include, but are not limited to, steel cans; 55- and 85-gal steel drums; and SWBs.

Only solids are stored in Area 5. Therefore, the requirements of 20 NMAC 4.1, Subpart IX, 270.15(a), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are not applicable. In accordance with 20 NMAC 4.1, Subpart IX, 270.15(b)(1), revised November 1, 1995, Tables 4-1 through 4-3 provide information to show that the wastes stored in Area 5 consist of solid physical forms only and, by the nature of their physical form, do not contain free liquids.

4.1.4 Container Storage Area 6

Area 6 is used to store containers of TRU mixed waste and non-waste items, some of which may contain liquids. The container storage area is located along the eastern wall of the basement at TA-55-4, as shown on Figure 4-1. The storage area is approximately 79.6 ft long by 50.5 ft wide. The storage capacity of this area is 4,000 gal, or the equivalent of approximately 73, 55-gal drums. The types of waste containers holding mixed waste that may be stored in Area 6 include, but are not limited to, glass or plastic bottles; steel cans; and 30- and 55-gal steel drums.

Containers holding mixed waste that may potentially contain or are known to contain free liquids may be stored in Area 6; therefore, the requirements of 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are applicable. (Table 4-1 provides information on wastes that may be stored in Area 6.) This container storage area has a recessed floor and will provide secondary containment for the liquids stored in Area 6. The floor is constructed of concrete, is free of cracks and gaps, and is coated with a chemical-and temperature-resistant epoxy primer and epoxy paint. This coating is compatible with the wastes stored in Area 6 and will effectively prevent the migration of waste into the concrete. The capacity of the recessed floor is at least 10 percent of the volume of the potential liquid-bearing containers or the volume of the largest potential liquid-bearing container that may be stored in Area 6, whichever is greater, pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(3), revised November 1, 1995.

4.1.5 Container Storage Area 7

Area 7 may be used to store containers of hazardous waste, TRU mixed waste, and low-level mixed waste, any of which may potentially contain liquids. The container storage area is located in the northwest section of the basement at TA-55-4, as shown on Figure 4-1. The area is split with one portion on either side of the basement corridor leading to the outside access ramp. The western portion is approximately 33.3 ft long by 3 ft wide. The eastern portion is approximately

48.7 ft long by 2.2 ft wide. Area 7 has a maximum storage capacity of 4,400 gal, or the equivalent of 80, 55-gal drums. Waste containers holding hazardous or mixed waste stored in Area 7 may include, but are not limited to, steel cans; 30-, 55-, and 85-gal steel drums; and other waste boxes. Occasionally, large waste boxes and/or SWBs are staged temporarily (i.e., less than 24 hours) in Area 7 prior to loading and transport to other locations.

Containers holding hazardous or mixed waste that may potentially contain or are known to contain free liquids may be stored in Area 7; therefore, the requirements of 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are applicable. (Tables 4-1 through 4-5 provide information on wastes that may be stored in Area 7.) Containers suspected or known to contain free liquids are stored in secondary containment units. The containment units will hold at least 10 percent of the volume of the potential liquid-bearing containers or the volume of the largest potential liquid-bearing container that may be stored in each unit, whichever is greater, pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(3), revised November 1, 1995.

4.1.6 Container Storage Areas 8 and 9

Areas 8 and 9 may be used to store containers of TRU mixed waste and low-level mixed waste, any of which may potentially contain liquids. The container storage areas are located in Room 401 of TA-55-4 (TA-55-4-401), as shown on Figure 4-2. Area 8 is 6 ft long by 5.5 ft wide. The storage capacity of this area is 660 gal, or the equivalent of 12, 55-gal drums. Area 9 is 6.25 ft long by 5 ft wide. Its maximum storage capacity is 280 gal, or the equivalent of approximately 5, 55-gal drums. Waste containers holding mixed waste stored in Areas 8 and 9 include, but are not limited to, steel cans and 30-, 55-, and 85-gal steel drums.

Containers holding mixed waste that may potentially contain or are known to contain free liquids may be stored in Areas 8 and 9; therefore, the requirements of 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are applicable. (Tables 4-1, 4-2, and 4-4 provide information on wastes that may be stored in Areas 8 and 9.) TA-55-4-401 has a recessed floor and will provide secondary containment for the liquids stored in Areas 8 and 9. The entire floor is constructed of 10-in.-thick concrete, is free of cracks and gaps, and is coated with a chemical- and temperature-resistant epoxy primer and epoxy paint. This coating is compatible with the wastes stored in Areas 8 and 9 and will effectively prevent the migration of waste into the concrete. The capacity of the recessed floor is at least 10 percent of the volume of the potential

liquid-bearing containers or the volume of the largest potential liquid-bearing container that may be stored in Areas 8 and 9, whichever is greater, pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(3), revised November 1, 1995.

4.1.7 Container Storage Area 10

Area 10 may be used to store containers of TRU mixed waste and low-level mixed waste solids. The container storage area is located in TA-55-4-433, as shown on Figure 4-2. The floor of TA-55-4-433 is constructed of 10-in.-thick concrete and is coated with a chemical- and temperature-resistant epoxy primer and epoxy paint. Area 10 is split into two portions within the room. One portion of the container storage area, located in the northern end of the room, is 4 ft long by 3 ft wide. The other portion of the container storage area, located in the southern end of the room, is 10 ft long by 2 ft wide. Area 10 has a maximum storage capacity of 550 gal, or the equivalent of 10, 55-gal drums. Waste containers holding mixed waste stored in Area 10 include, but are not limited to, steel cans and 30-, 55-, and 85-gal steel drums.

Only solids are stored in Area 10. Therefore, the requirements of 20 NMAC 4.1, Subpart IX, 270.15(a), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are not applicable. In accordance with 20 NMAC 4.1, Subpart IX, 270.15(b)(1), revised November 1, 1995, Tables 4-1 and 4-2 provide information to show that the wastes stored in Area 10 consist of solid physical forms only and, by the nature of their physical form, do not contain free liquids.

4.1.8 Container Storage Area 11

Area 11 may be used to store containers of TRU mixed waste solids. The container storage area is located in TA-55-4-432, as shown on Figure 4-2. The floor of TA-55-4-432 is constructed of 10-in.-thick concrete and is coated with a chemical- and temperature-resistant epoxy primer and epoxy paint. The storage area is approximately 20.3 ft long by 34.2 ft wide. Area 11 has a maximum storage capacity of 4,400 gal, or the equivalent of 80, 55-gal drums. Waste containers holding mixed waste stored in Area 11 include steel cans and 30-, 55-, and 85-gal steel drums.

Only solids are stored in Area 11. Therefore, the requirements of 20 NMAC 4.1, Subpart IX, 270.15(a), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are not applicable. In accordance with 20 NMAC 4.1, Subpart IX,

270.15(b)(1), revised November 1, 1995, Table 4-1 provides information to show that the wastes stored in Area 11 consist of solid physical forms only and, by the nature of their physical form, do not contain free liquids.

4.1.9 Container Storage Pad

A container storage pad, located outside and northwest of TA-55-4, is used to store containers of hazardous waste, TRU mixed waste, and low-level mixed waste, any of which may potentially contain liquids. The pad, laid in the mid-1980s, is constructed of asphalt with a variable thickness of 4 to 6 in. The container storage pad, shown on Figure 4-3, has a trapezoidal shape with the four sides measuring 102 ft, 86 ft, 156 ft, and 105 ft. The pad is sloped and elevated 2 to 4 in. above ground level and has a culvert beneath the pad running north and south to minimize run-on of precipitation. The storage capacity of this area is 135,000 gal, or the equivalent of approximately 2,455 55-gal drums. The types of waste containers holding hazardous or mixed waste that may be stored on the storage pad include 30-, 55-, and 85-gal steel drums; SWBs; large waste boxes; and various small containers.

Containers holding hazardous or mixed waste that may potentially contain or are known to contain free liquids may be stored on the container storage pad; therefore, the requirements of 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are applicable. (Tables 4-1 through 4-5 provide information on wastes that may be stored on the container storage pad.) The containers that may contain or are known to contain free liquids are stored in covered, self-containment units which provide secondary containment. (Section 4.2.1 and Appendix D provide detailed information on the covered, self-containment units.) Because the self-containment units are covered and elevated by design, run-on and/or precipitation will not affect the containment capacity. The capacity of the covered, self-containment units is at least 10 percent of the volume of the potential liquid-bearing containers or the volume of the largest potential liquid-bearing container that may be stored in each covered, self-containment unit, whichever is greater, pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(3), revised November 1, 1995.

4.1.10 Container Storage Area/TA-55-185

The container storage area located in TA-55-185 may be used to store containers of hazardous waste, TRU mixed waste, and low-level mixed waste solids. TA-55-185 is located west of

TA-55-4, as shown on Figure 4-4. The building was constructed in 1991 and consists of a steel frame with fiberglass insulation and a concrete floor. It is approximately 60 ft long by 40 ft wide. The container storage area within the building is approximately 60 ft long by 17.5 ft wide. The storage capacity of this area is 27,500 gal, or the equivalent of 500, 55-gal drums. The types of waste containers holding hazardous or mixed waste that may be stored in the container storage area in TA-55-185 include, but are not limited to, 30-, 55-, and 85-gal steel drums; large waste boxes; and SWBs.

Only solids are stored in the container storage area in TA-55-185. Therefore, the requirements of 20 NMAC 4.1, Subpart IX, 270.15(a), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.175(b), revised November 1, 1995, are not applicable. In accordance with 20 NMAC 4.1, Subpart IX, 270.15(b)(1), revised November 1, 1995, Tables 4-1 through 4-3 provide information to show that the wastes stored in this container storage area consist of solid physical forms only and, by the nature of their physical form, do not contain free liquids.

4.2 WASTE MANAGEMENT PRACTICES APPLICABLE TO THE CONTAINER STORAGE AREAS [20 NMAC 4.1, Subpart V, Part 264, Subpart I]

The following sections provide an overview of the general operations and process information that are applicable to all of the container storage areas addressed in this permit application. This overview includes a discussion of container types; storage configuration; handling and inspection procedures; precautions taken when handling or storing incompatible, ignitable, or reactive wastes; and procedures for removal of liquids. This information is submitted to fulfill the requirements of 20 NMAC 4.1, Subpart V, Part 264, Subpart I, revised November 1, 1995.

4.2.1 Container Types

Containers used to store hazardous waste, low-level mixed waste, and TRU mixed waste at the container storage areas addressed in this permit application include, but are not limited to, steel cans; 30-, 55-, and 85-gal steel drums; SWBs; large waste boxes; and various small containers (Appendix D provides additional information on the types of waste containers used at TA-55). Sections 4.1.1 through 4.1.10 identify the specific types of waste containers in use at each of the container storage areas. All containers holding TRU mixed waste are vented. The vented containers have high-efficiency particulate air (HEPA) filters that allow gases (e.g., hydrogen), if any, to be released but that prevent the release of airborne particulates.

The most common drum used for storage at these container storage areas is the 55-gal drum. The standard drum in use is constructed of 16-gauge steel and has an inner diameter of 22.5 in. and a usable inside height of 33.25 in. The drums may be lined and may have either a removable lid or a prefastened lid with a 2-in. and a 0.75-in. opening. Currently, two sizes of large waste boxes are used for storage of low-level mixed waste solids at TA-55. These large waste boxes are constructed of low-carbon, hot-rolled steel and have continuous welds on all four sides and the bottom. Both sizes of this type of waste box, 45 cubic ft and 90 cubic ft, are designed to be loaded from the top. The lid is designed to be clamped and locked closed. SWBs are used to store TRU mixed waste at TA-55 and are approved by the U.S. Department of Energy (DOE) for use at the Waste Isolation Pilot Plant (WIPP). SWBs are constructed of low-carbon, hot-rolled steel and have continuous welds on all four sides and the bottom. SWBs are designed to be loaded from the top, have a lid that is bolted on, and a capacity of 72 cubic ft.

Overpacks are used to package large equipment items and gloveboxes or may be used when a container's integrity is suspected. Special order waste boxes are used to package gloveboxes. These boxes can be designed to be loaded and unloaded from the top as well as the side and/or the end. SWBs are commonly used to overpack equipment. Eighty-five-gal drums may be used to overpack 55-gal drums. The 85-gal overpacks are constructed of 16-gauge steel, at a minimum.

Covered, self-containment units, self-containment pallets, single-drum containment units, and cabinets (see Appendix D) may be used as a form of secondary containment at any of the container storage areas that may potentially store free liquids. The covered, self-containment units are constructed of molded, chemical-resistant polyethylene and are equipped with a removable polyethylene grating and a hinged two-part cover which is impervious to precipitation. Depending on the size used, the base of the covered, self-containment unit has a 135-gal or a 240-gal capacity. The self-containment pallets consist of a molded high-density polyethylene base and a fiberglass grating that elevates containers above the base. The pallets vary in size depending on the size of the container or containers for which they are providing secondary containment. The single-drum containment unit is an 85-gal container made of heavy-duty polyethylene. This containment unit is designed to hold one 55-gal drum. The cabinets are constructed of an epoxy enamel coated steel frame. The base of each cabinet has a raised, leakproof sill, and each shelf is lined with a high-density polyethylene tray. The base of each of

these containment systems is sufficiently impervious to contain leaks and spills, as required by 20 NMAC 4.1, Subpart V, 264.175(b)(1), revised November 1, 1995. Each containment system will hold, at a minimum, 10 percent of the volume of the potential liquid-bearing containers or the volume of the largest potential liquid-bearing container stored in each system, whichever is greater, pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(3), revised November 1, 1995.

4.2.2 Storage Configuration

The hazardous and mixed waste storage configuration varies for each container storage area. Storage configurations depend on facility throughput, size constraints, and the chemical and radiological characteristics of the waste in storage at any one time.

Containers holding hazardous or mixed waste in each container storage area will be protected from potential contact with accumulated liquids that could be introduced in the event of a plumbing failure, as a result of fire-suppression activities, leaks, spills, or precipitation by either being elevated or stored in an area that is designed and operated to remove accumulated liquids. Because Areas 1 through 11 and the container storage area located in TA-55-185 are indoors, run-on of precipitation will not occur in these areas. Large waste boxes and covered, self-containment units are elevated by design. Other containers will be elevated as appropriate. Additionally, the floor of the basement contains sump pits/pumps that are operated to facilitate the collection and removal of liquids. All containers holding hazardous or mixed waste will be kept from contact with standing liquids in accordance with the requirements of 20 NMAC 4.1, Subpart IX, 270.15(a)(2) and 270.15(b)(2), revised November 1, 1995. These design considerations and waste management practices also meet the requirements of 20 NMAC 4.1, Subpart V, 264.175(b)(2) and 264.175(c), revised November 1, 1995.

To allow for inspection, containers are arranged in rows with a minimum of 24 in. between the rows. Wastes contained in drums are arranged in rows and stacked to a maximum of two high for 55-gal drums. The 85-gal drums are not stacked. SWBs are stacked to a maximum of two high. Large waste boxes are stacked to a maximum of two high, unless size and weight restrictions prohibit stacking due to safety concerns. The large waste boxes vary in size and shape; therefore, rows consisting of these container types may vary in width. However, an aisle space of at least 24 in. is maintained between all rows. Main aisle space may vary for each area

and depends on the type and size of equipment used for container movement and spill control. Adequate aisle space allows personnel to quickly access exit doors in an emergency and facilitates container inspections.

4.2.3 Handling and Inspection [20 NMAC 4.1, Subpart V, 264.171, 264.173, and 264.174]

As required by 20 NMAC 4.1, Subpart V, 264.171, revised November 1, 1995, any container that is not in good condition (e.g., severe rusting, apparent structural defects) is overpacked or the wastes are repackaged in containers that are in good condition prior to storage. All containers holding hazardous or mixed waste are kept closed during storage in accordance with 20 NMAC 4.1, Subpart V, 264.173(a), revised November 1, 1995, except when a container's contents need to be repackaged or waste needs to be added to or removed from the container. Containers are handled and stored at all times in a manner that will not rupture a container nor cause it to leak, as required by 20 NMAC 4.1, Subpart V, 264.173(b), revised November 1, 1995.

The purpose of the inspections is to identify leaking containers, deterioration of containers, and loss of integrity of the containment system, as required by 20 NMAC 4.1, Subpart V, 264.174, revised November 1, 1995. Inspections will be performed at each container storage area according to the schedules in Section 6.0. The inspections include checking the structural integrity (e.g., for bulging) of the various waste containers used for storage at TA-55. Section 6.0 of this permit application provides more detailed information regarding inspection requirements and how they are met.

4.2.4 Ignitable, Reactive, and Incompatible Wastes [20 NMAC 4.1, Subpart V, 264.17(a), 264.176, and 264.177]

Ignitable, reactive, and incompatible wastes are and will be kept physically segregated during storage at TA-55. Ignitable or reactive waste may potentially be stored at any of the container storage areas addressed in this permit application. Pursuant to 20 NMAC 4.1, Subpart V, 264.17, revised November 1, 1995, LANL will follow specific waste management procedures for ignitable and reactive waste. Containers storing hazardous and/or mixed waste will be segregated according to the following compatibility group scheme: (1) flammables/ignitables, (2) oxidizers, (3) corrosive acids, (4) corrosive bases, (5) reactives (those reactive with water), (6) reactives (except those reactive with water) and (7) other wastes. TRU mixed waste in Area 6 is stored

based on the radionuclide content of the waste due to the "as low as reasonably achievable" principle, established by the Atomic Energy Act, and because of criticality concerns.

In accordance with the requirements of 20 NMAC 4.1, Subpart V, 264.176, revised November 1, 1995, containers holding ignitable or reactive waste are and will be stored at least 50 ft from the facility's property line (refer to Maps 1 and 2 of Revision 1.0 of the TA-55 Part A Permit Application ([LANL, 1996]). All ignitable and reactive wastes are also protected from sources of ignition or reaction, in accordance with 20 NMAC 4.1, Subpart V, 264.17(a), revised November 1, 1995. Smoking is not allowed at the container storage areas in TA-55-4, TA-55-185, or in and around the container storage pad. "No Smoking" signs are conspicuously placed at TA-55 wherever there is a potential hazard from ignitable or reactive waste as required by 20 NMAC 4.1, Subpart V, 264.17(a), revised November 1, 1995. In addition, most mechanical equipment operated within the area is grounded to minimize the potential for sparking and accidental ignition.

When incompatible wastes are stored at TA-55, they are and will be stored according to specific segregation schemes to meet the requirements of 20 NMAC 4.1, Subpart V, 264.177(c), revised November 1, 1995. Containers holding incompatible wastes and that potentially contain free liquids will be stored in separate secondary containment systems. No incompatible wastes will be mixed, and no wastes will be placed in containers that previously held incompatible wastes, as required by 20 NMAC 4.1, Subpart V, 264.177(a) and (b), revised November 1, 1995, and 20 NMAC 4.1, Subpart IX, 270.15(d), revised November 1, 1995. Only containers made of or lined with materials that will not react with and are otherwise compatible with the waste to be stored will be used for storage at these container storage areas. Wastes carrying the U.S. Environmental Protection Agency (EPA) Hazardous Waste Numbers F020, F021, F022, F023, F026, or F027 are neither generated nor stored at TA-55; therefore, the requirements of 20 NMAC 4.1, Subpart V, 264.175(d)(1), revised November 1, 1995, are not applicable.

4.2.5 Removal of Liquids [20 NMAC 4.1, Subpart IX, 270.15(a)(5)]

Liquids that might accumulate in any of the container storage areas or secondary containment systems will be removed as soon as possible or, if a potential criticality hazard exists, as soon as practicable. A HEPA vacuum, a portable pump, and/or sorbents may be used, depending on the volume and nature of the accumulated liquid, to remove the liquid for subsequent sampling and analysis. The collected liquids and/or sorbents will be transferred to appropriate containers

and will be sampled. If a sample represents a spill from an identifiable source, the sample will be analyzed for the hazardous waste constituents known to be components of the source. If a sample represents a spill from other than an identifiable source, or are liquids not resulting from a spill (e.g., water generated during fire-suppression activities), samples will be analyzed for the potential constituents listed in Table 7-3, as appropriate. The Nuclear Materials Technology (NMT) Division's Waste Management and Environmental Compliance Group will determine the ultimate disposition of these containers according to regulatory requirements. This method of removal and analysis of accumulated liquids will satisfy the requirements of 20 NMAC 4.1, Subpart IX, 270.15(a)(5), revised November 1, 1995, for prevention of overflow.

4.3 MIXED WASTE STORAGE TANK SYSTEMS [20 NMAC 4.1, Subpart IX, 270.16; 20 NMAC 4.1, Subpart V, 264.191, 264.192, and 264.193]

This section provides a description of the two storage tank systems in TA-55-4-401 addressed in this permit application. One storage tank system is comprised of glovebox GB-438 and ancillary equipment and is associated with the evaporator unit in TA-55-4-401. Glovebox GB-438 and its ancillary equipment comprise the "evaporator glovebox storage tank system." The other tank system is comprised of 5 stainless steel tanks and ancillary equipment and is associated with the cementation unit in TA-55-4-401. The 5 tanks and ancillary equipment comprise the "cementation unit storage tank system." Both tank systems are used to store evaporator bottoms solutions (i.e., TRU mixed waste) generated from the evaporator unit associated with the nitrate-based aqueous process.

Each description includes design, construction, materials, installation, testing, and operation information. Secondary containment for the tank systems is discussed in Section 4.3.3. Engineering drawings of both tank systems, including a process isometric of the two tank systems in relation to each other and the cementation unit (i.e., Figures 4-5 through 4-12 and Figures 4-15 through 4-21) are provided under separate cover to comply with UCNI procedures.

4.3.1 Evaporator Glovebox Storage Tank System [20 NMAC 4.1, Subpart V, 264.191(b)(4)]

The evaporator glovebox storage tank system consists of glovebox GB-438 and ancillary equipment near the west wall of TA-55-4-401. The tank system was constructed in 1986 and installed at its present location in TA-55-4-401 in 1988. The tank system is used to store

evaporator bottoms solutions received from the evaporator unit prior to storage in the cementation unit storage tank system and subsequent solidification in the cementation unit (see Figure 4-6).

4.3.1.1 Design, Construction, and Materials [20 NMAC 4.1, Subpart IX, 270.16(b), (c), (d), and (i); 20 NMAC 4.1, Subpart V, 264.191(b)(1) and (3)]

The evaporator glovebox storage tank is fabricated from 0.1875-in. 316 stainless steel with a 2B finish conforming to the American Society for Testing and Materials (ASTM) A240. The lower half of the tank is fabricated with additional layers of materials welded to the outside of the 0.1875-in.-thick stainless steel enclosure. These materials consist of 0.25-in.-thick lead shielding, conforming to ASTM B29, and an outer layer of 0.0625-in., 316 stainless steel cladding. The tank is of welded construction with all welds blended, ground, and polished to blend with adjacent material. All joints are vacuum tight.

The support frame and legs of the evaporator glovebox storage tank are constructed of carbon steel and conform to ASTM A36. The support frame is bolted to the base of the tank for stabilization. In addition, the legs of the tank are bolted to the support frame and secured to the 10-in.-thick concrete floor with anchor bolts. The 10-in.-thick concrete floor was constructed to conform to the building code requirements of the American Concrete Institute (ACI) 318-71 for reinforced concrete. The reinforcing steel was detailed and fabricated in accordance with the "Manual of Standard Practice for Detailing Reinforced Concrete Structures," ACI 315. The design construction and tolerance of the framework around the concrete is in accordance with ACI 347. Figures 4-7 through 4-10 show the dimensions of the evaporator glovebox storage tank and its support system.

The window components of the evaporator glovebox storage tank are constructed of 0.25-in. leaded glass, laminated on both sides with 0.125-in. clear glass, and installed with a neoprene gasket. Additionally, each window is backed with 0.25-in. safety glass installed with a neoprene gasket/seal that provides air-tight containment. The dual glass configuration is secured to the tank with a welded frame consisting of a 0.25-in.-thick lead shielding and a 0.0625-in., 316 stainless steel cladding similar to the additional layers of materials welded to the outside of the lower half of the tank. The welded window frames are bolted to the tank. Replacement windows and gaskets will be made of the same or similar materials.

The glove components of the evaporator glovebox storage tank are constructed of neoprene and Hypalon. Each glove is tested for material continuity by the manufacturer before acceptance and installation within the evaporator glovebox storage tank. Each glove is selected for its resistance to nitric acid as well as its lead-equivalent shielding power to gamma radiation. Replacement gloves will be made of the same or similar materials.

The evaporator glovebox storage tank houses two welded, steel trays and eight glass columns and associated ancillary equipment. Each of the steel trays has a capacity of approximately 27 L. Each of the eight glass columns has a capacity of 27 L. Liquid mixed waste can be vacuum-transferred from the steel trays to the glass columns and from the glass columns to the cementation unit storage tank system. Each glass column is individually filled and visually monitored when the waste is transferred from the steel trays into a glass column. If the maximum capacity of a column is reached, the liquid waste is automatically directed to a vacuum trap. The maximum capacity of the vacuum trap is approximately 5.5 L. The glass columns and the vacuum trap are constructed of PYREX® glass, manufactured by Corning, with stainless steel end plates. Replacement parts for the columns and vacuum trap will be of the same or similar materials. The glass columns are equipped with an air-sparging system. Sparging operations are carried out to homogeneously mix the waste prior to sampling or transferring.

The piping associated with the evaporator glovebox storage tank system includes the transfer line from the evaporator, the wet vacuum line, the lean residue transfer line, and the ventilation lines entering and exiting the evaporator glovebox storage tank. All piping and associated valves are constructed of single-walled, 316 stainless steel. The wet vacuum line and the lean residue transfer line are 0.75-in. pipe; the transfer line from the evaporator is 1.0-in. pipe; and the ventilation lines are 2.0-in. pipe. Pipe diameters may change in the event that a portion of the piping requires replacement. The evaporator glovebox storage tank's ancillary equipment is supported by a steel channel Uni-strut® support system. The Uni-strut® support system is secured to the concrete ceiling with anchor bolts and provides the system's ancillary equipment with support and protection against physical damage and excessive stress that could potentially result from settlement, vibration, expansion, or contraction. Replacement supports will be made of the same or similar materials. The entire system is located within a building; therefore, frost heave affects will not occur. Figures 4-11 and 4-12 illustrate the process flow and configuration for the piping associated with the evaporator glovebox storage tank system.

All of the components within the evaporator glovebox storage tank system are corrosion resistant and are compatible with the waste stored in the tank system. No external component of the tank system is in contact with soil or water.

4.3.1.2 Installation, Testing, and Certification [20 NMAC 4.1, Subpart IX, 270.16(a); 20 NMAC 4.1, Subpart V, 264.191(b) and 264.193(i)]

The evaporator glovebox storage tank system is considered an existing tank system in accordance with 20 NMAC 4.1, Subpart V, 264.191, revised November 1, 1995. The storage tank system has secondary containment that meets the requirements of 20 NMAC 4.1, Subpart V, 264.193, revised November 1, 1995; therefore, pursuant to 20 NMAC 4.1, Subpart V, 264.191(a), revised November 1, 1995, the requirement that the owner or operator of the tank system determine that the tank system is not leaking or is unfit for use is not applicable. In addition, the requirement that the owner or operator obtain and keep on file a written assessment attesting to the tank system's integrity is also not applicable. However, for the purpose of demonstrating that the evaporator glovebox storage tank system will function as a completely leak-proof system and would meet the assessment requirements if they were applicable, a written assessment has been prepared in accordance with 20 NMAC 4.1, Subpart V, 264.191(b), and 20 NMAC 4.1, Subpart IX, 270.16(a), revised November 1, 1995, attesting that the tank system is adequately designed and has sufficient structural integrity and compatibility with the waste stored to ensure that it will not collapse, rupture, or fail. The written assessment, reviewed and certified by an independent, qualified, registered professional engineer, is included as Attachment 4-2 of this permit application.

A helium leak test using a mass spectrometer was performed on the evaporator glovebox storage tank upon fabrication at Silver Engineering and again after the tank was installed and made operational at its present location in TA-55-4-401. Because secondary containment (see Section 4.3.3) is provided for this tank system, the requirements in 20 NMAC 4.1, Subpart V, 264.193(i), revised November 1, 1995, are not applicable.

4.3.2 Cementation Unit Storage Tank System [20 NMAC 4.1, Subpart IX, 270.16(e); 20 NMAC 4.1, Subpart V, 264.192(a)(3), (4), and (5)(i), (ii), and (iii), and 264.192(c), (e), and (f)]

The cementation unit storage tank system consists of five vertical tanks and ancillary equipment located perpendicular to the west wall of TA-55-4-401. The tanks are used to store evaporator bottoms solutions received from the evaporator glovebox storage tank system prior to solidification

in the cementation unit. The five tanks were fabricated in 1985. The tank system was considered an existing tank system in accordance with 20 NMAC 4.1, Subpart V, 264.191, revised November 1, 1995; however, new components (i.e., the cementation unit storage tank system header/manifold and the transfer line from the evaporator glovebox storage tank to the cementation unit storage tank system header/manifold) have recently been installed within the tank system and may be considered major, nonroutine modifications. Due to these modifications, the cementation unit storage tank system will be addressed in this permit application as a new tank system in accordance with 20 NMAC 4.1, Subpart V, 264.192, revised November 1, 1995.

The cementation unit storage tank system is erected upon a 10-in.-thick concrete floor within TA-55-4-401. The 10-in.-thick concrete floor provides a foundation that will maintain the load of the tank system when full. The concrete floor and ceiling were constructed to conform to the building code requirements of ACI 318-71 for reinforced concrete. The reinforcing steel was detailed and fabricated in accordance with the "Manual of Standard Practice for Detailing Reinforced Concrete Structures," ACI 315. The design construction and tolerance of the framework around the concrete is in accordance with ACI 347. The entire tank system, including ancillary equipment, is elevated and supported by a steel channel, Uni-strut® support system. The Uni-strut® support system is secured to the concrete floor and ceiling with anchor bolts and provides the system's ancillary equipment with support and protection against physical damage and excessive stress due to settlement and vibration. Replacement supports will be made of the same or similar materials. The system stores only solutions that have been previously cooled to room temperature, and the solutions are transferred utilizing a slight vacuum (i.e., 10 to 20 inches of mercury). The system does not operate under pressure. Because of the moderate operating parameters (i.e., temperature and pressure) of the system, physical damage and excessive stress due to expansion and contraction are not anticipated. Furthermore, the cementation tank system is not within a saturated zone or seismic fault zone and is within a building so frost heave effects are not expected.

4.3.2.1 Design, Construction, and Materials [20 NMAC 4.1, Subpart IX, 270.16(b), (c), (d), and (i); 20 NMAC 4.1, Subpart V, 264.192(a)(1)]

Each of the five cementation unit storage tanks has a capacity of 55 L. Each tank has an outside diameter of 6.625 in., a straight side height of 10 ft, a wall thickness of 0.28 in., and a conical bottom, as shown on Figure 4-15. The tanks are constructed of 316 stainless steel. The

stainless steel materials are corrosion-resistant and are compatible with the liquid waste stored in the tanks. Corrosion testing was conducted on the tanks in 1993 by TA-55 facility engineers. The vent trap and the vacuum trap operating within the cementation unit storage tank system also have an outside diameter of 6.625 in. The vent trap has a straight side height of 9 in. and a maximum capacity of approximately 4 L. The vacuum trap has a straight side height of 37 in., a conical bottom, and a maximum capacity of approximately 17 L. The vent trap and the vacuum trap are constructed of 316 stainless steel for corrosion resistance and materials compatibility with the waste. All of the tanks were designed in accordance with the latest applicable standards, including American Society of Mechanical Engineers, Section 8, Division 1 standards. The tanks are installed such that, if necessary, they can be replaced.

The piping associated with the cementation unit storage tank system includes the header/manifold, vacuum manifold, and lower manifold for the cementation unit storage tanks; the vent trap vent line and drain line; the transfer line from the evaporator glovebox storage tank to the cementation unit storage tank system header/manifold; and the transfer line from the lower manifold to the cementation unit. All piping and associated valves are constructed of 316 stainless steel. All intertank piping and transfer piping is single-walled 0.75-in. pipe. Pipe diameters may change in the event that a portion of the piping requires replacement. All tank-to-piping connections are flanged. Figures 4-16 and 4-17 illustrate the process flow and configuration for the piping system associated with these five storage tanks.

One vacuum pump serves both the evaporator glovebox storage tank system and the cementation unit storage tank system. The liquid waste can be vacuum-transferred from the evaporator glovebox storage tank system to the cementation unit storage tank system and from the cementation unit storage tank system to the cementation unit. The cementation unit storage tanks are vacuum-sparged to achieve a homogeneous waste mixture prior to transferring the tank contents to the cementation unit for treatment by solidification.

Each storage tank is equipped with a high-level detector that automatically shuts off the inlet valve to the tank system. If the sensing device is triggered, the inlet valve to the tank system is closed and the liquid waste is prevented from entering the system. The vacuum trap operating within the system is also equipped with a high-level detector. The 55-L cementation storage tanks receive waste from the 27-L glass columns in the evaporator glovebox storage tank; therefore,

it is very unlikely that the capacity of one of the cementation unit storage tanks would be reached before the motor-operated valves bypass the liquid waste to a second cementation unit storage tank.

4.3.2.2 Installation, Testing, and Certification [20 NMAC 4.1, Subpart IX, 270.16(a) and (f); 20 NMAC 4.1, Subpart V, 264.192(a), (b), (d), and (g) and 264.193(i)]

In accordance with 20 NMAC 4.1, Subpart V, 264.192(a), revised November 1, 1995, a written assessment has been prepared attesting that the cementation unit storage tank system has sufficient structural integrity and is acceptable for handling hazardous waste. The written assessment, reviewed and certified by an independent, qualified, registered professional engineer, is included as Attachment 4-3 of this permit application.

In accordance with 20 NMAC 4.1, Subpart V, 264.192(d), revised November 1, 1995, owners or operators of new tanks and ancillary equipment must ensure that the system is tested for tightness. The cementation unit storage tank system was tightness tested on May 30, 1996, at operating pressure (i.e., under a vacuum of 10 to 20 in. of mercury) and determined to be tight. The signed certification attesting to the system's tightness; the detailed tightness testing procedure adhered to during the tightness tests; and the results of the tightness tests are included as Attachment 4-4 of this permit application.

In accordance with 20 NMAC 4.1, Subpart V, 264.192(b), revised November 1, 1995, owners or operators of new tank systems or components must ensure that proper handling procedures are adhered to during installation in order to prevent damage to the system. The new components (i.e., the transfer line from the evaporator glovebox storage tank to the cementation unit storage tank system header/manifold and the cementation unit storage tank system header/manifold) have been inspected by a qualified inspector for weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, and other structural damage or inadequate construction or installation. The signed certification attesting to the proper installation of the new components and a copy of the inspection check list is included as Attachment 4-5 of this permit application.

Because secondary containment (see Section 4.3.3) is provided for this tank system, the requirements in 20 NMAC 4.1, Subpart V, 264.193(i), revised November 1, 1995, are not applicable.

4.3.3 Secondary Containment for the Storage Tank Systems [20 NMAC 4.1, Subpart IX, 270.16(g); 20 NMAC 4.1, Subpart V, 264.193]

TA-55-4-401 serves as secondary containment for each of the storage tank systems. The secondary containment will prevent the migration of wastes or accumulated liquids to any soil, groundwater, or surface water. Because the storage tanks and secondary containment are inside a building, run-on of precipitation will not affect the containment capacity. The floor of TA-55-4-401 is recessed 2.5 in. The room itself is approximately 60 ft long by 75 ft wide. The containment area can accommodate over 20,000 L of liquids. The entire floor is constructed of 10-in.-thick concrete and is coated with a chemical- and temperature-resistant epoxy primer and epoxy paint. This coating is compatible with the wastes stored in the tanks and will effectively prevent the migration of waste into the concrete. The construction joints in the floor slab and exterior walls of TA-55-4-401 are all constructed with chemical-resistant water stops in place. The conduit piping penetrating the floor of the room is secured with rubber boots, bushings, and flanges. All penetrations (i.e., holes for conduit) in the floor have been hermetically sealed to prevent liquids from entering the penetrations. Figures 4-13 and 4-14 provide structural drawings illustrating the first floor construction and the locations of floor penetrations.

The storage tank systems are inspected each working day to detect leaks. Eight continuous air monitoring (CAM) units are installed at various locations throughout TA-55-4-401 to detect any airborne alpha contamination that would be present if a leak were to occur at any point in the system. Additionally, radiological control technicians (RCT) periodically monitor for radioactive contamination and would detect any leaks during monitoring. Leaks or spills would be detected within 24 hours, as required by 20 NMAC 4.1, Subpart V, 264.193(c)(3), revised November 1, 1995. In the event of a leak or spill, the liquids will be removed as quickly as possible with sorbents and packaged in appropriate containers or vacuum-transferred, using the existing wet vacuum, into an available storage tank. The collected materials will then be sampled and analyzed for the hazardous waste constituents known to be components of the source or potential constituents listed in Table 7-3, as appropriate. NMT personnel will determine the ultimate disposition of this waste according to regulatory requirements. (Section 7.0 of this permit application provides more information on response actions to leaks or spills.)

4.4 WASTE MANAGEMENT PRACTICES APPLICABLE TO STORAGE TANK SYSTEMS [20 NMAC 4.1, Subpart V, Part 264, Subpart J]

The following sections provide a general overview of the operations and process information that are applicable to the storage tank systems addressed in this permit application. This overview includes a discussion of the characteristics of the waste stored (including hazardous characteristics and precautions taken when handling or storing incompatible, ignitable, or reactive wastes).

4.4.1 Hazardous Characteristics of the Waste to be Stored [20 NMAC 4.1, Subpart IX, 270.16(j); 20 NMAC 4.1, Subpart V, 264.17(a), 264.191(b)(2), 264.192(a)(2), 264.198, and 264.199]

The solutions stored in the evaporator glovebox storage tank system and the cementation unit storage tank system are generated from a nitrate-based aqueous process used to produce a relatively pure plutonium oxide. The process consists of a series of operations including preparation, plutonium leaching with nitric acid, anion exchange, plutonium/oxalate precipitation, and evaporation. The solutions sent to the evaporator consist of plutonium oxalate filtrate, solutions from plutonium leaching, and process waters. The evaporator bottoms solutions from the evaporator unit are discharged into the steel trays in the evaporator glovebox storage tank, and sufficient time is allotted for the solutions to cool to room temperature. As the solutions cool, waste salts crystallize and precipitate out of solution. The solutions are then filtered and vacuum-transferred from the steel trays to the glass columns in the evaporator glovebox storage tank system. The solutions can then be vacuum transferred from the glass columns to the cementation unit storage tank system. The only wastes stored in the evaporator glovebox storage tank system and the cementation unit storage tank system are the filtered evaporator bottoms solutions and waste salts generated from these solutions. The evaporator bottoms solutions and the waste salts are eventually solidified in the cementation unit. (Table 4-6 provides information on wastes that may be treated in the cementation unit.)

Currently, no ignitable or reactive mixed wastes are stored in the evaporator glovebox storage tank system or in the cementation unit storage tank system. Pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.198, revised November 1, 1995, in the event that ignitable or reactive waste is stored in the tanks, the waste will be stored in such a way that it is protected from any material or condition that may cause the waste to ignite or react.

It is not anticipated that incompatible wastes will be placed in the same tank system or that a mixed waste will be placed in a tank system that previously held an incompatible waste. However, in the event that incompatible wastes may be stored, precautions will be taken in accordance with the requirements of 20 NMAC 4.1, Subpart V, 264.17(b), revised November 1, 1995.

4.5 MIXED WASTE CEMENTATION UNIT [20 NMAC 4.1, Subpart IX, 270.23; 20 NMAC 4.1, Subpart V, Part 264, Subpart X]

This section provides a description of the cementation unit at TA-55-4. The cementation unit addressed in this permit application is used to solidify process waste generated as a result of plutonium processing at TA-55-4. The description includes the location, design, materials of construction, operation, and secondary containment.

4.5.1 Design, Materials of Construction, and Operation [20 NMAC 4.1, Subpart IX, 270.23(a); 20 NMAC 4.1, Subpart X, 264.101]

The cementation unit is located in glovebox GB-454 along the west wall of TA-55-4-401. The unit, which has been operating since 1991, consists of a pH adjustment column and vacuum trap, two motor-driven mixers, four impellers, associated support structures, and associated piping housed within the glovebox, as shown on Figures 4-18 and 4-19, which are included under separate cover to comply with UCNI procedures.

The pH column has a straight side height of 5 ft and an outside diameter of 6.66 in. The maximum capacity of the column is approximately 27 L. The column is raised above the glovebox floor approximately 3 in. by three steel legs and is secured to one wall of the glovebox with a steel bracket that binds the column approximately 3 ft up from the base of the column. The vacuum trap associated with the column has a straight side height of 2 ft and an inside diameter of 6 in. The maximum capacity of the vacuum trap is approximately 11 L. Both the pH column and the vacuum trap are constructed of PYREX® glass with stainless steel end plates similar to the glass columns in the evaporator storage tank system described in Section 4.3.1. Replacement parts for the column and vacuum trap will be of the same or similar materials. The glass and stainless steel materials are corrosion-resistant and compatible with the waste received in the column. The pH column is used to adjust the pH of the waste to ensure compatibility with the cement used to solidify the waste. The column receives waste from the evaporator glovebox storage tank system and/or the cementation unit storage tank system. An upper limit of

approximately 15 L of waste is transferred to the pH column at any one time. A compressed air line enters the glovebox and is connected to two pressurized air tanks outside of the glovebox. The compressed air line is used for sparging during pH treatment operations and for remote valve operation.

The two mixers within the unit are high-flow, gear-driven, fixed-mount mixers (manufacturer's information on the fixed-mount mixers is included as Appendix E of this permit application). All couplings, shafts, and impellers are constructed of 316 stainless steel. The shafts are 5 ft long. Two impellers are mounted to each shaft. Each impeller has a diameter of approximately 11 in. The mixers are driven by 3.5-horsepower motors encased within the mixer housing. The mixer housing is approximately 2.5 ft long. The maximum weight of each mixer is 225 pounds. Each mixer is mounted on steel plates and supported by two steel guides on either side of each mixer. Each guide is bolted to a 6-in. steel flange at either end and is secured to the glovebox floor and ceiling. Each motor is mounted to a center screw drive that allows the mixers to be independently raised and lowered within the glovebox. The glovebox is constructed of a section of 0.75-in. lead "sandwiched" between two sections of approximately 0.188-in.-thick low-carbon grade, 316 stainless steel. The floor of the glovebox contains two circular openings with removable covers that allow the shafts and impellers of each mixer to be lowered into drums attached beneath the glovebox.

During cementing operations, two 55-gal steel drums are positioned under the glovebox directly under the openings in the floor of the glovebox. A "bag-out" bag extends from the glovebox into each drum between the drum and the drum liner. This liner is fastened at the bottom of the glovebox with an elastic cord and clamped into place to prevent hazardous and/or radiological constituents from escaping the confinements of the glovebox and the drums during treatment operations. The cement and the waste to be solidified are transferred into the drums and the impellers lowered into the mix. The waste and cement are then homogeneously mixed inside the drums. Each drum is positioned on a steel platform/scale that is secured in a steel track. The platform allows the drums to be safely and easily removed from the unit after the cement has dried.

The piping associated with the cementation unit includes a pipe that enters glovebox GB-454 from the storage tank systems and extends to the pH column; the pH column vent line; the

compressed air line entering the glovebox and extending to the vacuum trap and the pH column; the wet-vacuum line extending from the vacuum trap; the sodium hydroxide line entering the glovebox and extending to the pH column and drum openings; and the transfer port exiting the pH column. All of the aforementioned piping is 316 stainless steel. Tygon® tubing is used to transfer the contents of the pH column from the transfer port to the drums. Replacement tubing will be of same or similar material. The cement is transferred into the glovebox and drums from a hopper/screw feeder through rubber tubing. Figures 4-20 and 4-21 illustrate the process flow and configuration for the piping system associated with the cementation unit.

4.5.2 Secondary Containment

Secondary containment for the cementation unit is provided by TA-55-4-401. The room's dimensions and containment features have been previously described in Section 4.3.3 for the storage tank systems.

4.6 WASTE MANAGEMENT PRACTICES APPLICABLE TO THE CEMENTATION UNIT

The following sections provide a general overview of the operations and process information that are applicable to the cementation unit addressed in this permit application. This overview includes a discussion of the characteristics of the waste treated (including hazardous characteristics and precautions taken when handling incompatible, ignitable, or reactive wastes); and operational controls and treatment effectiveness. This information is submitted to fulfill the requirements of 20 NMAC 4.1, Subpart V, Part 264, Subpart B, revised November 1, 1995.

4.6.1 Hazardous Characteristics of the Waste to be Treated [20 NMAC 4.1, Subpart V, 264.17(a)]

The materials treated in the cementation unit include the waste stored in the evaporator glovebox storage tank system and cementation unit storage tank system, used salts from pyrochemical processes, and inorganic and organic process solids. Table 4-6 provides information on wastes treated in the cementation unit.

Currently, no ignitable or reactive mixed wastes are treated in the cementation unit. Pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.198, revised November 1, 1995, in the event that ignitable or reactive waste may be treated in the unit, the waste will be treated and stored

in such a way that it is protected from any material or condition that may cause the waste to ignite or react.

It is not anticipated that incompatible wastes will be treated in the cementation unit or that a mixed waste will be treated in a vessel that previously held incompatible wastes. All wastes to be cemented are certified by TA-55 waste management personnel prior to treatment. Additionally, the cementation treatment process itself is administratively controlled to prevent commingling of incompatible wastes. However, in the unlikely event that incompatible wastes may be treated, precautions will be taken in accordance with the requirements of 20 NMAC 4.1, Subpart V, 264.17(b), revised November 1, 1995.

4.6.2 Treatment Effectiveness [20 NMAC 4.1, Subpart IX, 270.23(d)]

The cementation unit is subject to the TRU Waste Characterization Quality Assurance Program Plan (QAPP) (DOE, 1995b) and the WIPP Waste Acceptance Criteria (WAC) (DOE, 1991). Waste characterization procedures outlined in these documents are based on knowledge of raw materials and physical/chemical processes of waste generating activities and analytical results. The waste characterization and certification ensures that the waste is examined and the hazardous nature of the waste is identified in accordance with 20 NMAC 4.1, Subpart II, Part 261, Subparts C and D, revised November 1, 1995.

The treatment process itself is administratively controlled. Certification, packaging, storage, and transportation of TRU mixed waste from this operation are carried out in accordance with LANL's Chemical Science and Technology Division WAC, WIPP-WAC, 20 NMAC 4.1 regulations, and Department of Transportation requirements.

A report on the demonstration of treatment effectiveness of the cementation unit is provided as Attachment 4-6 to meet the requirements of 20 NMAC 4.1, Subpart IX, 270.23(d), revised November 1, 1995.

4.6.3 Environmental Performance Standards [20 NMAC 4.1, Subpart V, Part 264, Subpart X]

The cementation unit at TA-55-4 is located and will be operated, maintained, and closed in a manner that will ensure protection of human health and the environment, in accordance with 20 NMAC 4.1, Subpart V, 264.601, revised November 1, 1995. The unit is located in glovebox

GB-454 in TA-55-4-401 within the boundaries of LANL. Section 2.0 of this permit application discusses geologic and hydrologic characteristics of the LANL facility. The cementation unit has been designed to facilitate safe handling and treatment of wastes in order to prevent adverse human health and environmental impacts. Sections 4.5 and 4.6 discuss the design and waste management practices for this unit in detail. Section 3.0 of this permit application includes the waste analysis plan for this unit. The contingency plan (Section 7.0) of this permit application describes emergency response actions taken to minimize adverse impacts of unanticipated events.

4.6.3.1 Protection of the Ground Water [20 NMAC 4.1, Subpart V, 264.601(a)]

Adverse effects on human health or the environment due to migration of waste or hazardous constituents to the ground water as a result of the treatment operations conducted in the cementation unit are unlikely. The unit is located in a vacuum-pressurized glovebox within a room and inside a building. TA-55-4-401 provides secondary containment for the unit. The floor of the room is recessed 2.5 in. The room itself is approximately 60 ft long by 75 ft wide. The capacity of the containment area is greater than 100 percent of the volume of waste that may be treated in the unit at any one time. Because the unit is inside a building, run-on of precipitation will not affect the containment capacity. The entire floor is constructed of 10-in.-thick concrete and is coated with a chemical- and temperature-resistant primer and epoxy paint. This coating is compatible with the waste treated in the cementation unit and will effectively prevent the migration of waste into the concrete. Additionally, operating procedures followed at TA-55 and the waste management practices discussed herein will further ensure protection of the environment.

Certified operators inspect the unit each working day to detect leaks. Eight CAM units installed at various locations throughout TA-55-4-401 will detect any airborne alpha contamination that would be present if a leak were to occur resulting in a release outside of glovebox GB-454. In the event of a release, the materials in question will be removed as quickly as possible and will be packaged in an appropriate container. The contents of these containers will be analyzed and managed according to NMT and regulatory requirements.

Hydrogeologic Assessment and Potential Pathways and Exposure Routes

TA-55 is located in a semiarid, temperate, mountain climate. The annual precipitation in the Los Alamos area varies between 33 and 46 centimeters. The evaporation of free-standing water

exceeds the annual precipitation. Section 2.2.3 of this permit application provides site-specific information for the soils at TA-55, including permeability rates and available water-holding capacity. In addition, it is estimated that 875 to 1,100 ft of unsaturated tuff and volcanic rock separate the facility's soil surface from the main aquifer (refer to Figure 2-11). Collectively, the depth to the main aquifer and the annual moisture deficit significantly limit the potential for contaminants to migrate to the ground water in the unlikely event that contaminants reach the ground surface surrounding TA-55-4.

The only aquifer in Los Alamos capable of municipal and industrial water supply is the main aquifer. Figure 2-13 presents water supply wells in the Los Alamos area. No wells are located at TA-55.

LANL has established an extensive ground-water monitoring system to assess and protect the quality of the ground water in the Los Alamos area. The monitoring network includes test wells, supply wells, gauging stations, observation wells, and other hydrogeologic devices located both within and beyond LANL boundaries. Routine samples are analyzed for toxic constituents, basic water quality, and resource depletion. The results are published annually in the "Environmental Surveillance Report" and the "Water Supply Report." Details on the Environmental Surveillance Groundwater Monitoring Plan can be found in the "Groundwater Protection Management Program Plan" (LANL, 1995c).

4.6.3.2 Protection of Surface Water [20 NMAC 4.1, Subpart V, 264.601(b)]

The location of the cementation unit and the waste management practices and containment features discussed in Section 4.6.3.1 will effectively prevent environmental contamination, including migration of waste or hazardous constituents to surface water or wetlands. Therefore, adverse effects on human health or the environment due to migration of waste or hazardous constituents to surface water or wetlands as a result of the treatment operations conducted in the cementation unit are unlikely.

Hydrologic Assessment and Potential Pathways and Exposure Routes

The annual precipitation that occurs at or near TA-55 is low. Drainage from the site flows into Mortandad Canyon and/or Two Mile Canyon. The streamflow in both of these canyons is primarily ephemeral resulting from rainfall or snowmelt. These waters may, at times, also contain

National Pollutant Discharge Elimination System-permitted waste water discharge. Map 3 of Revision 1.0 of the TA-55 Part A Permit Application shows the locations of these surface waters.

4.6.3.3 Protection of Soil Surface [20 NMAC 4.1, Subpart V, 264.601(b)]

The location of the cementation unit and the waste management practices and containment features discussed in Section 4.6.3.1 will effectively prevent the migration of waste or hazardous constituents to the soil surface. Therefore, adverse affects on human health or the environment due to migration of waste or hazardous constituents to the soil surface as a result of the treatment operations conducted in the cementation unit are unlikely.

Geological Assessment and Potential Pathways and Exposure Routes

The texture of the soils in Los Alamos County ranges from very fine clay and sandy loams to gravelly, sandy loams and stony, clay loams. In the unlikely event that a release penetrates the confinements of TA-55-4 and reaches the soil surface, soil erosion by storm water or winds could potentially transport these contaminants to the surrounding area.

4.6.3.4 Protection of the Atmosphere [20 NMAC 4.1, Subpart V, 264.601(c)]

The location of the cementation unit and the waste management practices and containment features discussed in Section 4.6.3.1 will effectively prevent the migration of waste or hazardous constituents to the atmosphere. Additionally, the cementation unit is operated within a vacuum-pressurized glovebox equipped with HEPA filters. In total, the cementation unit is located within three succeedingly greater pressure zones. These zones are (in order of increasing pressure) the glovebox, TA-55-4-401, and the main corridor outside of TA-55-4-401. Therefore, adverse affects on human health or the environment due to migration of waste or hazardous constituents to the atmosphere as a result of the treatment operations conducted in the cementation unit are unlikely.

Meteorologic Assessment and Potential Pathways and Exposure Routes

The surface winds in Los Alamos are light, averaging 7 miles per hour. Section 2.1.4 of this permit application provides detailed information on winds in Los Alamos. Under normal conditions, resuspension of particulates is limited. The predominant prevailing wind direction is from the southwest to the northeast. Figures 2-4 and 2-5 of this permit application depict wind roses for the Los Alamos area.

4.7 RECORDKEEPING REQUIREMENTS [20 NMAC 4.1, Subpart V, Part 264, Subpart E]

Recordkeeping requirements applicable to all of the units addressed herein are discussed in the following sections.

4.7.1 Operating Record [20 NMAC 4.1, Subpart V, 264.73 and 264.74]

A written operating record will be maintained at the facility until closure. The operating record will contain the following information, as it becomes available:

- A description (including waste sources) and the quantity of each hazardous (including mixed) waste and the method(s) and date(s) of storage at TA-55 as required by Appendix I of 20 NMAC 4.1, Subpart V, 264, revised November 1, 1995
- The location of each hazardous waste within the facility, the quantity at each location, and the final disposition of each waste
- Records of acceptable knowledge or process knowledge information and available waste analysis results on the hazardous constituents of the wastes to be stored
- Summary reports and details of all incidents that require implementation of the contingency plan, as specified in 20 NMAC 4.1, Subpart V, 264.56(j), revised November 1, 1995
- Records and results of inspections, to be kept for at least three years, as required by 20 NMAC 4.1, Subpart V, 264.15(d) and 264.174, revised November 1, 1995
- Monitoring, testing, or analytical data, where required by 20 NMAC 4.1, Subpart V, Part 264, revised November 1, 1995, and corrective action, where required by 20 NMAC 4.1, Subpart V, 264.101, revised November 1, 1995
- Records of the quantities (and dates of placement) for each shipment of hazardous waste placed in land disposal units under an extension to the effective date of any land disposal restriction granted pursuant to 20 NMAC 4.1, Subpart VIII, 268.5, revised November 1, 1995; a petition pursuant to 20 NMAC 4.1, Subpart VIII, 268.6, revised November 1, 1995; or a certification under 20 NMAC 4.1, Subpart VIII, 268.8, revised November 1, 1995; and the applicable notice required by a generator under 20 NMAC 4.1, Subpart VIII, 268.7(a), revised November 1, 1995
- The information contained in the notice (except the manifest number) and the certification and demonstration, if applicable, required by the generator or the owner or operator under 20 NMAC 4.1, Subpart VIII, 268.7, revised November 1, 1995, or 20 NMAC 4.1, Subpart VIII, 268.8, revised November 1, 1995.

TA-55 has a dedicated representative in waste management from LANL's Environment, Safety, and Health Division Quality Assurance Support Group (ESH-14) for quality assurance control/review of process controls and procedures.

Information will be provided for inclusion in LANL's annual facilitywide report, required by 20 NMAC 4.1, Subpart V, 264.73(b)(9), revised November 1, 1995, on the waste minimization program. This information will include documentation that the proposed method of storage or treatment is the practicable method currently available to minimize threats to human health and the environment. All records, including plans, required under 20 NMAC 4.1, Subpart V, Part 264, Subpart E, revised November 1, 1995, will be furnished upon request and will be made available at all reasonable times for inspection by duly designated representatives of the DOE, the New Mexico Environment Department (NMED), and/or the EPA. To satisfy the requirements of 20 NMAC 4.1, Subpart V, 264.74(c), revised November 1, 1995, a copy of records of waste disposal locations and quantities, as required by 20 NMAC 4.1, Subpart V, 264.73(b)(2), revised November 1, 1995, will be submitted to NMED and the local land authority upon closure of the facility. Any shipments to off-site facilities will comply with the appropriate requirements of 20 NMAC 4.1, Subpart III, Part 262, revised November 1, 1995; 20 NMAC 4.1, Subpart V, Part 264, revised November 1, 1995; and 20 NMAC 4.1, Subpart VIII, Part 268, revised November 1, 1995.

4.7.2 Biennial Report [20 NMAC 4.1, Subpart V, 264.75]

The DOE Los Alamos Area Office (LAAO) and LANL will prepare and submit a biennial report to the NMED by March 1 of each even-numbered year. The biennial report will be submitted to the NMED on EPA Form 8700-13B. The report will cover facility activities during the previous calendar year and will include:

- The EPA identification number, name, and address of the facility
- The calendar years covered by the report
- A description and the quantity of each hazardous (including mixed) waste the facility received during the year
- The method of treatment, storage, or disposal for each hazardous waste

- For generators who treat, store, or dispose of hazardous waste on-site, a description of the efforts undertaken during the year to reduce the volume and toxicity of waste generated

- For generators who treat, store, or dispose of hazardous waste on-site, a description of the changes in volume and toxicity of waste actually achieved during the year in comparison to previous years to the extent such information is available for the years prior to 1984

- The certification signed by DOE/LAAO or an authorized representative.

4.7.3 Additional Reports [20 NMAC 4.1, Subpart V, 264.77]

In accordance with the requirements of 20 NMAC 4.1, Subpart V, 264.77, revised November 1, 1995, DOE/LAAO will also report the following to the NMED:

- Releases, fires, and explosions as specified in 20 NMAC 4.1, Subpart V, 264.56(j), revised November 1, 1995

- Facility closures specified in 20 NMAC 4.1, Subpart V, 264.115, revised November 1, 1995

- As otherwise required by 20 NMAC 4.1, Subpart V, Part 264, Subparts F, BB, and CC, revised November 1, 1995.

Table 4-1

Transuranic Mixed Waste Stored at Technical Area 55

Waste Description	TRUPACT-II Content (TRUCON) Codes	Waste-Generating Process Description	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[b] (milligrams per liter)
Solidified inorganic process solids and liquids[c]	LA 114	Inorganic process solids and liquids that may include process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines, generated as a result of plutonium (Pu) processing operations that are solidified in cement.	D007	Chromium	5.0
Combustible waste	LA 116	Combustible solids (e.g., paper, rags, plastic, rubber) and a small fraction of noncombustibles (e.g., metal scrap) generated from Pu processing activities.	D004 D005 D006 D007 D008 D009 D010 D011 F001 F002 F003 F005	Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver Spent halogenated solvents	5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0 NA[d]
Noncombustible metal waste	LA 117	Noncombustible metal waste (e.g., motors, pumps, tools, process equipment) and glass with a small fraction of combustible waste (e.g., plastics) generated from Pu processing activities.	D005 D006 D008 D009 D011	Barium Cadmium Lead Mercury Silver	100.0 1.0 5.0 0.2 5.0
Glass waste	LA 118	Glass waste (e.g., discarded laboratory glassware, windows, bottles), and metal with a small fraction of combustibles (e.g., plastics) generated from Pu processing activities.	D008 D009	Lead Mercury	5.0 0.2
Leaded glove waste	LA 123	Leaded gloves discarded with a small fraction of noncombustible waste (e.g., motors, tools) generated from Pu processing activities.	D008	Lead	5.0
Mixed combustible/ noncombustible waste	LA 125	Mixtures of combustible and noncombustible waste including paper, rags, plastic, rubber, leaded glovebox gloves, glass, motors, pumps, tools, and miscellaneous metal waste.	D004 D005 D006 D007 D008 D009 D010 D011 F002	Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver Spent halogenated solvents	5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0 NA

Refer to footnotes at end of table.

Table 4-1 (Continued)

Transuranic Mixed Waste Stored at Technical Area 55

Waste Description	TRUPACT-II Content (TRUCON) Codes	Waste-Generating Process Description	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[b] (milligrams per liter)
Solidified organic process solids and liquids[c]	LA 126	Solidified process solids and liquids which, together with plastic packaging, result in >5% and normally ≤10% organics. These process solids may include process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines, generated as a result of Pu processing operations that are solidified in cement.	D007	Chromium	5.0

[a] U.S. Environmental Protection Agency.
[b] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, Part 261, Subpart D, revised November 1, 1995.
[c] At TA-55, these wastes may potentially contain liquids.
[d] Not applicable: Refers to the absence of regulatory limits for F-listed wastes.

Table 4-2

Low-Level Solid Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Homogeneous Wastes				
Unused solid reagent chemicals	Discarded off-specification unused reagent powders and crystalline materials.	D001 D002 D003 D004 D005 D006 D007 D008 D009 D011 All P- or U-listed waste codes	Ignitability Corrosivity Reactivity Arsenic Barium Cadmium Chromium Lead Mercury Silver	NA[c] NA NA 5.0 100.0 1.0 5.0 5.0 0.2 5.0 NA
Heterogeneous Wastes				
Contaminated bulk lead shielding and scrap	Radiation shielding in laser applications and materials from demolition and decommissioning of research laboratories containing metal fittings, piping, and tools with Uranium-238 contamination and/or heavy metal materials.	D006 D007 D008	Cadmium Chromium Lead	1.0 5.0 5.0
Discarded bricks	Lead bricks from radiation shielding and debris from decontamination and decommissioning projects.	D006 D008	Cadmium Lead	1.0 5.0

Refer to footnotes at end of table.

Table 4-2 (Continued)

Low-Level Solid Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Organic-contaminated noncombustible solids	Absorbed oils, laboratory debris, and discarded equipment.	D004	Arsenic	5.0
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
		D027	1,4-Dichlorobenzene	7.5
		D030	2,4-Dinitrotoluene	0.13
		D032	Hexachlorobenzene	0.13
		D033	Hexachlorobutadiene	0.5
		D034	Hexachloroethane	3.0
		D042	2,4,6-Trichlorophenol	2.0
		F001	1,1,1-Trichloroethane, Trichloroethylene	NA
		F002	Cholobenzene, Methylene chloride, Trichloroethylene, Tetrachloroethylene	NA
		F004	Cresol, Nitrobenzene	NA
		F005	Toluene, Methyl ethyl ketone, Benzene	NA
Mercury waste	Free elemental mercury, mercuric compounds, gels containing mercuric compounds, old thermometers, hygrometers, vacuum tubes, fluorescent light bulbs, and other instruments and equipment containing unrecoverable mercury.	D009	Mercury	0.2
		U151	Mercury	NA
Batteries	Discarded battery cores (with potential residual liquid), including lead-acid, rechargeable nickel-cadmium, and mercury.	D001	Ignitability	NA
		D002	Corrosivity	NA
		D003	Reactivity	NA
		D004	Arsenic	5.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2

Refer to footnotes at end of table.

Table 4-2 (Continued)

Low-Level Solid Mixed Waste Stored at Technical Area 55

[a] U.S. Environmental Protection Agency.
[b] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261, Subpart D, revised November 1, 1995.
[c] Not applicable: Refers to the absence of regulatory limits for ignitable, corrosive, and reactive characteristic wastes and F-, P-, and U-listed wastes.

Table 4-3

Solid Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Contaminated solid wastes	Machining operations, chemistry research, decontamination and decommissioning projects, metal finishing operations, and general maintenance operations.	D001	Ignitability	NA[d]
		D003	Reactivity	NA
		D004	Arsenic	5.0
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
		D018	Benzene	0.5
		D022	Chloroform	6.0
		D030	2,4-Dinitrotoluene	0.13
		D032	Hexachlorobenzene	0.13
		D033	Hexachlorobutadiene	0.5
		D034	Hexachloroethane	3.0
		D036	Nitrobenzene	2.0
		D039	Tetrachloroethylene	0.7
		D040	Trichloroethylene	0.5
		D042	2,4,6-Trichlorophenol	2.0
		F001	1,1,1-Trichloroethane, Carbon tetrachloride	NA
		F002	1,1,1-Trichloroethane	NA
		F003	Acetone, Methanol	NA
		F005	Toluene, Benzene	NA
Paint and paint-related wastes	Painting and finishing operations, and general facility maintenance.	D001	Ignitability	NA
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D011	Silver	5.0
		F003	Xylene	NA
		F005	Toluene	NA

Refer to footnotes at end of table.

Table 4-3 (Continued)

Solid Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Solid metals and metallic compounds	Machining and cutting operations; synthesis reactions; solder from electronic manufacturing, repair, and brazing operations; and grinding operations.	D001 D003 D004 D005 D006 D007 D008 D009 D010 D011	Ignitability Reactivity Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	NA NA 5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0
Mercury wastes	Lamp replacement, laboratory operations, mercury spill clean-up, and equipment cleaning and maintenance.	D009 U151	Mercury Mercury	0.2 NA
Used batteries	Equipment maintenance.	D002 D006 D007 D008 D009 D011	Corrosivity Cadmium Chromium Lead Mercury Silver	NA 1.0 5.0 5.0 0.2 5.0
Unused/off-specification commercial chemical products	Laboratory research and spill residues.	D001 D003 D004 through D043 All P- and U-listed waste codes	Ignitability Reactivity Toxicity characteristic leaching procedure wastes Discarded commercial chemical products and off-specification species	NA NA –[c] NA

[a] Denotes information from the Los Alamos National Laboratory Chemical Science and Technology Division Waste Profile Form database.
[b] U.S. Environmental Protection Agency.
[c] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed (D004-D043) at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, Part 261, Subpart D, revised November 1, 1995.
[d] Not applicable: Refers to the absence of regulatory limits for ignitable, corrosive, and reactive characteristic waste and F-, P-, and U-listed wastes.

Table 4-4

Low-Level Liquid Mixed Waste Stored At Technical Area 55

Waste Description	Waste-Generating Process Description	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Spent solvents and contaminated solvent mixtures	Extraction operations, bench-scale experimental inorganic chemistry, environmental analysis, and radiochemistry.	D001	Ignitability	NA[c]
		D002	Corrosivity	NA
		D004	Arsenic	5.0
		D005	Barium	100.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
		D018	Benzene	0.5
		D019	Carbon tetrachloride	0.5
		D021	Chlorobenzene	100.0
		D022	Chloroform	6.0
		D027	1,4-Dichlorobenzene	7.5
		D028	1,2-Dichloroethane	0.5
		D030	2,4-Dinitrotoluene	0.13
		D032	Hexachlorobenzene	0.13
		D033	Hexachlorobutadiene	0.5
		D034	Hexachloroethane	3.0
		D036	Nitrobenzene	2.0
		D042	2,4,6-Trichlorophenol	2.0
		D043	Vinyl chloride	0.2
		F001	Tetrachloroethylene, Trichloroethylene, Methylene chloride, 1,1,1-Trichloroethane, Carbon tetrachloride, Chlorinated fluorocarbons	NA
		F002	Tetrachloroethylene, Trichloroethylene, 1,1,1-Trichloroethane, 1,1,2-Trichloro-1,2,2-trifluoroethane	NA
		F003	Xylene, Acetone, Ethyl acetate, Ethyl ether, Methyl isobutyl ketone, n-Butyl alcohol, Methanol	NA
		F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene	NA
Corrosive liquid wastes	Radiochemistry research, plutonium-processing operations, and analytical chemistry.	D001	Ignitability	NA
		D002	Corrosivity	NA
		D007	Chromium	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
		D036	Nitrobenzene	2.0

Refer to footnotes at end of table.

Table 4-4 (Continued)

Low-Level Liquid Mixed Waste Stored at Technical Area 55

Waste Description	Waste-Generating Process Description	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Nonaqueous, noncorrosive liquids contaminated with heavy metals	Metal polishing operations, and radiochemistry research.	D001	Ignitability	NA
		D004	Arsenic	5.0
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
Oil wastes	Equipment maintenance operations.	D004	Arsenic	5.0
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D028	1,2-Dichloroethane	0.5
		F001	Tetrachloroethylene, Trichloroethylene, Methylene chloride, 1,1,1-Trichloroethane, Carbon tetrachloride, Chlorinated fluorocarbons,	NA
		F002	Tetrachloroethylene, Trichloroethylene, 1,1,1-Trichloroethane, 1,1,2-Trichloro-1,2,2-trifluoroethane	NA
		F003	Xylene, Acetone, Ethyl acetate, Ethyl ether, Methyl isobutyl ketone, n-Butyl alcohol, Methanol	NA
		F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene	NA
Unused liquid reagent chemicals	Discarded off-specification unused liquid reagent chemicals.	D001	Ignitability	NA
		D002	Corrosivity	NA
		All P- and U-listed waste codes	Discarded commercial chemical products and off-specification species	NA
Photographic processing and photocopier wastes	Photographic film processing and photocopying operations.	D001	Ignitability	NA
		D002	Corrosivity	NA
		D007	Chromium	5.0
		D008	Lead	5.0
		D011	Silver	5.0

Refer to footnotes at end of table.

Table 4-4 (Continued)

Low-Level Liquid Mixed Waste Stored at Technical Area 55

[a] U.S. Environmental Protection Agency.
[b] A waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed (D004–D043) at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261, Subpart D, revised November 1, 1995.
[c] Not applicable: Refers to the absence of regulatory limits for ignitable and corrosive characteristic wastes and F-, P-, and U-listed wastes.

Table 4-5

Liquid Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Spent solvents and contaminated solvent mixtures	Research and development activities; laser research; organic and inorganic chemistry research (e.g., solvent extractions, liquid chromatography solvents, polymer synthesis, and distillations); cleaning; and degreasing operations.	D001	Ignitability	NA[d]
		D002	Corrosivity	NA
		D003	Reactivity	NA
		D004	Arsenic	5.0
		D005	Barium	100.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
		D018	Benzene	0.5
		D019	Carbon tetrachloride	0.5
		D021	Chlorobenzene	100.0
		D022	Chloroform	6.0
		D028	1,2-Dichloroethane	0.5
		D030	2,4-Dinitrotoluene	0.13
		D032	Hexachlorobenzene	0.13
		D035	Methyl ethyl ketone	200.0
		D036	Nitrobenzene	2.0
		D038	Pyridine	5.0
		D040	Trichloroethylene	0.5
		D043	Vinyl chloride	0.2
		F001	Tetrachloroethylene, Trichloroethylene, Methylene chloride, 1,1,1-Trichloroethane, Carbon tetrachloride, Chlorofluorocarbons	NA
		F002	Tetrachloroethylene, Trichloroethylene, 1,1,1-Trichloroethane, 1,1,2-Trichloro-1,2,2-trifluoroethane	NA
		F003	Xylene, Acetone, Ethyl acetate, Ethyl ether, Methanol, Methyl isobutyl ketone, n-Butyl alcohol	NA
		F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene	NA

Refer to footnotes at end of table.

Table 4-5 (Continued)

Liquid Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Paint and paint-related wastes	Painting and finishing operations, and general facility maintenance.	D001	Ignitability	NA
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D011	Silver	5.0
		F003	Xylene	NA
		F005	Toluene	NA
Photographic processing and photocopier wastes	Photographic film processing and photocopying operations.	D001	Ignitability	NA
		D002	Corrosivity	NA
		D007	Chromium	5.0
		D008	Lead	5.0
		D011	Silver	5.0
Corrosive liquid wastes	Analytical research and operations, electroetching, and electropolishing.	D001	Ignitability	NA
		D002	Corrosivity	NA
		D004	Arsenic	5.0
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
		D038	Pyridine	5.0
		F002	Tetrachloroethylene, Methylene chloride, Trichloroethylene, 1,1,1-Trichloroethane, Chlorobenzene, 1,1,2-Trichloro-1,2,2-trifluoroethane, Ortho-dichlorobenzene, Trichlorofluoromethane, 1,1,2-Trichloroethane	NA
		F003	Methanol	NA
		F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene, 2-Ethoxyethanol, 2-Nitropropane	NA

Refer to footnotes at end of table.

Table 4-5 (Continued)

Liquid Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Contaminated noncorrosive, aqueous and nonaqueous solutions and sludges, including oils	Vacuum pump maintenance, spectrometric operations, equipment cleaning and maintenance, synthesis reactions, analytical operations, metal polishing operations, and vehicle maintenance.	D001	Ignitability	NA
		D003	Reactivity	NA
		D004	Arsenic	5.0
		D005	Barium	100.0
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D010	Selenium	1.0
		D011	Silver	5.0
		D018	Benzene	0.5
		D038	Pyridine	5.0
		D040	Trichloroethylene	0.5
		F002	Tetrachloroethylene, Methylene chloride, Trichloroethylene, 1,1,1-Trichloroethane, Chlorobenzene, 1,1,2-Trichloro-1,2,2-trifluoroethane, Ortho-dichlorobenzene, Trichlorofluoromethane, 1,1,2-Trichloroethane	NA
		F003	Xylene, Acetone, Ethyl acetate, Ethyl benzene, Ethyl ether, Methanol, Methyl isobutyl ketone, n-Butyl alcohol, Cyclohexanone	NA
		F005	Toluene, Methyl ethyl ketone, Carbon disulfide, Isobutanol, Pyridine, Benzene, 2-Ethoxyethanol, 2-Nitropropane	NA
Battery fluids	Equipment maintenance.	D002	Corrosivity	NA
		D006	Cadmium	1.0
		D007	Chromium	5.0
		D008	Lead	5.0
		D009	Mercury	0.2
		D011	Silver	5.0

Refer to footnotes at end of table.

Table 4-5 (Continued)

Liquid Hazardous Waste Stored at Technical Area 55

Waste Description[a]	Waste-Generating Process Description[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[c] (milligrams per liter)
Unused/off-specification commercial chemical products	Laboratory research and spills residues.	D001 D002 D003 D004 through D043 All P- and U-listed waste codes	Ignitability Corrosivity Reactivity Toxicity characteristic leaching procedure wastes Discarded commercial chemical products and off-specification species	NA NA NA –[c] NA

[a] Denotes information from the Los Alamos National Laboratory Chemical Science and Technology Division Waste Profile Form database.
[b] U.S. Environmental Protection Agency.
[c] A waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed (D004-D043) at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, Part 261, Subpart D, revised November 1, 1995.
[d] Not applicable: Refers to the absence of regulatory limits for ignitable, corrosive, and reactive characteristic waste, and F-, P-, and U-listed wastes.

Table 4-6

Transuranic Mixed Waste Characterized for Treatment in the Cementation Unit at Technical Area 55

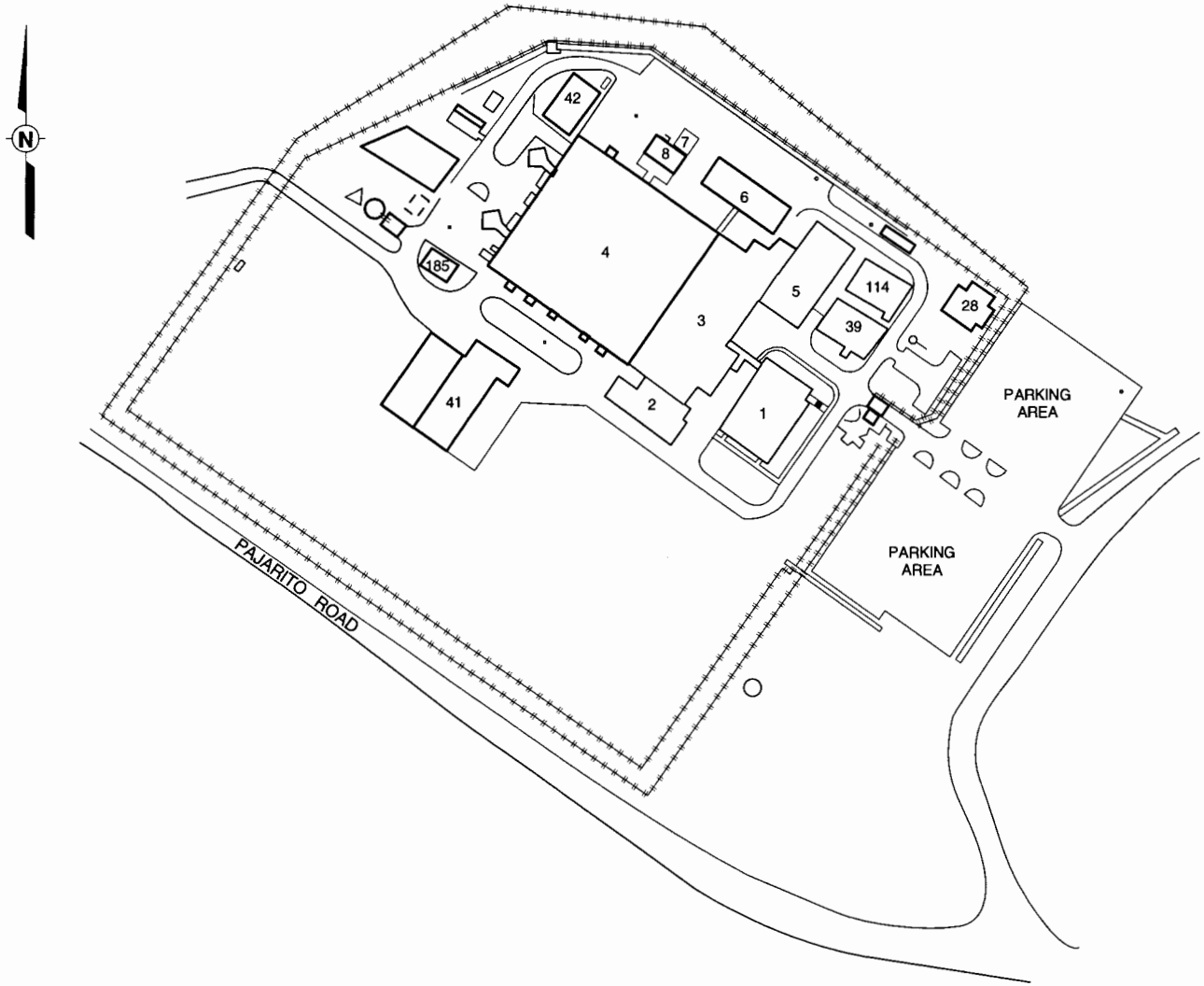
Waste Description	TRUPACT-II Content (TRUCON) Codes	Waste-Generating Process Description	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[b] (milligrams per liter)
Solidified inorganic process solids and liquids[c]	LA 114	Inorganic process solids and liquids that may include process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines, generated as a result of plutonium (Pu) processing operations that are solidified in cement.	D007	Chromium	5.0
Solidified organic process solids and liquids[c]	LA 126	Solidified process solids and liquids which, together with plastic packaging, result in >5% and normally ≤10% organics. These process solids may include process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, metal oxides, and fines, generated as a result of Pu processing operations that are solidified in cement.	D007	Chromium	5.0

[a] U.S. Environmental Protection Agency.
[b] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261, Subpart D, revised November 1, 1995.
[c] At TA-55, these wastes may potentially contain liquids.

Figures 4-1 through 4-21 have been provided confidentially under separate cover.

ATTACHMENT 4-1

Index to Selected Buildings/Structures at Technical Area 55



Structure #	Description
1	Administration Building
2	Support Office Building
3	Support Building
4	Plutonium Building
5	Warehouse
6	Utility Building
7	Calcium Building
8	Generator Building
28	Nuclear Materials Building
39	Educational Support Center
41	Nuclear Materials Storage
42	Process Support Building
114	Office Building
185	Drum Storage Building

Index to Selected Buildings/Structures at Technical Area 55

ATTACHMENT 4-2

Registered Professional Engineer Written Assessment/Certification for the Evaporator Glovebox Storage Tank System

REGISTERED PROFESSIONAL ENGINEER
WRITTEN ASSESSMENT/CERTIFICATION

EVAPORATOR GLOVEBOX STORAGE TANK SYSTEM
TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

The evaporator glovebox storage tank system (i.e., glovebox GB-438 and ancillary equipment) located at Los Alamos National Laboratory (LANL), Technical Area 55, Building 4, Room 401 (TA-55-4-401) is considered an existing tank system in accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart VI, 265.191. The system was constructed in 1986 and installed at its present location in TA-55-4-401 in 1988 [20 NMAC 4.1, Subpart VI, 265.191(b)(4)]. The evaporator glovebox storage tank system has secondary containment that meets the requirements of 20 NMAC 4.1, Subpart VI, 265.193; therefore, the requirement that the owner or operator of the tank system determine that the tank system is not leaking or is unfit for use is not applicable. In addition, the requirement that the owner or operator obtain and keep on file a written assessment, reviewed and certified by an independent, qualified, registered professional engineer, attesting to the tank system's integrity is also not applicable [20 NMAC 4.1, Subpart VI, 265.191(a)]. However, for the purpose of demonstrating that the evaporator glovebox storage tank system will function as a completely leak-proof system and would meet the assessment requirements if they were applicable, the following written assessment has been prepared in accordance with 20 NMAC 4.1, Subpart VI, 265.191(b), attesting that the tank system is adequately designed and has sufficient structural integrity and compatibility with the waste stored to ensure that it will not collapse, rupture, or fail.

The evaporator glovebox storage tank is fabricated from 3/16-inch, 316 stainless steel with a 2B finish conforming to the American Society for Testing and Materials (ASTM) A240. The lower half of the tank is fabricated with additional layers of materials welded to the outside of the 3/16-inch-thick stainless steel enclosure. These materials consist of 1/4-inch-thick lead shielding, conforming to ASTM B29, and an outer layer of 1/16-inch, 316 stainless steel cladding. The tank system is of welded construction with all welds blended, ground, and polished to blend with adjacent material. Welding procedure qualifications and welder's performance qualifications conform to the requirements of either the American Welding Society B3.0-41 or the American Society of Mechanical Engineers (ASME) Section IX for welding and brazing qualifications. Questionable welds, if any, are liquid penetrant inspected according to ASME Section VIII [20 NMAC 4.1, Subpart VI, 265.191(b)(1)]. All joints are vacuum tight.

The support frame and legs of the evaporator glovebox storage tank are constructed of carbon steel and conform to ASTM A36. The support frame is bolted to the base of the tank for stabilization. In addition, the legs of the tank are bolted to the support frame and secured to the

10-inch-thick concrete floor with anchor bolts. The 10-inch-thick concrete floor was constructed to conform to the building code requirements of the American Concrete Institute (ACI) 318-71 for reinforced concrete. The reinforcing steel was detailed and fabricated in accordance with the "Manual of Standard Practice for Detailing Reinforced Concrete Structures," ACI 315. The design construction and tolerance of the framework around the concrete is in accordance with ACI 347.

The window components of the evaporator glovebox storage tank are constructed of 1/4-inch leaded glass, laminated on both sides with 1/8-inch clear glass, and installed with a neoprene gasket. Additionally, each window is backed with 1/4-inch safety glass installed with a neoprene gasket/seal that provides air-tight containment. The dual glass configuration is secured to the tank with a welded frame consisting of a 1/4-inch-thick lead shielding and a 1/16-inch, 316 stainless steel cladding similar to the additional layers of materials welded to the outside of the lower half of the tank. The welded window frames are bolted to the tank system.

The glove components of the evaporator glovebox storage tank are constructed of neoprene and Hypalon. Each glove is tested for material continuity by the manufacturer before acceptance and installation within the evaporator glovebox storage tank. Each glove is selected for its resistance to nitric acid as well as its lead equivalent shielding power to gamma radiation.

All of the components within the tank system are corrosion resistant and are compatible with the waste stored in the tank system. No external component of the tank system is in contact with soil or water [20 NMAC 4.1, Subpart VI, 265.191(b)(3)].

The stored waste consists of nitrate-based aqueous mixed waste solutions and waste salts generated from these solutions. The potential hazardous characteristics of the waste include corrosivity and toxicity for cadmium, chromium, and lead (i.e., EPA Hazardous Waste Numbers D002, D006, D007, and D008). Currently, no ignitable, reactive, or incompatible mixed wastes are stored or are anticipated to be stored in this tank system [20 NMAC 4.1, Subpart VI, 265.191(b)(2)].

A helium leak test using a mass spectrometer was performed on the evaporator glovebox storage tank upon fabrication at Silver Engineering and again after the tank was installed and made operational at its present location in TA-55-4-401. During leak testing, in accordance with the standard helium leak testing procedure for gloveboxes, any detectable leak at welds, gasket sealed joints, or any other part of the glovebox is unacceptable. In the event a leak is detected

during initial testing of any glovebox to be utilized at LANL, the glovebox is repaired and retested. Gloveboxes that have been repaired and fail retesting are not accepted for use by LANL. In addition to the initial leak tests performed on the evaporator glovebox storage tank, continuous leak detection is mandatory operating procedure for TA-55-4-401 and thus provides continuous leak detection for the tank system. Eight continuous air monitoring units are installed at various locations throughout TA-55-4-401 to detect any airborne alpha contamination (i.e., the radioactive constituent of the solutions stored in the tank system). Additionally, fixed head air monitors are installed on the outside of the tank system and filter the air as it is pulled through the vacuum vent lines at TA-55-4-401. The filters from these monitors are changed and analyzed weekly for the presence of the radioactive constituent of the stored waste. The above continuous leak detection devices are capable of rapidly detecting leaks in volumes less than 0.03 ounce, far exceeding conventional tank system leak detection devices [20 NMAC 4.1, Subpart VI, 265.191(b)(5)].

(The procedure adhered to during the helium leak test is included in this attachment following the certification. The procedure is referenced from the "Technical Specifications for Glove Boxes, Drop Boxes, Introductory Boxes and Conveyor Tunnels," Specification No. MST-8-S184-R00, Los Alamos National Laboratory, Los Alamos, New Mexico, July 27, 1988. A copy of the checklist documenting operability tests and equipment verification for proper operation of the evaporator glovebox storage tank system is also included in this attachment following the certification.)

REGISTERED PROFESSIONAL ENGINEER
WRITTEN ASSESSMENT/CERTIFICATION
(Continued)

CERTIFICATION · JOHN M. PIETZ, P.E.

I, John M. Pietz, have reviewed the design of the evaporator glovebox storage tank system located at LANL, TA-55-4-401. My duties were to assess the structural integrity of the glovebox storage tank system and its compatibility with the waste stored in this system to ensure that it will not collapse, rupture, or fail.

I certify under penalty of law that this document (i.e., Attachment 4-2 of the TA-55 Part B Permit Application) was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted for this assessment and certification. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

JOHN M. PIETZ
NEW MEXICO
12833
REGISTERED PROFESSIONAL ENGINEER

6/24/96
Date

John M. Pietz, P.E.
Consulting Engineer
IT Corporation
New Mexico Registered Professional Engineer No. 12833
Expires: December 31, 1997

HELIUM LEAK TEST FOR GLOVE BOXES, DROP BOXES, AND TUNNEL SECTIONS

1.0 Equipment

1.1 Leak Detector: Helium Mass Spectrometer Leak Detector, with Sniffer Probe, University Approved.

1.2 Helium: U.S.B.M. Grade A.

1.3 Calibrated Helium Leak: 10^{-7} - 10^{-8} atm cc/sec leak rate.

1.4 Manometer: water filled, open-ended J tube 1/2" i.d. min., max. pressure head 6" water, operating range 4" water.

1.5 Helium pressure regulating valve: 2,000 psi/0-15 psi, with pressure relief valve set at 1–2 psig.

1.6 Helium flowmeter, range 0–15 $ft.^3$/min.

2.0 Procedure

2.1 Seal glove box openings. Method of sealing of glove box openings shall be at the discretion of the seller.

2.2 Attach helium fill tubing with shut off valve, to a port in the glove box on one end, or preferably on upper corner.

2.3 Attach helium vent with shut off valve on opposite side of the box preferably lower corner diagonally opposite fill port.

2.4 Attach manometer to convenient opening and fill with water.

2.5 Calibrate He leak detector to minimum sensitivity with calibrated leak and determine sensitivity (S) as follows:

$$S = \frac{L_s}{\text{Meter Divisions}} \text{ atm - cc/sec/div}$$

L_s = standard He leak rate (atm - cc/sec)

2.6 Attach helium bottle, regulator, and flow meter to helium inlet on glove box.

2.7 Flush He through box at a convenient rate (Q) so that the internal pressure of the box is always less than 6" H_2O, and determine the rate and pressure to be used.

2.8 Calculate the time required for the He flush as follows: Calculate the volume (V $ft.^3$) of the box to $\pm$ 10%. Using the flow rate Q ($ft.^3$/min.) determined above, the flushing time for 90% helium atmosphere will be (assuming completely mixed flow),

$$T_{min.} = 2.3\ V/Q$$

2.9 Close the helium supply valve and close the helium vent valve. Adjust the helium inlet to get 4" water on the manometer.

2.10 Ventilate the room to eliminate helium contamination in the room, then stop ventilation.

2.11 A 1/8-inch leak test probe will be moved along all joined surfaces (welded or gasketed), with probe not more than 1/4" from area to be checked, and moving probe about 2 ft./min.

2.12 Record location and intensity of all leaks: The leak rate (L) will be determined from meter reading (R_L) from a particular leak and the instrument sensitivity (S) as determined in 2.5.

$$L = S\ (R_L - R_B)$$

Note at 5,000' MSL (Mean Sea Level) the above procedure will give a minimum leak detection capability of about 8×10^{-7} atm cc/sec.

Evaporator Project
Operability Tests and Equipment Verification

Checklist for equipment and instrumentation verified as operating properly and calibrated appropriately.

ITEM VERIFIED	DATE	INITIALS
<u>Evaporator Enclosure</u>		
Control loops		
• EV A Steam		
- Foxboro 761 PID controller	10-4-89	[illegible]
- Control valve		
• EV A Level		
- Foxboro 761 PID controller	10-4-89	[illegible]
- Control valve		
• EV B Steam		
- Foxboro 761 PID controller	10/4/89	[illegible]
- Control valve		
• EV B Level		
- Foxboro 761 PID controller	10/4/89	[illegible]
- Control valve		
Pneumatic valves		
• Feed		
- EV A, #6 and #7	10/2/89	[illegible]
- EV B, #18 and #19	10/2/89	[illegible]
• Distillate		
- EV A to hot tanks, #23	10/2/89	[illegible]
- EV A to cold tanks, #21	10/2/89	[illegible]
- EV B to hot tanks, #24	10/2/89	[illegible]
- EV B to cold tanks, #22	10/2/89	[illegible]
Flowmeters (Micromotion)		
- EV A feed	10/3/89	SLY
- EV B feed	10/3/89	SLY
- EV A distillate	10/3/89	SLY
- EV B distillate	10/3/89	SLY
Feed pumps (Wilden diaphragm with air to 25 psig)		
- EV A	10/2/89	[illegible]
- EV B	10/2/89	[illegible]
Magnetic level meters		
- EV A	10/2/89	[illegible]
- EV B	10/2/89	[illegible]

ITEM VERIFIED	DATE	INITIALS
Visual sightglasses		
- EV A	10/2/89	dGd
- EV B	10/2/89	dGd
Density meters (0.9 to 1.5 SpG)		
- EV A	10/4/89	dGd
- EV B	10/4/89	dGd
Feed storage tanks and vent/vac traps leak tested	1/24/89	dGd
Industrial water lines		
- EV A demistor, sightglass, reboiler	10-4-89	[illegible]
- EV B demistor, sightglass, reboiler	10-4-89	[illegible]
Temperature thermohms and gauge readouts		
- EV A bottoms	10/4/89	dGd
- EV A steam	10/4/89	dGd
- EV B bottoms	10/4/89	dGd
- EV B steam	10/4/89	dGd
Backup pneumatic valve control panel	10/2/89	dGd
Steam systems		
• PRV set to 35 psig		
- Saltbox and steam candles	10-4-89	[illegible]
- Evaporators	10-4-89	[illegible]
• SRV set to 50 psig		
- Saltbox and steam candles	10-4-89	[illegible]
- Evaporators	10-4-89	[illegible]
• Traps on supply lines		
- Saltbox and steam candles	10-4-89	[illegible]
- Evaporators	10-4-89	[illegible]
• Condensate traps		
- EV A	10-4-89	[illegible]
- EV B	10-4-89	[illegible]
Zone 2 exhaust HEPA, DOP tested	10-3-89	JRO by [illegible]
Zone 2 inlet HEPAs		
- South inlet	10/2/89	dGd
- West inlet	10/2/89	dGd
Overhead 1 ton craneS with limit switches. Load tested to 125% of capacity (X2)	12/5/88	DAO by dGd *

* Reference crane test packages.

ITEM VERIFIED	DATE	INITIALS
<u>Saltbox</u>		
Configured glass columns		
- steam candles	10/2/89	dGd
- vent/vac inlets (X2)	10/2/89	dGd
- overhead hoist setup for column replacement	10/2/89	dGd
- (two with thermocouples and wire screen cages)	10/2/89	dGd
Offgas condenser	10/2/89	dGd
Vent/vac trap with drain to feed tanks		
- EV A feed	10/3/89	SLY
- EV B feed	10/3/89	SLY
Heat tape on transfer line	10/3/89	SLY
RTD	10/3/89	SLY
Acid metering valves (X2)	10/3/89	SLY
Shielded salt trays with NPCCW supply/return (X2)	10/3/89	SLY
Filter boats, stainless steel (X2)	10/3/89	SLY
Glovebox services		
- compressed air (~~X2~~) 4 dGd	10-4-89	[illegible]
- industrial water (X4)	10-4-89	[illegible]
- 110/120V outlets (X2)	10-4-89	[illegible]
- NPCCW supply and return (X2)	10-4-89	[illegible]
- house vacuum with trap	10-4-89	[illegible]
12" HEPA filters stacks (X3)	6/22/89	JPO by dGd *
8" inlet filters (X2)	10-4-89	[illegible]
Sample port	10/3/89	SLY * **

* REFERENCE MEMO HSE-5-89-818

** He leaked checked by LANL MACHINE SHOP
* AND IN PLACE

ATTACHMENT 4-3

Registered Professional Engineer Written Assessment/Certification for the Cementation Unit Storage Tank System

REGISTERED PROFESSIONAL ENGINEER
WRITTEN ASSESSMENT/CERTIFICATION

CEMENTATION UNIT STORAGE TANK SYSTEM
TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

The cementation unit storage tank system located at Los Alamos National Laboratory (LANL), Technical Area 55, Building 4, Room 401 (TA-55-4-401) was constructed and installed prior to January 1991 and was considered an existing tank system in accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart VI, 265.191. New components (i.e., the header/manifold and the transfer line from glovebox GB-438 to the cementation unit storage tank system header/manifold) have recently been installed within the cementation unit storage tank system and may be considered major, nonroutine modifications. In accordance with 20 NMAC 4.1, Subpart VI, 265.192(a), owners or operators of new tank systems or components must obtain and submit to the New Mexico Environment Department a written assessment, reviewed and certified by an independent, qualified, registered professional engineer, attesting that the tank system has sufficient structural integrity and is acceptable for handling hazardous waste.

The cementation tank system consists of:

- Five vertical, 55-liter storage tanks
- Vacuum trap
- Vent trap
- Vent trap vent line and drain line
- Header/manifold
- Vacuum manifold
- Lower manifold
- Transfer line from glovebox GB-438 to the cementation unit storage tank system header/manifold
- Transfer line from the lower manifold to the cementation unit.

In accordance with 20 NMAC 4.1, Subpart VI, 265.192(b), an independent, qualified installation inspector has inspected the new components installed within the cementation unit storage tank

system (see Attachment 4-5). These components were constructed and installed to the American National Standards Institute (ANSI) B31.3 standard for chemical plant and petroleum refinery piping [20 NMAC 4.1, Subpart VI, 265.192(a)(1) and 265.192(e)]. This standard prescribes requirements for the materials, design, fabrication, assembly, erection, examination, inspection, and testing of all piping within the property limits of the facility engaged in the processing activities. The new header/manifold and transfer line were inspected for weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, and other structural damage or inadequate construction or installation. These inspections were performed on February 28, 1996. No weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, or other structural damage or inadequate construction or installation were observed.

All of the components comprising the cementation unit storage tank system are constructed of 316 stainless steel for corrosion resistance and are compatible with the waste stored in the tanks. The stored waste consists of nitrate-based aqueous mixed waste solutions. The potential hazardous characteristics of the waste include corrosivity and toxicity for cadmium, chromium, and lead (i.e., EPA Hazardous Waste Numbers D002, D006, D007, and D008). Currently, no ignitable, reactive, or incompatible mixed wastes are stored or are anticipated to be stored in this tank system [20 NMAC 4.1, Subpart VI, 265.192(a)(2)].

No external component of the cementation unit storage tank system is in contact with soil or water [20 NMAC 4.1, Subpart VI, 265.192(a)(3) and 265.192(f)] and no part of the tank system is underground [20 NMAC 4.1, Subpart VI, 265.192(a)(4) and 265.192(c)].

The cementation unit storage tank system is erected upon a 10-inch-thick concrete floor within TA-55-4-401. The 10-inch-thick concrete floor provides a foundation that will maintain the load of the tank system when full. The concrete floor and ceiling were constructed to conform to the building code requirements of the American Concrete Institute (ACI) 318-71 for reinforced concrete. The reinforcing steel was detailed and fabricated in accordance with the "Manual of Standard Practice for Detailing Reinforced Concrete Structures," ACI 315. The design construction and tolerance of the framework around the concrete is in accordance with ACI 347 [20 NMAC 4.1, Subpart VI, 265.192(5)(i)]. The entire tank system, including ancillary equipment, is elevated and supported by a steel channel, Uni-strut® support system. The Uni-strut® support system is secured to the concrete floor and ceiling with anchor bolts and provides the system's ancillary equipment with support and protection against physical damage and excessive stress due to settlement and vibration [20 NMAC 4.1, Subpart VI, 265.192(e)]. The system stores only

solutions that have been previously cooled to room temperature, and the solutions are transferred utilizing a slight vacuum (i.e., 10 to 20 inches of mercury). The system does not operate under pressure. Because of the moderate operating parameters (i.e., temperature and pressure) of the system, physical damage and excessive stress due to expansion and contraction are not anticipated. Furthermore, the cementation tank system is not within a saturated zone or seismic fault zone [20 NMAC 4.1, Subpart VI, 265.192(a)(5)(ii)], and is within a building so that frost heave effects are not expected [20 NMAC 4.1, Subpart VI, 265.192(a)(5)(iii)].

In accordance with 20 NMAC 4.1, Subpart VI, 265.192(d), all new tanks and ancillary equipment must be tested for tightness. To further ensure that the structural integrity of the cementation unit storage tank system was not jeopardized during the installation of the new components, the entire system was tightness tested on May 30, 1996, at operating pressure (i.e., under vacuum at 10 to 20 inches of mercury), and determined to be tight (see Attachment 4-4).

REGISTERED PROFESSIONAL ENGINEER
WRITTEN ASSESSMENT/CERTIFICATION
(Continued)

CERTIFICATION · JOHN M. PIETZ, P.E.

I, John M. Pietz, have reviewed a portion of the design of the new components installed on the cementation unit storage tank system located at LANL, TA-55-4-401. The new components include the cementation unit storage tank system header/manifold and the transfer line from glovebox GB-438 to the cementation unit storage tank system header/manifold. My duties were to assess possible affects the modifications may have had on the system and to ensure that the structural integrity of the system and its ability to handle hazardous waste was not compromised as a result of the modifications.

I certify under penalty of law that this document (i.e., Attachment 4-3 of the TA-55 Part B Permit Application) was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted for this assessment and certification. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

JOHN M. PIETZ
NEW MEXICO
12833
REGISTERED PROFESSIONAL ENGINEER

John M. Pietz, P.E.
Consulting Engineer
IT Corporation
New Mexico Registered Professional Engineer No. 12833
Expires: December 31, 1997

6/24/96
Date

ATTACHMENT 4-4

Tightness Testing Certification for the Cementation Unit Storage Tank System

TIGHTNESS TESTING CERTIFICATION

CEMENTATION UNIT STORAGE TANK SYSTEM
TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

New components (i.e., the cementation unit storage tank system header/manifold and the transfer line from glovebox GB-438 to the cementation unit storage tank system header/manifold) have been installed within the cementation unit storage tank system located at Los Alamos National Laboratory (LANL), Technical Area 55, Building 4, Room 401 (TA-55-4-401) and may be considered major, nonroutine modifications. In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart VI, 265.192(d), owners or operators of new tanks and ancillary equipment must ensure that the system is tested for tightness. The cementation unit storage tank system was tightness tested on May 30, 1996, at operating pressure (i.e., under a vacuum of 10 to 20 inches of mercury), and determined to be tight. Testing was conducted such that pressure changes caused by temperature variances during testing, tank inflection due to increased vacuum in the tank, or trapped air or vapor pockets within the system were accounted for. (The detailed tightness testing procedure adhered to during the tightness tests and the results of the tightness tests are included in this attachment following the certification.)

TIGHTNESS TESTING CERTIFICATION

CERTIFICATION • JOHN M. PIETZ, P.E.

I, John M. Pietz, have supervised the tightness testing of the cementation unit storage tank system located at LANL, TA-55-4-401. The tightness testing was performed on May 30, 1996. My duties were to direct and witness the testing for tightness for the following tank system components:

- Five vertical, 55-liter storage tanks
- Vacuum trap
- Vent trap
- Vent trap vent line and drain line
- Header/manifold
- Vacuum manifold
- Lower manifold
- Transfer line from glovebox GB-438 to the cementation unit storage tank system header/manifold
- Transfer line from the lower manifold to the cementation unit.

as required by 20 NMAC 4.1, Subpart VI, 265.192(d).

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document (i.e., Attachment 4-4 of the TA-55 Part B Permit Application). Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

JOHN M. PIETZ
NEW MEXICO
12833
REGISTERED PROFESSIONAL ENGINEER

6/24/96

John M. Pietz, P.E.
Consulting Engineer
IT Corporation
New Mexico Registered Professional Engineer No. 12833
Expires: December 31, 1997

Date

TIGHTNESS TESTING PROCEDURE

CEMENTATION UNIT STORAGE TANK SYSTEM
TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

The following tightness testing procedure has been developed for the cementation unit storage tank system located at Los Alamos National Laboratory, Technical Area 55, Building 4, Room 401.

PART 2 - MATERIALS AND EQUIPMENT

2.01 MATERIALS AND EQUIPMENT

A. Vacuum Pump: The existing house vacuum pump, located in Room 407, shall be used as the vacuum source to establish and maintain the specified vacuum during each test.

B. Vacuum Gauge: The vacuum gauge shall be an ANSI Grade 2A vacuum gauge with an accuracy of 0.5 percent. The gauge shall have a face diameter of 6 inches and graduated in 0.2-inch mercury increments. The gauge shall be calibrated and installed within one month prior to testing the system.

PART 3 - EXECUTION

3.01 TESTING PROCEDURES

The cementation unit storage tank system consists of:

- Five vertical, 55-liter storage tanks (i.e., feed tanks 1 through 5)
- Vacuum trap
- Vent trap
- Vent trap vent line and drain line
- Header/manifold
- Vacuum manifold
- Lower manifold
- Transfer line from glovebox GB-438 to the cementation unit storage tank system header/manifold

TIGHTNESS TESTING PROCEDURE
(Continued)

- Transfer line from the lower manifold to the cementation unit.

The entire system will be tightness tested by systematically blanking off sections of the tank system. Each section to be tested shall have the solutions emptied prior to testing. The valve on the wet vacuum line between the vacuum pump and the vacuum trap will be closed for the duration of each test to isolate a vacuum within the components being tested. In order to determine the presence of leaks, each tested section will be held under a vacuum of 10 to 20 inches of mercury for 30 minutes.

The following information specifies the sequence of events to be adhered to during the tightness testing:

A. The vacuum gauge shall be installed on the end of the header/manifold near feed tank 1.

B. All tests will include the following piping sections to facilitate the use of the existing vacuum pump and a single vacuum gauge connection:

- the wet vacuum line,
- the vacuum trap,
- the vacuum manifold, and
- the header/manifold.

C. The first test (Test 1) shall be run through the components listed in item B in addition to the following:

- the line from feed tank 1 to the vacuum manifold, feed tank 1, and the inlet line off of the header/manifold into feed tank 1,
- the line from feed tank 2 to the vacuum manifold, feed tank 2, and the inlet line off of the header/manifold into feed tank 2,
- the line from feed tank 3 to the vacuum manifold, feed tank 3, and the inlet line off of the header/manifold into feed tank 3,
- the line from feed tank 4 to the vacuum manifold, feed tank 4, and the inlet line off of header/manifold into feed tank 4,
- the transfer line from glovebox GB-438 to the header/manifold,
- the lower manifold, and
- the transfer line from the lower manifold to the cementation unit.

D. The second test (Test 2) shall be run through the components listed in item B in addition to the following:

- the vacuum trap drain line,
- the line from feed tank 5 to the vacuum manifold,
- feed tank 5, and
- the inlet line off of the header/manifold into feed tank 5.

E. The third test (Test 3) shall be run through the components listed in item D in addition to the following:

- the vent trap inlet line,
- the vent trap,
- the vent line to the cementation unit, and
- the vent trap drain line to the cementation unit.

3.02 FAILED TEST PROCEDURES

A change in vacuum greater than 2 percent of the test vacuum of a given test indicates a failed test. In the event that a test fails, the appropriate repairs shall be made and the failing component(s) retested. No component that has failed the tightness test shall be placed into use until repairs are made and a passing test is achieved.

TIGHTNESS TESTING RESULTS

CEMENTATION UNIT STORAGE TANK SYSTEM
TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

CEMENTATION UNIT STORAGE TANK SYSTEM TIGHTNESS TESTS[1]			
		TIMES	GAUGE READINGS
TEST 1[2]	Start	9:07 A.M.	17.8 inches of mercury
	End	9:37 A.M.	17.8 inches of mercury
TEST 2[2]	Start	9:47 A.M.	17.8 inches of mercury
	End	10:17 A.M.	18.1 inches of mercury
TEST 3[2]	Start	10:30 A.M.	18.0 inches of mercury
	End	11:00 A.M.	18.0 inches of mercury

Note:

(1) Tightness tests were completed on May 30, 1996.

(2) Components tested are as described in the tightness testing procedure for the cementation unit storage tank system.

ATTACHMENT 4-5

Installation Inspection Certification for the Cementation Unit Storage Tank System

INSTALLATION INSPECTION CERTIFICATION

CEMENTATION UNIT STORAGE TANK SYSTEM
TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart VI, 265.192(b), owners or operators of new tank systems or components must ensure that proper handling procedures are adhered to in order to prevent damage to the system during installation. New components (i.e., the transfer line from Glovebox 438 to the cementation unit storage tank system header/manifold and the cementation unit storage tank system header/manifold) have been installed on the cementation unit storage tank system at Los Alamos National Laboratory (LANL), Technical Area 55, Building 4, Room 401 (TA-55-4-401). The cementation unit storage tank system transfer line and header/manifold have been inspected by a qualified inspector for weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, and other structural damage or inadequate construction or installation. The weld inspection check list for the new components is included in this attachment following the certification.

INSTALLATION INSPECTION CERTIFICATION
(Continued)

CERTIFICATION · FRANCIS J. FITZGIBBON JR.

I, Francis J. Fitzgibbon Jr., have supervised the installation of the new components for the cementation unit storage tank system located at LANL, TA-55-4-401. My duties were to supervise the installation of the transfer line from Glovebox 438 to the cementation unit storage tank system header/manifold and the installation of the cementation unit storage tank system header/manifold. The new components were inspected for the presence of the following items:

- Weld breaks
- Punctures
- Scrapes of protective coatings
- Cracks
- Corrosion
- Other structure damage or inadequate construction or installation,

as required by 20 NMAC 4.1, Subpart VI, 265.192(b). As a result of this inspection, none of the above items were noted.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document as it relates to my duties at the time of installation of the cementation unit storage tank system transfer line from Glovebox 438 to the cementation unit storage tank system header/manifold and the cementation unit storage tank system header/manifold. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Francis J. Fitzgibbon Jr.

Francis J. Fitzgibbon Jr.
Construction Supervisor
Johnson Controls World Services, Inc.

5 JUNE 96
Date

JOHNSON CONTROLS
WORLD SERVICES INC.

WELD INSPECTION CHECK LIST

PROJECT	WORK ORDER #	DATE
EVAPORATOR MAINTENANCE	WT 61070	FEB. 28, 1996
LOCATION	**CODE OR SPECIFICATION**	**TYPE OF MATERIAL**
TA-55, PF-4, ROOM 401A	ANSI B31.3 CATEGORY M	STAINLESS STEEL

TEES, HEAT NO. BRW-4

IDENTIFICATION	WELDER IDENTIFICATION	INITIAL INSPECTION	REPAIR WELD INSPEC.	FINAL INSPECTION	WELDING PROCEDURE	WELDER QUALIFICATION	MATERIAL CONTROL	WELD SIZE/PROFILE	WELD LOCATION	CRACKS	INCOMPLETE PENETRATION	INCOMPLETE FUSION	POROSITY	BURN THROUGH	UNDER CUT	ARC STRIKES	COMP RT	COMP UT	COMP MT	COMP PT	SATISFACTORY	UNSATISFACTORY	REMARKS
C1 THROUGH C14	PF 087			✓	✓	✓		✓	✓	✓	✓		✓		✓						X		
C17 THROUGH C 20	PF 087			✓	✓	✓		✓	✓	✓	✓		✓		✓						X		
C25 AND C 29	PF 087			✓	✓	✓		✓	✓	✓	✓		✓		✓						X		
C35 AND C 36	PF 02			✓	✓	✓		✓	✓	✓	✓		✓		✓						X		
C15, C16, C21, C22, C23	PF 011			✓	✓	✓		✓	✓	✓	✓		✓		✓						X		
C24, C26, C27, C28, C34	PF 011			✓	✓	✓		✓	✓	✓	✓		✓		✓						X		

N/A
2/28/96

N/A
2/28/96

✓: ATTRIBUTE INSPECTED
X: SATISFACTORY/UNSATISFACTORY
ADDITIONAL NOTES:
WELD NUMBERS AND WELDER ID STEEL STAMPED

AMS QC 1
DONALD R. SMITH
92061991
CWI

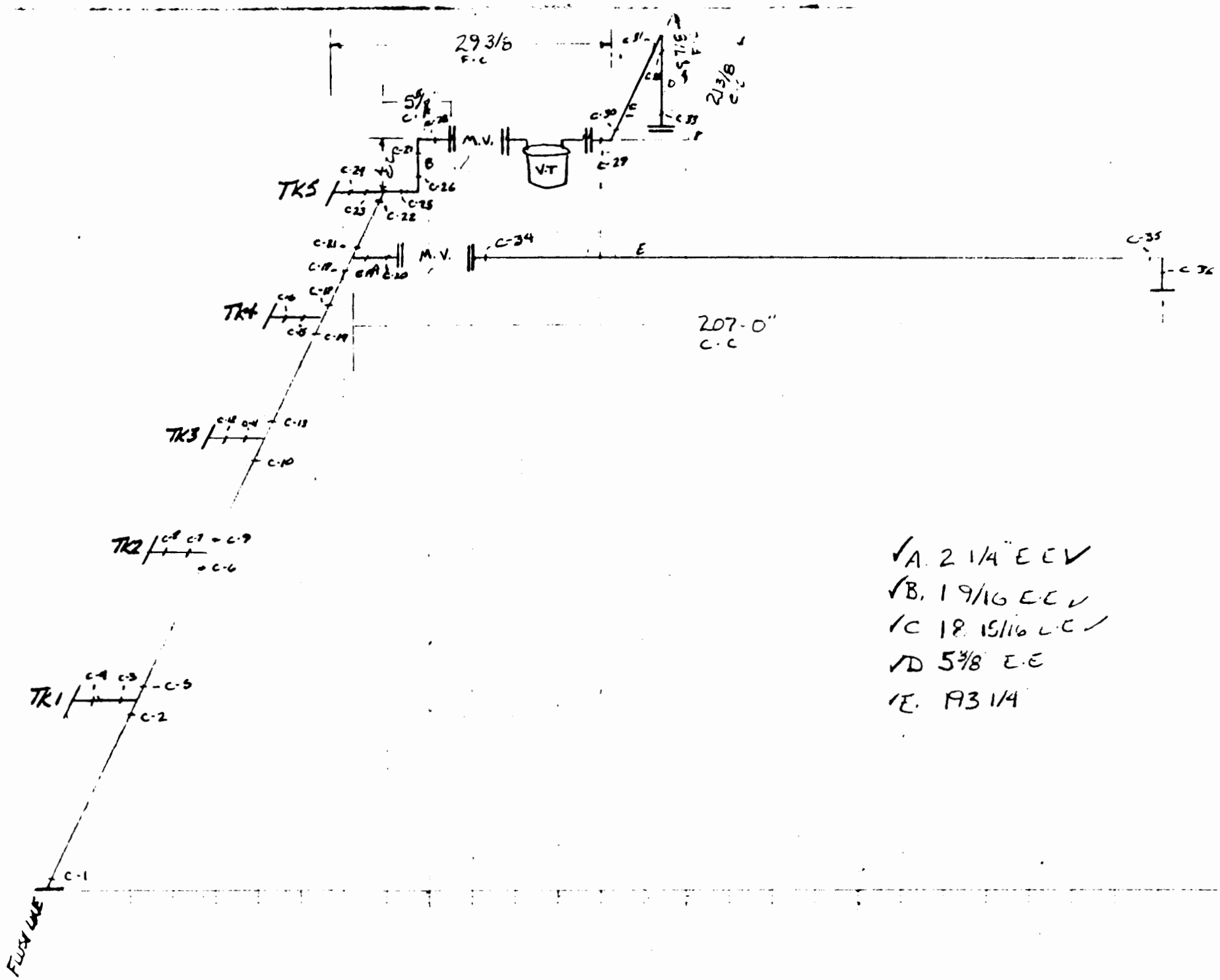
INSPECTOR

LEVEL
CWI ☒
CAWI ☐

FEB. 29, 1996
DATE

FORM 45-20-001.002

QA-REPORTS1 LA18


29 3/8
F.C
5 3/8
C.C
M.V.
V.T
M.V.
TK5
TK4
TK3
TK2
TK1
C-34
E
C-35
C-36
207-0"
C.C
FUSI LINE
A. 2 1/4" E.E
B. 1 9/16 E.E
C 18 15/16 E.E
D 5 3/8 E.E
E. A3 1/4

ATTACHMENT 4-6

Demonstration of Treatment Effectiveness for the Cementation Unit

INTRODUCTION

The cementation unit in Technical Area (TA) 55, Building 4, Room 401 (TA-55-4-401) is considered a miscellaneous waste management unit and, as such, is subject to the miscellaneous unit requirements in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart V, 264.600 through 264.603, revised November 1, 1995, and 20 NMAC 4.1, Subpart IX, 270.23, revised November 1, 1995. The 20 NMAC 4.1, Subpart V, 264.600 through 264.603, revised November 1, 1995, requirements are addressed in other sections of this Part B permit application. 20 NMAC 4.1, Subpart IX, 270.23(d), revised November 1, 1995, requires "a report on the demonstration of treatment effectiveness of the treatment based on laboratory or field data." Pursuant to 20 NMAC 4.1, Subpart IX, 270.23(d), revised November 1, 1995, this attachment provides a technical paper that demonstrates that the cementation unit at TA-55 effectively treats wastes, based on the treatment objectives described below and the results of the testing summarized in the technical paper. The use of these results in demonstrating the treatment effectiveness of the cementation unit is appropriate for the following reasons:

- The waste streams used in the testing are very similar or the same as those actually treated in the cementation unit;
- TA-55 uses Portland cement in their cementing operation as was done in the testing; and
- The testing conditions described in the technical paper were modeled to the actual cementing operation at TA-55 to the extent practicable.

The cementation unit in TA-55-4-401 is used to solidify solid and liquid mixed wastes (i.e., evaporator bottoms solutions and organic and inorganic process solids [plastic packaging]) in 55-gallon drums. The hazardous constituents of concern in these mixed waste items are certain toxicity characteristic metals (i.e., cadmium, chromium, and lead). From a hazardous waste management perspective, the primary objective of the treatment process is to immobilize the toxicity characteristic metals in a cement matrix so that the metals are no longer leachable (as determined by the toxicity characteristic leaching procedure [TCLP]) and thus are rendered nonhazardous following treatment. Also, because the wastes solidified in the cementation unit

contain a radioactive component and are ultimately destined for the Waste Isolation Pilot Plant (WIPP) for disposal, the cementation treatment process must produce solidified cement monoliths that meet the WIPP Waste Acceptance Criteria (WAC). Specifically, the cemented monoliths must meet the WIPP-WAC which prohibit free liquids.

The following technical paper describes bench- and full-scale testing that was performed to evaluate the effectiveness of using Portland cement in the cementation unit to solidify evaporator bottoms. The goal of the project was to develop a Portland cement-based waste form that meets the WIPP-WAC and reliably passes the TCLP. The results of this testing, as summarized in the technical paper, demonstrate that the use of Portland cement in the TA-55 cementation unit under the conditions prescribed, produces a cement monolith that meets all of the performance standards devised for the project, particularly no free liquids generation, passing the TCLP, and meeting minimum compressive strength criteria.

DRAFT

WASTE-FORM DEVELOPMENT FOR CONVERSION TO PORTLAND CEMENT AT LOS ALAMOS NATIONAL LABORATORY (LANL) TECHNICAL AREA 55 (TA-55)

by

G.W. Veazey, A.R. Schake, P.D. Shalek , D.A. Romero, and C.A. Smith

ABSTRACT

The process used at TA-55 to cement transuranic (TRU) waste has experienced several problems with the gypsum-based cement currently being used. Specifically, the waste form could not reliably pass the Waste Isolation Pilot Plant (WIPP) prohibition for free liquid and the Environmental Protection Agency (EPA)-Toxicity Characteristic Leaching Procedure (TCLP) standard for chromium. This report describes the project to develop a Portland cement-based waste form that ensures compliance to these standards, as well as other performance standards consisting of homogeneous mixing, moderate hydration temperature, initial set within 24 hours, and structural durability. Testing was conducted using the two most prevalent waste streams reporting to the cementation operation of lean residue (LR)- and oxalate filtrate (OX)-based evaporator bottoms (EV). A formulation with a minimum cement-to-liquid (C/L)* ratio of 0.80 kg/l for OX-based EV and 0.94 kg/l for LR-based EV and a pH of 10.3 to 12.1 was found to pass the required performance standards. The Portland process was also found to result in a yearly cost savings for raw materials of more than $30,000.

INTRODUCTION

TA-55 houses a variety of operations related to plutonium purification. The intended destination of the TRU wastes generated from these operations is WIPP, and accordingly, these wastes must be in compliance with the WIPP-Waste Acceptance Criteria (WAC).[1] The majority of the wastes meet the WIPP-WAC in their initial state. However, particulates# and free liquids (aqueous and nonpolar organic) require further treatment to meet the WIPP requirements designed to reduce dispersibility and respirability. The purpose of the TA-55 cementation operation is to convert these particulate and liquid wastes to a solid, cohesive form that meets the WIPP-WAC.

Initially, Portland cement was used as the fixation agent in the TA-55 process, but in 1983 a gypsum/polymer-based cement named Envirostone* was substituted. Envirostone's

*The cement-to-liquid ratio is used in this report to express the quantitative relationship between cement and liquid. The liquid includes the water and ionic components used to prepare the surrogate wastes and NaOH solution. This ratio is used instead of the dimensionless water-to-cement ratio commonly used in the cement industry in order to remain historically consistent with TA-55 operations.

#This work was performed under Revision 4 of the WIPP-WAC, which required the immobilization of particulates. Since this time, Revision 5 of the WIPP-WAC has been issued. Revision 5 does not require the immobilization of particulates, although it does not prohibit immobilization of particulates.

 DRAFT

setting reaction involves the hydration of hemihydrated calcium sulfate ($CaSO_4 \cdot 1/2H_2O$) to the dihydrated form ($CaSO_4 \cdot 2H_2O$). There were three reasons for the conversion to Envirostone. First, Envirostone was more compatible with the nonpolar organic liquid waste. Second, while Portland's setting reaction required an alkaline pH, Envirostone's was compatible with an acidic pH. Since the EV waste is highly acidic, less caustic solution was needed with Envirostone for pH adjustment. Third, the lower pH required for Envirostone eliminated the visibility problem that had resulted from generation of ammonia-based fumes at the higher pH of the Portland operation.

Envirostone served TA-55's cementation needs well until the cementation operation came under the jurisdiction of the more stringent WIPP-WAC and the EPA-Resource Conservation and Recovery Act (RCRA) regulation concerning characteristic toxicity.[2] It then became apparent that Envirostone exhibited several deficiencies that outweighed the benefits of its use. These deficiencies related to free-liquid generation in violation of the WIPP-WAC restriction on such and inadequate RCRA-metal leaching resistance. Portland cement was found to be a superior performer in these areas.[3,4] This report will review the investigation into the performance of Portland cement and describe the development of a Portland cement waste form to address the problems associated with Envirostone.

RATIONALE FOR PURSUING PORTLAND CONVERSION

Radiolytic Free-Liquid Generation: The first inadequacy with Envirostone became apparent in 1989 with the discovery that Envirostone cemented waste forms were generating free liquid several weeks after cementation.[5,6] This liquid generation resulted in the decertification of the TA-55 cementation process to produce waste forms acceptable for WIPP. A significant effort was subsequently initiated to find the cause of and arrest the phenomenon.[7,8,9] Several mechanisms capable of producing liquid were investigated and discarded. These included reversal of the calcium sulfate hydration reaction and delayed condensation-type polymerization.[6,10] Dehydration was eliminated when x-ray powder diffraction analysis found no change in the $CaSO_4$ molecule following free-liquid generation.[11] Delayed polymerization was eliminated when Envirostone without the polymerization precursors (plaster of Paris) was found to likewise generate free liquid.[6,11]

The free-liquid mechanism was ultimately shown to be irradiation-induced when it was found cemented surrogate-waste samples subjected to gamma irradiation produced free liquid, while unirradiated samples did not.[6] A mechanism that supported this scenario was radiolysis of the water in the pores of the cement structure.[12,13,14] In this mechanism, the H_2 and O_2 formed by disassociation of the water in the pores builds up sufficient internal pressure to force residual liquid to the surface. This mechanism was investigated at Hanford[15,16,17,18] and LANL for its potential to generate free liquid in cemented waste forms. Hanford workers showed that free-liquid generation is related to the waste form's compressive strength and permeabilty.[17] Work was also done at Hanford to develop a computer model to predict the occurrence of radiolytic free liquid based on a waste form's

*Envirostone is a trademark of the United States Gypsum Company.

permeability, gas generation rate, and internal pressurization.[18] Work at LANL with actual waste showed that increasing either the C/L ratio or mixing time reduced the occurrence and volume of free liquid,[6,8,10] presumably due to a resulting decrease in permeability. Best results were achieved in the full-scale operation at LANL by extending the mix time into the setting stage until the mixer began to lose its ability to generate a surface vortex.[3,6,7,10,19] Very few Envirostone waste forms produced with this technique generated free liquid. However, because some waste forms still generated free liquid,[3,19] the extended-mix technique was not considered to have entirely solved the problem.

To investigate the relative ability of the Portland cemented waste form to resist radiolytic free-liquid generation, surrogate EV waste forms made with Envirostone and Portland cements were subjected to gamma irradiation. Under irradiation by a 590 rad/min. Co^{60} source, the Envirostone sample produced liquid after 2.5×10^6 rads in 3 days. The test was concluded at 8.1×10^7 rads (95 days) without the Portland sample producing free liquid.[20] The superiority of Portland-type cement was further supported when bench-scale Portland samples prepared with actual waste were also found to produce no free liquid, while those prepared with Envirostone did.[21]

Leaching Resistance: The Envirostone waste form was discovered in 1992 to be unable to meet the nonhazardous limit for chromium as defined by the Toxicity Characteristic Leaching Procedure (TCLP). This discovery resulted in a shutdown of the operation during the DOE-imposed moratorium on the production of mixed waste. This inadequacy of Envirostone waste forms was first indicated in leaching studies using surrogate EV waste[22] and later confirmed with actual EV waste studies.[23] Both tests showed Portland waste forms had at least an order of magnitude higher leaching resistance for total chromium (Cr^{+3}/Cr^{+6}) in the TCLP. Portland cement also showed superior leaching resistance for cadmium and lead, two other metals found to have elevated concentrations in the EV waste. The graphical comparison of TCLP performance in the surrogate- and actual waste tests using Envirostone and Portland cement is shown in Figures 1 and 2.

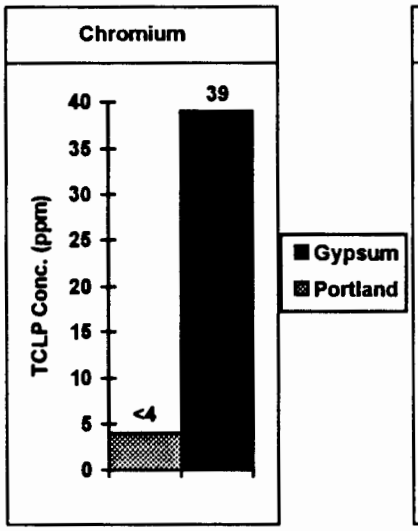


Fig. 1. TCLP performance with surrogate EV waste.

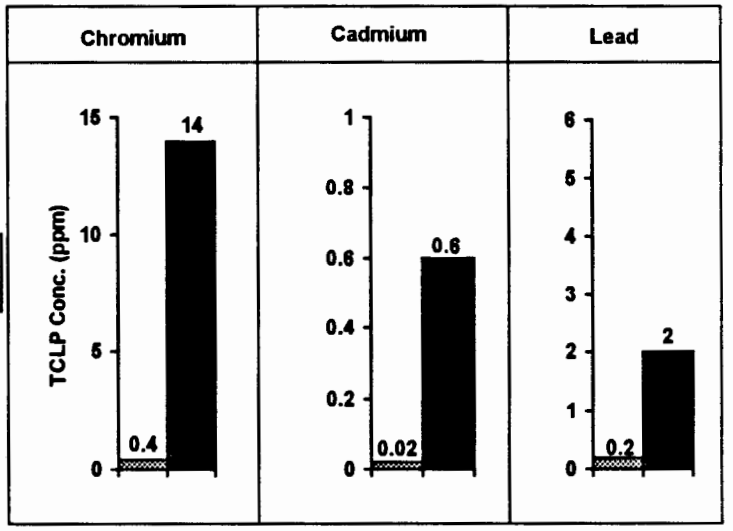


Fig. 2. TCLP performance with actual EV waste. TCLP limits: Cr = 5 ppm, Cd = 1 ppm, Pb = 5 ppm.

DEVELOPMENT OF THE PORTLAND WASTE FORM

Waste stream characterization: The surrogate waste used in this project consisted only of the EV waste stream because of its predominance in TA-55's waste streams requiring cementation. In order to prepare surrogate mixtures that accurately reflect current conditions, a characterization analysis of the EV waste stream was necessary.[24]

All EV wastes produced from April 1992 to February 1994 were analyzed for historically-present cations and anions, RCRA metals, and other components that can interfere with the setting reaction of Portland cement such as Cl^{-1}, SO_4^{-2}, and NO_3^{-1}. The results were sorted into the three major categories of EV waste: lean residue (LR)-based, oxalate filtrate (OX)-based, and hot distillate-based EV streams. The primary difference between the first two categories was the LR-based EV had a high concentration of calcium and magnesium, while the OX-based EV had a high concentration of sodium and oxalate. The composition of the hot distillate-based waste was similar to the LR-based waste composition. Due to this similarity, testing with hot distillate-based surrogate was not included in this project. The analytical data defining each of these waste streams is listed in Appendix 1.

Waste Form Performance Standards: The following standards were devised to define satisfactory performance of the final waste form. These include regulatory-based standards to meet the EPA TCLP limits (to produce a non-mixed waste form) and the WIPP-WAC restrictions on free liquid and particulates. Oerational-based standards were included to ensure homogeneous mixing, efficient throughput, and safe operating temperatures for the drum packaging.

1) Adequate mixability

To ensure that the recommendations of this work will provide consistent results, the mixing must be thorough enough to yield a homogeneous paste. Therefore, the viscosity of the cement paste must not be above the maximum viscosity at which the mixing equipment can provide thorough mixing. This limiting viscosity was defined as the maximum viscosity at which center-to-edge mixing of the cement paste could still occur.* Dilution was necessary for formulations with viscosities above this limit.

2) No free liquid at $\geq$24 hours following cementation

The requirement for absence of free liquid was necessary to meet the WIPP-WAC restriction on accessible free liquid.[25] The 24-hour limit was considered desirable to ensure a reasonable throughput efficiency. Free liquid could result from initial bleed water not reabsorbed or delayed generation of free liquid resulting from radiolysis. Adequate performance related to radiolysis would be defined by no generation of free liquid during gamma irradiation of 10^8 rads.

*Center-to-edge mixing is defined as rotational movement of the cement surface extending to the point of contact with the wall of the mixing container.

3) Moderate hydration temperature

The objective of this standard was to prevent the failure of the vinyl drum bag as a result of excessive heat from the hydration reaction of the cement. The conservative estimate bythe bag manufacturer for the failure temperature was 145 °F.[26] Since the temperature of the cement monolith reached during hydration in the drum-scale test would be higher than in the bench-scale test, an assumption had to be made on what temperature ceiling to select for the bench-scale tests. Using the industry standard of an increase of 15 °F per 100 lb of Portland cement,[27] the assumption was made that an increase of as much as 45 °F could be seen on scale-up to the drum scale. This led to the range of acceptable temperatures being set at ≤100 °F for the bench-scale experiments. All temperatures were taken at the center of the waste form. The actual full-scale temperature rise would be determined later in the full-scale test.

4) Penetration resistance of ≥500 psi at 24 hours following cementation

To ensure a reasonable throughput efficiency, it was considered desirable that indication of a successful setting reaction should be seen within 24 hours after the start of cement addition. The condition used to indicate a successful set was 500 psi penetration resistance. This indicator was adopted from the American Society for Testing and Materials (ASTM) standard for determining the initial set of a cement sample.[28]

5) Sustained compressive strength of ≥ 500 psi at 28 days following cementation

Minimum compressive strength was not needed to meet WIPP or EPA requirements. It was incorporated as a means to ensure the waste form was cohesive enough to resist breakdown to a particulate size prohibited by the WIPP-WAC. A minimum compressive strength of 500 psi was adopted for this study from the Nuclear Regulatory Commission's use of this level of strength as the best indicator of general physical durability for cemented waste.[29] The compressive strength data was collected according to the ASTM standard test method for compressive strength determination.[30] An additional requirement was included after the start of this work that there be no significant decline in compressive strength during the 28-day monitoring period. This was done after an expansive phase phenomenon was discovered that resulted in complete strength failure in a sample after satisfactory early development (*vide infra.*). The objective was to detect and discard any samples undergoing this phenomenon that still had a 28-day compressive strength value above 500 psi.

6) Pass EPA Leaching Standards for RCRA metals

The EPA has jurisdiction over the on-site storage of mixed waste. Since mixed waste is much more costly to store than nonhazardous TRU waste, it is advantageous for a waste form to pass the RCRA leaching standard for nonhazardous waste. This standard is defined by the EPA as passing the TCLP.[31] TCLP testing was performed at LANL according to EPA protocol.

EXPERIMENTAL EVALUATION

The goal of this project was to develop a simple cement formulation using only Type I/II Portland cement. Type I/II is the most readily available type of Portland cement, and its sole use would simplify the procurement of the raw materials. Another advantage to a one-component system would be the prevention of segregation problems that can occur in multicomponent systems in vibrating silos such as the one at TA-55. Other cement types and additives would be investigated only if required to address significant problems in areas such as slow setting, inadequate leaching resistance, or excessive temperature rise.

Surrogate preparation: The surrogates of the LR- and OX-based waste streams were prepared to approximate the median concentrations found in the waste stream characterization study listed in Appendix 1. The OX-based surrogate was prepared with the listed RCRA metals to evaluate the TCLP performance of the cemented waste form. The LR-based surrogate was prepared without RCRA metals. The concentrations of the LR- and OX-based surrogates are listed in Table 1.

Table 1: Composition of Surrogates
(in g/l except as noted)*

	LR-based	OX-based
Fe	9.03	8.56
Ca	58.39	16.88
K	18.51	6.38
Mg	54.77	21.40
Na	6.85	26.98
Al	4.75	1.75
NH_3	0.028	0.09
H+(molar)	1.40	4.55
Cl	1.02	0.27
NO_3	630	398
SO_4	1.55	1.00
C_2O_4	3.2	33.8
F	6.0	1.7
Cd	0	0.0028
Cr	0	2.45
Pb	0	0.056
Ag	0	0.0014
Ba	0	0.0355
Ni	0	1.205

*calculated from weight of dry chemicals

Equipment & Data Acquisition: The bench-scale equipment was assembled to match the design and proportions of the TA-55 full-scale process as much as possible. A programmable laboratory mixer (Lightnin Labmaster TSM2510) was used as the mixing device. The mixing profile was matched to those of the TA-55 process with the rpm being ramped up from 250 rpm to 400 rpm as paste viscosity dictated. The mixer power, mixer rpm, and mixing time were recorded for each test. For the full-scale test, the mixing container consisted of a 1/4-inch thick polyvinyl chloride rigid liner, inside a 12-mil vinyl bag, inside a 55-gal. drum (DOT 17-C). This was identical to the mixing container used in the TA-55 operations minus the lead between the bag and drum. The mixer (Lightnin XJ350), mixer shaft, and propellers (12.4-inch diameter A100) were identical to those used in the TA-55 process. The two propellers were separated on the shaft by one propeller diameter with the lower propeller being one-half diameter above the bottom of the liner. The full-scale test had a mixing rpm of 400 during the entire test. The mixing profile was not recorded during the full-scale test.

The following equipment was used for data acquisition in the bench- and full-scale tests. The bench-scale mixing profiles were recorded by a Compac Model M84 personal computer through an RS-232 interface with the mixer. Temperature was monitored using a Yokogawa Model LR4120 strip chart recorder and a type-K, Omega thermocouple (# 5TC-TT-K-24-36). The thermocouple was Teflon-coated to ease its removal from the hardened cement monoliths. The compressive strength of all waste forms was determined at 7, 14, and 28 days after cementation using a model C, 12-ton hydraulic press from the Carver Laboratory Press Company. The compressive strength data was taken on 2-inch cubes cast in H-2810 cube molds from the Humboldt Company. Penetration resistance was determined using a model H-3143 Acme hydraulic penetrometer from Humboldt. The gamma irradiation data for the bench-scale samples were collected with the use of a 380 rad/sec. gamma source located at Sandia National Laboratories (SNL).

Test Conditions: It was not the intention of this project to establish the failure boundary of all process parameters. Rather, it was to define a region of operability that will provide a confident expectancy for success. In this project, the process parameters of pH, C/L ratio, and dilution were varied to collect data on their influence on meeting the performance standards. Bench-scale testing was completed with LR-based surrogate before OX testing was begun. Conditions found to be unsatisfactory in the LR tests were not included in the OX tests. The pHs evaluated were 8.5, 9.6, 10.5, and 12.1 for the tests involving LR surrogate. The tests with OX-based surrogate were performed at a more limited range of 9.5, 10.5 and 11.5 as a result of pHs 8.5 and 12.1 being eliminated in the LR tests (*vide infra.*). All pH adjustment was accomplished using 10 molar NaOH solution. The C/L ratio was varied from 0.80 kg/l to 0.99 kg/l. The amount of water dilution was varied from 13.0% to 34.3% in the LR samples and 0% to 10% in the OX samples. The pH, C/L ratio, and dilution values used in the bench-scale tests are listed in Table 2.

A full-scale test was performed under conditions similar to a specific bench-scale sample to ascertain how scale-up would affect bench-scale results. A full-scale test was necessary because there are several areas in which bench-scale testing may not predict performance on the full scale. Bench-scale samples often do not show bleed water when full-scale samples

would.[32] Also, larger-scale samples exhibit a higher temperature rise during hydration that can produce cracks in the monolith. This damage can compromise performance in compressive strength development and leaching resistance.[32] In our case, the temperature was also a concern because of its potential to cause thermal damage to the vinyl drum bag.

RESULTS AND DISCUSSION

All bench-scale samples were evaluated for performance in mixability, bleed-water generation, initial set time, setting-temperature characteristics, and compressive strength. Evaluations of TCLP performance and radiolytic free-liquid generation were conducted only on OX samples. The performance in each category is discussed below. The results of the full-scale test follow those of the bench-scale tests.

The LR samples were used for the mixability study in which the pH and dilution values were varied concurrently with each sample. Consequently, pH and dilution must be considered together (i.e., pH/dilution) when determining their influence on LR samples in the following performance categories. The OX tests were conducted with only one process parameter being altered at a time. Subsequently, they are more useful in determining the relative influence of each parameter.

Bench-Scale Experiments: ***Mixability.*** The mixability limit was defined as the paste viscosity above which the mixing equipment lost its ability to achieve center-to-edge mixing. It was found that all LR samples exceeded this limit after the addition of the cement required for a C/L ratio of 0.80 kg/l. Dilution of these samples was required to allow addition of all of the cement. The required amount of dilution of the pre-cement solution was defined by a 0.1-watt power demand by the mixer while mixing the pre-cement solution at 250 rpm. A study was conducted in which the amount of dilution required at each pH was determined. It was found that the final pH of the pre-cement solution had a large effect on viscosity. A higher pH required more dilution as a result of the precipitation of more salts. The pH-dependent dilution values ranged from 13.0% to 34.3% and are reported in Table 2.

The same type of comparison of dilution and pH was not conducted on OX samples. Instead, the dilutions in the OX samples were fixed at 0%, 5%, and 10%. Although, the viscosity of the OX samples with 0% dilution was considered excessive, no difficulty in mixing was observed in any sample at 5% or 10% dilution. This lower dilution requirement for the OX-based samples is due to the lower salt content of the OX-based surrogate. This lower salt content is reflected in the lower total dissolved solids (TDS) value of the OX waste stream reported in Appendix 1.

Free liquid from Bleed-Water Generation. Although several samples initially generated bleed water, all bleed water was reabsorbed prior to the 24-hour limit.

Initial Set Time. The LR tests showed a definite relationship between each sample's initial set time and the pH/dilution values. This can be seen in Figure 3a, which shows the initial set time decreasing as the pH/dilution values increase. The samples prepared at pH 8.5 and pH

9.6 had initial set times exceeding the 24-hour limit. Because the pH 8.5 sample greatly exceeded the 24-hour limit, it was eliminated from further study in the OX tests.

The OX samples presented in Figure 3b show a lesser effect of pH on initial set time. Nevertheless, the results were consistent with the LR tests in that no sample prepared at ≤pH 9.6 met the 24-hour standard. This finding removed pHs ≤9.6 from further consideration. Figure 3b also shows a definite relationship between C/L ratio and initial set time in that the set time increased as the C/L ratio decreased. This increase was enough to prevent all 0.80 kg/l OX samples from meeting the 24-hour standard. Figure 3c shows the relationship of dilution to initial set time. As the dilution increased, the initial set time decreased. This decrease is presumably due to the decrease in the concentrations of set-retarding constituents of the waste. This may indicate that the decrease in initial set time of the LR samples with higher pH/dilution values (Figure 3a) was due primarily to the influence of dilution.

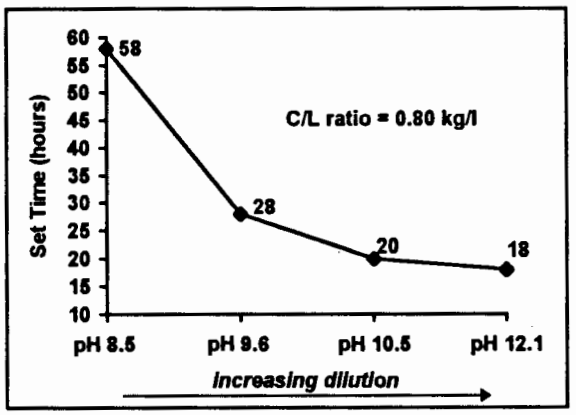


Fig. 3a. Effect of pH/dilution on initial set time for LR samples. (see Table 2 for dilution values).

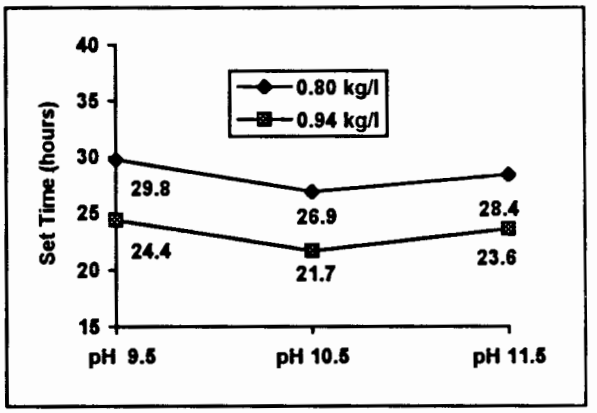


Fig. 3b. Effect of pH and C/L ratio on initial set time for OX samples. (avg. of samples w/ 10% dil.).

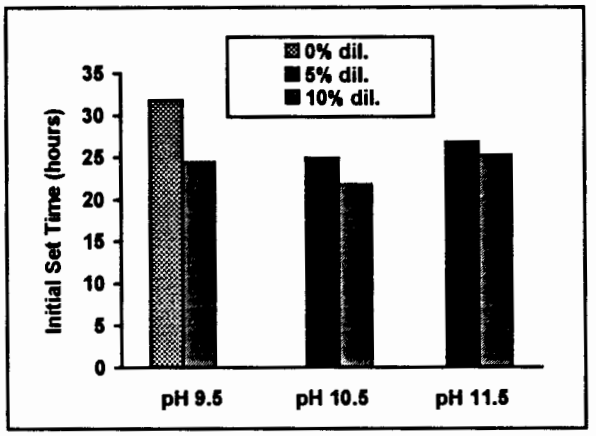


Fig. 3c. Effect of dilution on initial set time for OX samples (averages).

Temperature. The LR tests showed a definite relationship between each sample's pH/dilution values and the maximum hydration temperature and the elapsed time to maximum temperature. As the pH/dilution values increased, the maximum temperature increased and the elapsed time generally decreased. This can be seen in Figure 4a. The maximum temperature of 107 °F reached by the sample with pH 12.1 and 34.3% dilution exceeded the 100 °F temperature ceiling, thus causing a failure of this sample to meet the bench-scale temperature standard.

The OX samples presented in Figure 4b showed no significant change in temperature behavior as the pH was varied. The temperature profile of all OX pHs looked similar, with a peak temperature of approximately 86 °F at 24 hours. The dilution values for these samples were held constant at 10%. Since no effect was seen due to pH, this may indicate that the changing temperature profiles of the LR samples in Figure 4a were due to the effect of dilution.

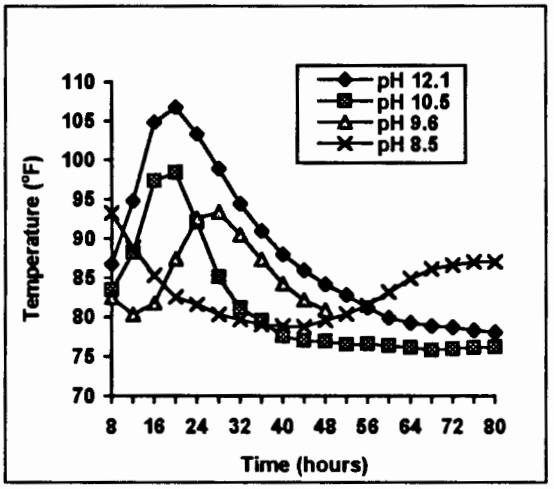


Fig. 4a. Temperature profile for LR samples LR14, LR15, LR16, & LR18. (C/L = 0.80 kg/l, see Table 2 for dilution values).

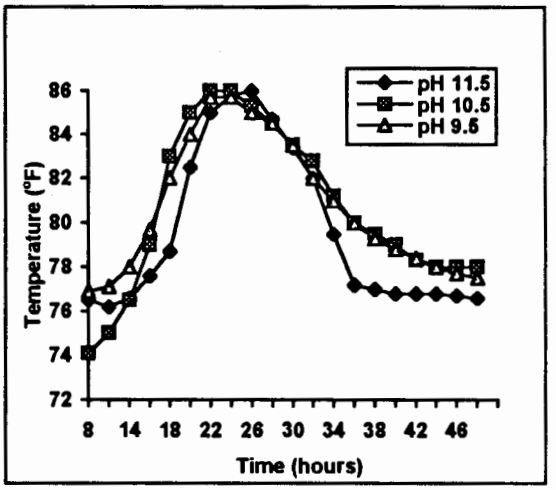


Fig. 4b. Temperature profile for OX samples OX4, OX8, & OX19. (C/L = 0.94 kg/l, dilution = 10%).

Table 2: Parameters and Results

Sample #	pH	C/L Ratio (kg/l)	Dilution[1] (vol%)	Initial Set Time (hr.)	Compressive Strength (psi) 7-day	14-day	28-day
LR15	8.5	0.80	13.0	58	450	0	0
LR11	9.6	0.94	ND[2]	26	1200	1550	1775
LR18	9.6	0.80	23.2	28	650	825	750
LR16	10.5	0.80	30.8	20	750	700	850
LR14	12.1	0.80	34.3	18	688	925	1075
OX1	9.5	0.94	0	30.6	687	775	975
OX2	9.5	0.94	0	33	650	825	950
OX9	9.5	0.94	5	ND[2]	875	1100	1250

OX12	9.5	0.94	10	24.6	1525	1000	1250
OX19	9.5	0.94	10	24.2	600	875	1000
OX16	9.5	0.80	10	29.8	375	450	650
OX3	10.5	0.84	0	<24	650	800	1100
OX14	10.5	0.80	10	26.9	300	500	700
OX5	10.5	0.99	0	ND(2)	975	1150	1325
OX6	10.5	0.94	5	23.1	800	2125	1300
OX17	10.5	0.94	5	26.7	700	825	1100
OX4	10.5	0.94	10	21.8	725	925	1150
OX10	10.5	0.94	10	25.4	750	850	1100
OX13	10.5	0.94	10	17.7	800	1000	1150
OX18	10.5	0.94	10	22	875	1000	1150
OX7	11.5	0.94	5	26.8	850	1100	1275
OX8	11.5	0.94	10	22.6	825	950	1275
OX11	11.5	0.94	10	24.6	950	1025	1150
OX15	11.5	0.80	10	28.4	375	525	675
OX20(3)	4	1.80	0	<24	1000	925	800
OX21(4)	4	1.80	0	<24	1200	1175	1000

(1)Dilution from water only (2)Not determined (3)Envirostone short mix (4)Envirostone long mix

Compressive Strength. As expected, the compressive strength increased as the C/L ratio was increased. This relationship is shown for selected LR and OX samples in Figures 5a and 5b, respectively. The effect of dilution on compressive strength was inconclusive as seen in the data presented in Table 2 for OX samples prepared at pH 9.6 and 0.94 kg/l. Although the 28-day compressive strength values for these samples at 5% dilution were greater than those at 10% dilution, the value for the sample at 0% dilution was less. The relationship of pH to compressive strength is shown for selected OX and LR samples in Figures 6a and 6b, respectively. This data shows the compressive strength increased with time and a higher pH produced a higher 28-day compressive strength.

An exception to the above trend occurred in the pH 8.5 LR sample (see Table 2 and Figure 6b). Here a phenomenon was observed that allowed satisfactory early strength development, but resulted in cube expansion and complete structural failure (strength = 0 psi) at the 14- and 28-day strength determinations. It is possible that the LR sample prepared at pH 9.6 and 0.80 kg/l (see Figure 5a) also exhibited some effects of this phenomenon. Although this sample did not technically fail because it had a strength above 500 psig at 28 days, the compressive strength at 28 days was lower than at 14 days. This may indicate that the waste form would have self destructed at a later time. The OX samples did not experience this delayed expansion phenomenon at the tested pHs of 9.5, 10.5, and 11.5. The explanation for this phenomenon in the LR samples is not certain. Since this occurred only in the LR samples with the lowest dilutions, the effect may be linked to a high concentration of one or more of the ions that are present in lower concentrations in the OX surrogate.

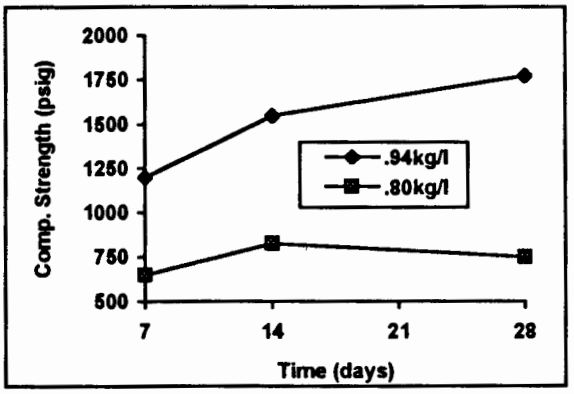


Fig. 5a. Effect of C/L ratio on compressive strength of LR samples LR11 & LR18. (pH = 9.6)

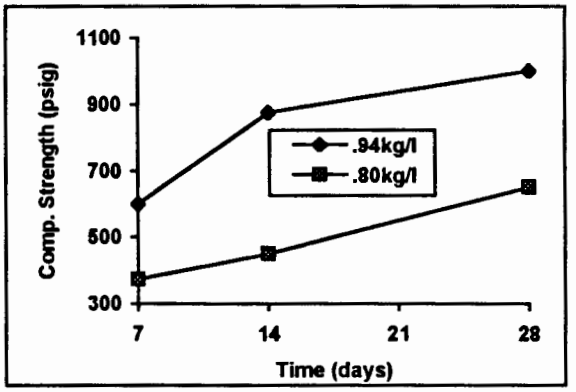


Fig. 5b. Effect of C/L ratio on compressive strength of OX samples OX16 & OX19. (pH = 9.5).

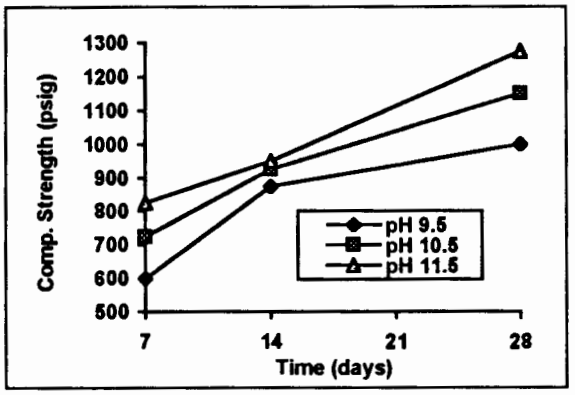


Fig. 6a. Compressive strength of OX samples OX4, OX8, & OX19. (C/L = 0.94 kg/l, dilution = 10%).

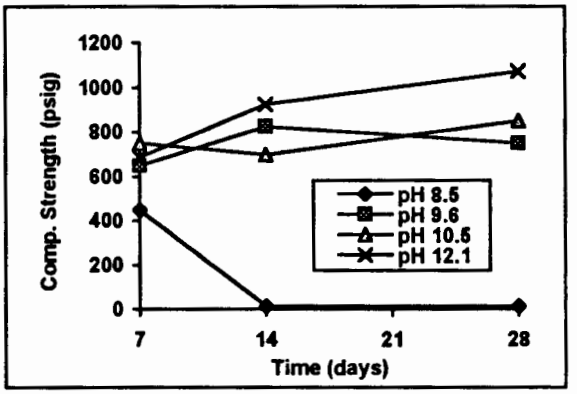


Fig. 6b. Compressive strength of LR samples LR14, LR15, LR16, & LR18. (C/L = 0.80 kg/l, see Table 2 for dilution values).

TCLP Results. TCLP testing was done only on OX samples. The OX samples were analyzed for the RCRA metals Cd, Cr, Pb, Ba, and Ni. The RCRA metals not included in the TCLP testing were present in concentrations that would be well below the TCLP limit even if 100% of each metal leached out in the TCLP extraction procedure. The samples for TCLP analysis were taken from the pH categories of 9.5, 10.5, and 11.5 and included the sample with the lowest compressive strength in each category. The sample with the lowest compressive strength was considered the worst-case condition for leaching resistance because of the connection of compressive strength to leaching resistance through a common dependency on permeability. The analytical results in Table 3 show that all samples passed the TCLP standards for nonhazardous waste.

Table 3: TCLP Results for Oxalate Surrogate Samples
(all concentrations in ppm)

Sample ID	Cd	Cr	Pb	Ba	Ni
TCLP limit	1	5	5	100	100
OX7	<0.003	0.11	<0.011	2.6	0.01
OX8	<0.003	0.12	<0.011	2.4	0.01
OX9	<0.003	0.12	<0.011	3.0	<0.01
OX14	<0.003	0.10	<0.011	2.7	0.01
OX15	<0.003	0.13	<0.011	2.6	<0.01
OX16	<0.003	0.11	<0.011	2.7	<0.01
OX17	<0.003	0.14	<0.011	2.7	0.01
OX18	<0.003	0.11	<0.011	2.9	0.01
OX19	<0.003	0.17	<0.011	2.8	0.05

Radiolytic Free-Liquid Generation. The testing for suppression of radiolytic free-liquid generation was conducted with OX samples. Gamma irradiation was used to simulate the radiolytic degradation caused by alpha irradiation in the actual wastes. It should be noted that gamma irradiation is less efficient than alpha irradiation due to the smaller size of the nuclear particle. To achieve 10^8 rads quickly, the test was conducted at SNL using a 380 rad/sec. gamma source. The samples were taken from the pH categories of 9.5, 10.5, and 11.5 and included the sample with the lowest compressive strength in each category. Compressive strength was again used as the worst-case indicator because of its connection to free-liquid generation through permeability. The test results, presented in Table 4, show that no Portland cement samples produced free liquid during the 10^8 rad irradiation test.

Two Envirostone-cemented samples were also included in this test, a short-mixed (OX20) and a long-mixed (OX21) sample. These were included to investigate a correlation found in previous work between longer mixes and suppression of radiolytic free-liquid generation in Envirostone cemented waste forms.[3,6,7,10,19] During the irradiation test, free liquid was found in both samples, the short-mix sample at 1.7×10^7 rads and the long-mix sample at 4.4×10^7 rads. The liquid generated by the long-mix sample was actually greater in volume than that by the short-mix sample. Based on these results, it can be concluded that the long-mix technique can not be consistently relied upon to suppress radiolytic free-liquid generation in Envirostone cemented waste forms.

Table 4: Gamma Irradiation

Cumulative Dose: (rad)	8.3×10^6	1.7×10^7	4.4×10^7	5.3×10^7	7.2×10^7	9.8×10^7
Sample ID	Liquid?	Liquid?	Liquid?	Liquid?	Liquid?	Liquid?
OX14	no	no	no	no	no	no
OX15	no	no	no	no	no	no

OX16	no	no	no	no	no	no
OX17	no	no	no	no	no	no
OX18	no	no	no	no	no	no
OX19	no	no	no	no	no	no
OX20 short-mix Envirostone	no	Yes (damp*)	Yes (1.55g)	Yes (3.35g)	no	no
OX21 long-mix Envirostone	no	no	Yes (3.59g)	Yes (4.91g)	no	no

*weights in parentheses are totals since start of free-liquid generation.

Full-Scale Testing: The full-scale test was conducted with LR-based surrogate and was designed to approximate the bench-scale sample LR16. The full-scale sample had a pre-cement pH of 10.3 and a C/L ratio of 0.80 kg/l, which corresponded to 220 lb of Portland cement. The EV, NaOH, and water volume percentages in the full-scale sample were 41%, 28%, and 31%, respectively. The full-scale test monitored all performance standards except RCRA-metal leaching resistance and radiolytic generation of free liquid. Compressive strength was used as an indicator of performance in these nonmonitored areas because of its common dependence with them on permeability. The results relative to each performance standard are reported below.

Mixability. The mixing equipment had no difficulty in providing center-to-edge mixing of the cement paste.

Free Liquid. No bleed water was present at any time after cementation.

Initial Set Time. Initial set occurred at 20.1 hours after cementation. This matched the 20-hour initial set time of LR16. The profile of the penetration resistance is shown in Figure 7.

Temperature. The full-scale test was especially useful in illuminating several areas of uncertainty concerning temperature behavior. The temperature was monitored at the center and edge (1 inch in) of the cement monolith and between the rigid liner and bag. The temperature reached a maximum of 163 °F at the center, 150 °F at the edge, and 103 °F at the bag. The full-scale temperature profile is shown in Figure 8.

The maximum center temperature of the full-scale sample was 66 °F higher than that of LR16. This corresponds to an increase of 30 °F per 100 lb of Portland cement ([66 °F/220 lb] x 100). This is twice as high as the industry standard of 15 °F per 100 lb used to establish the temperature ceiling for the bench-scale tests. This difference is likely due to the industry standard being based on concrete in which the aggregate would act as a heat sink. Another meaningful finding was that the temperature at the bag location was 60 °F lower than at the center of the monolith. This resulted in a temperature significantly below the 145 °F bag failure temperature. This data can now be used to back-calculate a revised temperature ceiling for the bench-scale tests. Starting with 145 °F, adding the 60 °F lower temperature at the bag and subtracting the 66 °F higher center temperature yields a revised ceiling of 139

°F. At this higher ceiling, the pH-12.1 LR sample, previously rejected as a result of having a maximum temperature of 107 °F, falls within in the acceptable temperature range.

Compressive strength. The compressive strength values of the full-scale sample equaled or exceeded that of LR16 at all times. This indicates no damage of the monolith occurred as a result of increased hydration temperature from scale-up. The compressive strength profiles of the full-scale sample and LR16 are shown in Figure 9. It can be seen that strength development occurred at a similar rate in both samples.

TCLP. TCLP analysis was not performed on the full-scale sample, but the several considerations indicate TCLP performance would be as good or better than that of the OX-based samples, which easily passed the TCLP standards. First, the higher compressive strength of the full-scale sample indicates the permeability should be less than that shown by the OX-based samples. Since leachability is dependent on permeability, the resistance to TCLP leaching should therefore be greater for the full-scale sample than for the OX-based samples. Second, because the dilution percentage of the full-scale sample was greater than the OX-based samples, the concentration of the RCRA metals would be less in the full-scale sample.

Radiolytic Free-Liquid Generation. Testing for radiolytic free-liquid generation was not performed on the full-scale sample, but a conclusion can be drawn from compressive strength data. The work at Hanford showed that the susceptibility of a waste form to radiolytic free-liquid generation decreased as the compressive strength increased, presumably as a result of a corresponding decrease in permeability.[17,18] Since the compressive strength of the full-scale sample was higher than the OX-based samples, resistance to radiolytic free-liquid generation should also be greater.

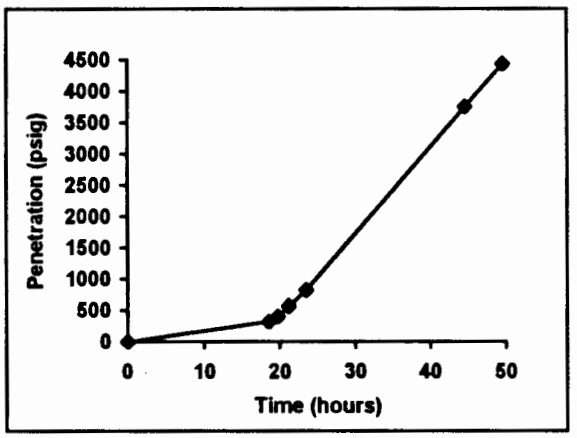


Fig. 7. Penetration resistance of full-scale test.

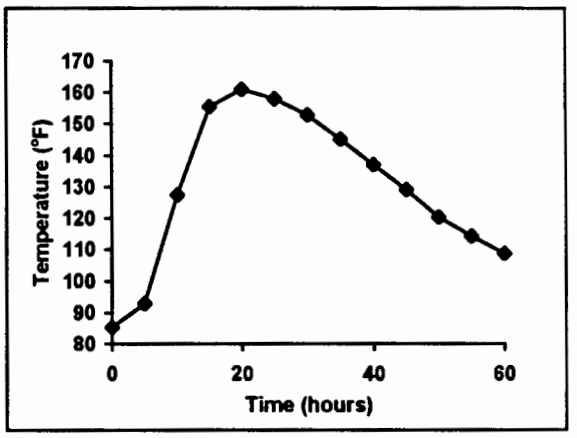


Fig. 8. Temperature profile of full-scale test (center).

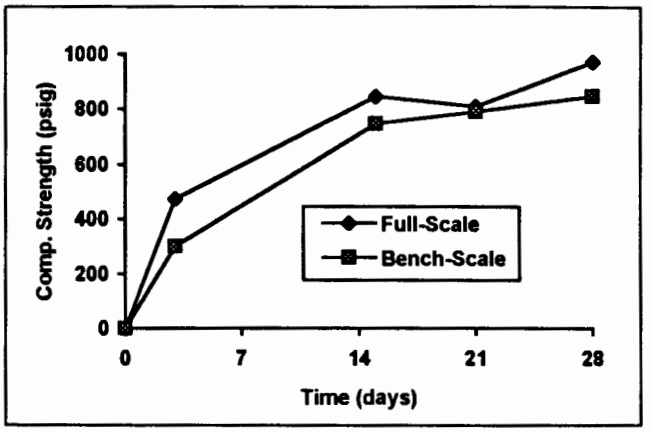


Fig. 9. Compressive strength comparison of full- and bench-scale (LR16) tests.

CONCLUSIONS

The above results define a range of operability that can be used to produce a Portland-based waste form meeting the performance standards identified in this project. The performance standards of principal importance were those addressing the inadequacies of Envirostone cement regarding free-liquid generation and failure to meet the TCLP limit for chromium. The Portland waste form was shown to be superior to both the short-mix and long-mix Envirostone waste forms in resisting gamma-induced free-liquid generation. The 9.8×10^7-rad dose at which the Portland sample still suppressed free liquid exceeds the dose at which the short-mix and long-mix Envirostone samples began to generate free liquid by 5.8 and 2.2 times, receptively (Table 4). The earlier work presented in Figures 1 and 2 had demonstrated that the Portland waste form was superior to Envirostone waste forms in chromium TCLP performance by at least an order of magnitude. The TCLP evaluation of the OX-based Portland samples in the present work showed TCLP performance similar to these earlier tests (see Table 3).

The bench-scale results established the minimum C/L ratio as 0.80 kg of Type I/II Portland cement per liter of liquid for LR-based EV surrogate and 0.94 kg/l for OX-based EV surrogate. The OX-based EV waste required a C/L ratio of 0.94 kg/l solely due to a failure to meet the 24-hour initial set standard at 0.80 kg/l. The bench-scale tests established the acceptable pH range for the liquid (EV, NaOH, and dilution water) at 10.5 to 11.5. The full-scale test, conducted with LR surrogate at pH 10.3 and 0.80 kg/l, served as a confirmation of bench-scale results and demonstrated the pH range could be lowered to 10.3. The full-scale test also provided revised temperature data that allowed inclusion of the pH 12.1 sample.

Actual operations will present some areas for flexibility. One, the C/L ratio may be increased to the limit of the mixing equipment's ability to achieve adequate mixability. An increased C/L ratio will improve performance in leaching resistance, set time, and compressive strength performance. However, no improvements in these areas should be necessary with EV wastes similar to those used as surrogates in this project. Two, to

simplify operations, it is highly recommended that the dilution percentage not be based on the viscosity of each waste batch. Instead, a fixed dilution percentage should be chosen that will be adequate for the viscosity of all EV batches. If EV compositions remain similar to those in this project, this will result in the worst-case dilution being based on LR-based EV waste. Due to the effect of decreasing initial set time with increasing dilution (see Figure 3c), this may result in waste forms with OX-based EV waste meeting the 24-hour standard for initial set time at 0.80 kg/l. Additionally, 24 hours was established as a *desired* standard to achieve a reasonable process throughput and it may be extended without jeopardizing the physical integrity to the waste form.

Waste loading will depend on how much drum volume is required by the other components making up the final waste form. In actual operations, the highest waste loading will be achieved by operating at the lowest acceptable C/L ratio and pH. A waste loading of 33.5 vol% was achieved in this project's full-scale sample. This waste loading is approximately equivalent to that of the Envirostone-based operation. The lower C/L ratio of the Portland system did not result in a higher waste loading than for the Envirostone system because it was offset by the higher water and NaOH dilution required by Portland's higher pH. However, increased waste loading can be expected in actual operations if the EV waste contains less salts than the LR surrogate used in this project.

The cement addition rate should be as high as possible in the TA-55 operation. Mixing should be continuous during the time of addition and ramped up to maximum rpm as the paste viscosity requires to maintain adequate mixing. To prevent overmixing, the paste should be mixed for only 4 minutes after the end of cement addition. Overmixing is to be avoided because it is known to interfere with an initial stage of the setting reaction, causing delayed set, slow curing, and even loss of final physical properties.[32] The presence of bleed water after completion of mixing is acceptable as long as reabsorption occurs within a reasonable time frame. The 24-hour standard for free-liquid reabsorption was selected as a *desired* standard to ensure a reasonable throughput for the cementation operation. An occasional extension of this time limit should not significantly impact process throughput.

Quality Assurance: Some care must be taken in procuring the Type I/II cement for the TA-55 cementation operation. Type I/II Portland cement is defined by a range for each of its mineralogical and physical properties. The ranges are broad enough that variations in setting characteristics and sensitivity to chemical interferants are sometimes observed between Type I/II cements from different sources. It is recommended therefore that the QA program for this operation assure that procurement be from a source offering a Type I/II cement with similar composition to that used in this development project. The particular cement used in this project is a low-alkali Type I/II cement. The source of the cement was Rio Grande Portland Cement Corporation in Tijeras, New Mexico. The mineralogical composition and other pertinent physical characteristics for this cement are listed in Appendix 2. The composition from this source has been very consistent throughout the 2-year period presented in this appendix.

This work was performed according to the LANL/TA-55 Quality Management Plan: Documents and Records Control Section, procedure number SS-TA-55-110-0-03.1-1.

Costs: For a production rate of 3 cement drums per week, the Portland cement required for operating the TA-55 cement process will be approximately 20.6 tons per year.* The current delivered cost from Rio Grande Portland Cement Corporation is approximately $80 per bulk ton,[33] resulting in a yearly cost of $1,648. This compares to $1,300 per ton and $40,225 per year for Envirostone cement, which equates to an overall reduction in cement cost of $38,577 per year.[34] The cost for delivery from Rio Grande Portland Cement Corporation is for bulk powder cement. Bulk delivery is less costly and has the advantage of allowing pneumatic delivery into the TA-55 cement silo. Pneumatic delivery will also reduce the number of person-hours required to load the silo from approximately 20 hours to 1 hour per year. The increased volume of NaOH solution should result in an increased cost of less than $5,000 per year.

Other Wastes: The recommendations of this report should be compatible with the addition of dry, non-reactive particulate wastes. In the present TA-55 operation, this type of waste is added to a pre-established cement paste to prevent the solids from settling during mixing. Using this technique, the primary effect will be an increase in paste viscosity, which may require additional dilution to maintain adequate mixing. Slurries (wet particulates) with a pH outside the range recommended in this report should be pretreated to properly adjust the pH prior to addition to the cement paste. Low-density slurries that do not require addition to a pre-established paste can be combined and pH adjusted with the waste liquid prior to cement addition. Ion-exchange resins present an additional concern in that they have been reported to cause setting and free-liquid problems under certain conditions not related to pH.[35,36] Non-EV aqueous wastes may also cause chemical interferences with the Portland setting reaction. It is recommended additional studies be conducted before incorporation of ion-exchange resins or non-EV aqueous wastes into the cementation operation.

No testing was done with organic wastes in this development project. Portland cement is not as efficient as Envirostone in treating nonpolar organics, but methods exist that permit satisfactory treatment of some organics with Portland cement.[37] It generally is adequate for limited volumes of nonpolar organics if they are prepared in a well-dispersed oil-in-water emulsion. It does not perform well with inverse emulsions (water in oil) or pure solvents.[32] Organics with high solubility (polar) generally are not immobilized well by Portland cement.[32] It is recommended additional development be conducted before incorporation of organic wastes into the cementation operation.

ACKNOWLEDGMENTS

The authors wish to thank the following:

- Rio Grande Portland Cement Corporation in Tijeras, New Mexico, for supplying the cement for all test work.
- Earl McDaniel of Oak Ridge National Laboratory for technical support.
- NMT-7 Cement Process personnel for assistance in conducting the full-scale test.

*Calculated at 150 drums per year at 275 lb of Portland cement per drum.

Appendix 1

Analysis of Evaporator Bottoms*
(in g/l except as noted)

	Lean Residue	Oxalate Filtrate	Hot Distillate
Fe	17.0	7.9	16.9
Ca	61	10.5	39.1
K	17.6	4.8	14.6
Mg	58.7	13.3	41.9
Na	7.4	23.9	9.4
Al	4.6	2.3	4.7
NH_3	.025	.090	.035
Cl	1.1	.265	1.35
NO_3	457	398	419
SO_4	1.6	<1	1.57
C_2O_4	3.3	33.8	11.3
F	5.4	1.7	5.1
H+ (molar)	1.0	4.6	1.75
TDS**	629	330	600
Ag	<.005	<.001	<.002
As	<.015	<.005	.010
Ba	.035	.018	.029
Cd	.014	.003	.014
Cr	3.0	1.94	2.35
Hg	<.025	<.005	.010
Ni	1.8	1.205	1.60
Pb	.19	.056	.125
Se	<.008	<.008	.009
Tl	<.060	<.020	<0.60

*median values of all analyzed EV samples
**total dissolved solids

28. American Society for Testing and Materials, "Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance," C 403-90, May 1990.

29. U.S. Nuclear Regulatory Commission, "Waste Form Technical Position, Revision 1," January 1991.

30. American Society for Testing and Materials, "Standard Test Method for Compressive Strength of Hydraulic Cement Mortars," C 109-92, June, 1992.

31. Environmental Protection Agency, *40 Code of Federal Regulations 268, Appendix I*, July 1, 1990.

32. Conner, J.R., *Chemical Fixation and Solidification of Hazardous Wastes*, Van Nostrand Reinhold Publishers, NY, NY, (1990).

33. Personal communication with Tim Mummey of Rio Grande Portland Cement Corporation on January 10, 1996.

34. Personal communication with NMT-7 Cement Process supervisor Chester Smith, January 1996.

35. Morgan, I.L and Bostick, W.D., "Performance Testing of Grout-Based Waste Forms for the Solidification of Anion Exchange Resins," *Stabilization and Solidification of Hazardous, Radioactive, and Mixed Wastes*, 2nd Volume, ASTM STP 1123, T.M. Gilliam and C.C. Wiles, Eds., American Society for Testing and Materials, Philadelphia, 1992, pp.133 - 145.

36. Neilson, R.M., Jr. and Colombo, P., "Solidification of Ion Exchange Resin Wastes," BNL 51615, Brookhaven National Laboratory, Upton, NY, August 1982.

37. Clark, D.E., Colombo, P., and Neilson, R.M., "Solidification of Oils and Organic Liquids," BNL-51612, Brookhaven National Laboratory, Upton, NY, July 1982.

5.0 PROCEDURES TO PREVENT HAZARDS

The information provided in this section is submitted in accordance with the applicable requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), revised November 1, 1995, for the following subject areas:

- Security procedures and equipment [20 NMAC 4.1, Subpart IX, 270.14(b)(4), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.14, revised November 1, 1995]
- Access control [20 NMAC 4.1, Subpart IX, 270.14(b)(19)(viii), revised November 1, 1995]
- Preparedness and prevention requirements [20 NMAC 4.1, Subpart V, Part 264, Subpart C, revised November 1, 1995]
- Procedures, structures, and equipment for preventing hazards [20 NMAC 4.1, Subpart IX, 270.14(b)(8), revised November 1, 1995]
- Requirements for ignitable, reactive, and incompatible waste at container storage areas [20 NMAC 4.1, Subpart IX, 270.14(b)(9), 270.15(c) and (d), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.17, 264.176, 264.177, revised November 1, 1995]
- Requirements for tank systems with ignitable, reactive, and incompatible waste [20 NMAC 4.1, Subpart IX, 270.14(b)(9) and 270.16(j), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.17, 264.198 and 264.199, revised November 1, 1995]
- General waste management practices for ignitable, reactive, and incompatible waste applicable to miscellaneous units [20 NMAC 4.1, Subpart IX, 270.14(b)(9), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.17, revised November 1, 1995].

In accordance with 20 NMAC 4.1, Subpart V, 264.31, revised November 1, 1995, the container storage areas, storage tank systems, and cementation unit addressed in this permit application are designed and operated to minimize the possibility of fire, explosion, or unplanned releases of hazardous constituents to any environmental medium.

5.1 SECURITY [20 NMAC 4.1, Subpart IX, 270.14 (b)(4) and 270.14(b)(19)(viii); 20 NMAC 4.1, Subpart V, 264.14]

Security at Los Alamos National Laboratory (LANL) Technical Area (TA) 55 is maintained with both manmade and natural barriers. These barriers prevent the unknowing entry and minimize the possibility for unauthorized entry of persons or livestock into TA-55 and thus satisfy the requirements of 20 NMAC 4.1, Subpart V, 264.14(a) and 264.14(b)(2), revised November 1, 1995.

Two 12-foot (ft)-high chain-link security fences with razor wire at the top surround the entire perimeter of TA-55, as shown on Figure 5-1. Warning signs are posted on the fences at approximately 40- to 75-ft intervals and can be seen from any approach to TA-55. Warning signs are also posted at each access to the units addressed in this application, in sufficient numbers to be seen from any approach to these areas. The legends on the signs are bilingual (i.e., English and Spanish) and indicate "Danger—Hazardous Waste Storage Area—Unauthorized Persons Keep Out." The signs are legible from a distance of 25 ft. The only exception to this at TA-55 are signs that need to be located in confined areas where space is limited. Signs for these confined areas may be reduced in size as a result but are legible to personnel who may require access to these areas.

Three entry gates allow access to TA-55. One entry gate is located at the main entrance to TA-55 at the southeast end of the facility, one entry gate is located on the road to TA-48 at the northwest end of TA-55, and one entry gate is located at the northeast corner of TA-55 (for access to TA-55, Building 28 [TA-55-28] only). An entry station is located adjacent to the entry gate at the main entrance to the facility. The entry station is manned 24 hours a day by Protection Technology Los Alamos (PTLA) security personnel. Unescorted access to TA-55 is granted only to persons possessing appropriate security clearance.

TA-55 is patrolled by PTLA security personnel during both operational and nonoperational hours to ensure that the gates are locked and that unauthorized entry has not occurred. The entire length of both security fences is also inspected several times each day by on-site security personnel and, if needed, repairs are made immediately. In accordance with 20 NMAC 4.1, Subpart IX, 270.14(b)(19)(viii), revised November 1, 1995, the locations of the security fences, entry gates, and entry station are shown on Figure 5-1. In addition to the fence and entry station, cliffs and canyons surrounding TA-55 provide natural barriers to discourage unauthorized entry.

5.2 PREPAREDNESS AND PREVENTION REQUIREMENTS [20 NMAC 4.1, Subpart V, Part 264, Subpart C]

The following sections present how operations at TA-55 comply with the preparedness and prevention requirements of 20 NMAC 4.1, Subpart V, Part 264, Subpart C, revised November 1, 1995. Additional information on the communication and alarm equipment available at LANL and specific to TA-55 is presented in Section 7.0 of this permit application. A list of the emergency

equipment available for use at the hazardous and mixed waste units included in this permit application is provided as Attachment 7-1. A videotape explaining the alarms and evacuation procedures at TA-55 must be viewed by visitors unfamiliar with these safety features prior to entering TA-55.

5.2.1 Required Equipment [20 NMAC 4.1, Subpart V, 264.32]

Buildings at TA-55 are equipped with multiple audible and visual safety alarm systems to alert personnel in the event of an emergency and to evacuate the area. These alarm systems are located both inside and outside buildings at TA-55 and are monitored and controlled by the facility monitor/control system (FMCS). The FMCS is in operation 24 hours a day and is located in the Operations Center at TA-55-4 with access through TA-55-3. Specific FMCS alarm systems at TA-55 are discussed below.

The TA-55 fire detection alarm system is provided by a computerized fire alarm system that monitors smoke and heat sensors, fire alarm pull boxes, and drop box push-button alarms located throughout TA-55. Personnel working at any one of the units addressed in this permit application have access to fire alarm pull boxes and/or drop box push-button alarms in the vicinity of the unit. Fire alarm pull boxes may be used by personnel to activate a local fire alarm when a fire or other emergency is discovered. Fire alarm pull boxes are located at TA-55-4 in Room 401 (TA-55-4-401) and TA-55-4-429 on the first floor and throughout the basement in the vicinity of the container storage areas. Five fire alarm pull boxes are readily available at TA-55-185 for personnel working in that building and outside TA-55-4 for personnel working at the container storage pad. In addition, drop box push-button alarms are located in laboratories on the first floor of TA-55-4. These alarms are used in the event of a fire in a drop box (or when needed) and are activated with push buttons. Once manually activated, the local drop box alarm (steady high-pitched sound) initiates an alarm in the Operations Center and an alarm at the Los Alamos County Fire Department (LACFD). Automatic thermal alarms are also located in active gloveboxes at TA-55-4.

Buildings at TA-55 are equipped with fire-suppression alarm systems and/or smoke detectors. The fire-suppression alarms are activated when water flow is detected in the sprinkler pipes of the fire-suppression system. The smoke detectors, once activated, also sound an alarm. Both types of alarms are area-specific and sound only in the affected area. Red lights are mounted

both inside and outside of structures at strategic locations at TA-55. Upon activation of the fire alarm system, the alarm sounds and the red lights flash to alert personnel of emergency conditions. All fire alarm pull boxes, heat and smoke detection systems, and automatic fire-suppression systems at TA-55 are connected to the LACFD through LANL's Central Alarm Station (CAS) (refer to Section 7.3.2.2) at all times.

A general evacuation alarm (loud mid-range pulsating tone) is activated by gamma sensors on the ceilings of rooms on the first floor of TA-55-4 and in other areas of the basement and sounds throughout TA-55. This alarm serves to alert personnel when abnormally high levels of radiation are detected. It may also be activated by the Operations Center for other emergencies requiring evacuation.

TA-55-4 is also equipped with a continuous air monitor (CAM) alarm system (local, high-pitched pulsating tone). CAMs, located throughout TA-55-4, sample the air and sound an alarm when airborne radioactivity is detected above acceptable levels.

Additionally, TA-55-4 is equipped with a ventilation alarm system designed to monitor ambient air for personnel working in areas containing hazardous or mixed waste and to monitor air pressure. The ventilation system creates zones within TA-55-4 which are at a lower pressure than the outside air. Air flows from the zones of highest pressure to the zones of lowest pressure (highest potential contamination areas). The air flow through the different zones is carefully balanced and controlled to provide the greatest protection to the personnel as well as to the environment. If negative air pressures exceed designated limits, a ventilation alarm (slow, repeating chime sound) is activated.

In addition to the alarms described above, the public address (PA) system may also be used to announce an evacuation at TA-55. The PA system can be heard throughout TA-55 and is activated by the Operations Center.

TA-55 is equipped with both local paging and conventional telephones to provide adequate communication and to summon external emergency assistance, if necessary. Local paging telephones and speakers and/or conventional telephones are located at or near all of the hazardous and mixed waste units addressed in this permit application (refer to Attachment 7-1

of this permit application). Local paging telephones are used to page on-site personnel within the local paging area and may be used in the event of an emergency to communicate the location and nature of hazardous conditions to personnel in the area. The general evacuation alarm system at TA-55 is interrupted when the TA-55 PA system is activated through the Operations Center. Personnel working at any of the units at TA-55 can also use conventional telephones to call the Operations Center to summon emergency assistance from the TA-55 Emergency Response Team, local police and fire departments, and state emergency response teams, if necessary.

Fire control equipment is readily available for each unit addressed in this permit application. Attachment 7-1 of this permit application describes the type, quantity, and location of the fire control equipment available at TA-55. Depending on the size of the fire and the fuel source, portable fire extinguishers may be used by on-site personnel. However, LANL policy encourages immediate evacuation of the area and notification of appropriate emergency personnel. All buildings at TA-55 are equipped with heat and smoke detection systems and/or automatic, heat-activated fire-suppression systems to aid in the timely response in the event of fires in these buildings.

Seven fire hydrants are currently located at TA-55, on the north, south, and west sides of TA-55-4. Water is supplied to the fire hydrants by a municipal water system which provides adequate volume and pressure (i.e., greater than 1,000 gallons [gal] per minute and 90 pounds per square inch static pressure) to multiple water hoses in the event of a fire. The LACFD will supply all water hoses needed in the event of a fire at TA-55. LANL plans to install additional fire hydrants at TA-55 to better serve all of the hazardous and mixed waste units. The hydrants will be installed according to National Fire Protection Association standards.

Spill control equipment maintained at TA-55 includes a portable spill cart, extra sorbents, and spill pillows (see Attachment 7-1). The mobile spill cart is located in the south, east-west corridor of TA-55-4, between TA-55-4-420 and TA-55-4-429. The spill cart can be transported to any location at TA-55-4 and contains protective suits; polyethylene booties; latex, polyethylene, and neoprene gloves; chemical protective goggles; gas mask canisters; masking, vinyl, and caution tape (acid/caustic); spill pillows; neutra acid and neutra base with spray triggers; base neutralizer; tools; cheesecloth; and a vinyl bag. TA-55-4-401, TA-55-4-432, TA-55-4-433, and a portion of

the basement (i.e., Area 6 as identified on Figure 7-5 of this permit application) at TA-55-4 have recessed floors to aid with spill containment (refer to Section 4.0 and Attachment 7-1). Sorbents are located in a shed on the container storage pad outside TA-55-4 and can be used to contain any spills that might occur at the container storage pad. TA-55-185 will be equipped with similar spill control equipment (e.g., sorbents) once wastes are managed there. Personnel who have the knowledge and training may use this equipment to mitigate small, containable spills when they are certain their actions will not put themselves or others at risk.

Personnel decontamination equipment is available at TA-55 for personnel working at any one of the units included in this permit application. The equipment includes portable eyewash stations and safety showers. Eyewash stations are located in TA-55-4-401, TA-55-4-429, and throughout the basement of TA-55-4. Eyewash stations are also located on the container storage pad and outside on the south side of TA-55-4 near TA-55-185. TA-55-185 will be equipped with an eyewash station if liquid wastes are managed there. Safety showers are readily available in TA-55-4-401, TA-55-4-429, and TA-55-4-433; in the office for Area 6 within TA-55-4 (basement); on the container storage pad; and outside on the south side of TA-55-4. TA-55-185 will be equipped with a portable safety shower if liquid wastes are managed there. A mobile decontamination cart is located north of Area 2 (refer to Figure 7-5 of this permit application) in TA-55-4 (basement). The cart can be transported throughout TA-55 and contains items such as paper hoods and coveralls, protective booties, gloves, tape, radiation tape, mops, buckets, plastic sheeting, soap, liquid cleaner, markers, miscellaneous tools, towels, nose swabs, extension cords, bags, and cheesecloth. Additional mobile decontamination equipment may be provided by LANL's Hazardous Materials Response Group (ESH-10) personnel. Material Safety Data Sheets (MSDS) provide useful exposure information and are available in TA-55-4-401, TA-55-4-432, and Area 2 of TA-55-4. MSDSs will also be located in TA-55-185 once wastes are managed there.

5.2.2 Testing and Maintenance of Equipment [20 NMAC 4.1, Subpart V, 264.33]

All TA-55 communications and alarm systems and fire protection, spill control, and decontamination equipment are tested and/or maintained according to the inspection schedule provided in Section 6.0. The frequency of inspection is adequate to ensure proper operation in the event of an emergency. Repair and replacement of emergency equipment are performed as required.

5.2.3 Access to Communications or Alarm System [20 NMAC 4.1, Subpart V, 264.34]

Whenever waste is being handled at any of the hazardous and mixed waste units at TA-55 addressed in this permit application, all personnel involved have immediate access to an internal alarm or emergency communication device, either directly or through visual or voice contact with another individual. In the event of an emergency, communication equipment at TA-55 allows personnel to contact the TA-55 Operations Center, the operating group management, the Emergency Response Team, and/or the CAS operator (refer to Section 7.2.2). In addition to the communications and alarm systems described in Section 5.2.1, TA-55 personnel may carry pagers, two-way hand-held radios, and/or cellular telephones so that they can contact or be contacted by TA-55 and other LANL emergency support personnel at all times.

5.2.4 Aisle Space Requirements [20 NMAC 4.1, Subpart V, 264.35]

For waste containers managed at the container storage areas addressed in this permit application, adequate aisle space is and will be maintained between rows of containers such that the wastes can be managed safely and easily. Adequate aisle space allows for the unobstructed movement of personnel and fire protection, spill control, and decontamination equipment to any part of the container storage area in the event of an emergency. In addition, adequate aisle space facilitates inspections, as discussed in Section 6.0.

5.2.5 Support Agreements with Outside Agencies [20 NMAC 4.1, Subpart V, 264.37(a)]

The U.S. Department of Energy maintains support agreements in the form of contracts and memoranda of understanding with various outside response agencies for emergency response assistance at LANL. In addition, LANL maintains contracts with additional response groups for security and scene access (i.e., PTLA) and maintenance support (i.e., Johnson Controls World Services Inc.) during emergency response. The "Contract Between the U.S. Department of Energy and the Incorporated County of Los Alamos" provides for the training of emergency response personnel so that they are familiar with the layout of the facility, the properties of hazardous waste handled at the facility, the associated hazards, and the possible evacuation routes. The "Memorandum of Understanding Between the U.S. Department of Energy Los Alamos Area Office and the Incorporated County of Los Alamos for Mutual Aid Assistance" summarizes the agreement for local police assistance. The "Memorandum of Understanding Between the U.S. Department of Energy and the Los Alamos Medical Center Concerning Mutual Assistance and Emergency Support" allows for the training of medical personnel regarding the

care and treatment of patients contaminated with radioactive materials. Support agreements are discussed briefly in the contingency plan (Section 7.0) and copies are presented as Appendices F, G, and H of this permit application. Responsibilities of internal and external emergency response groups and agencies are discussed fully in Section 7.2.

5.3 PREVENTIVE PROCEDURES, STRUCTURES, AND EQUIPMENT [20 NMAC 4.1, Subpart IX, 270.14(b)(8)]

A description of the preventive procedures, structures, and equipment at TA-55 is presented below. This information is provided in accordance with the requirements of 20 NMAC 4.1, Subpart IX, 270.14(b)(8), revised November 1, 1995. Adherence to the procedures and proper use of the structures and equipment will help to prevent hazards, prevent undue exposure of personnel to hazardous and mixed waste, and prevent releases to the environment.

Flatbed trucks and trailers or forklifts may be used to transport waste containers to and from the container storage areas at TA-55. Forklift operators may use a boom, if necessary, to improve handling capabilities. Small containers may be handled manually or with a dolly. The use of proper handling equipment, appropriate to a container's size and weight, helps to prevent hazards while moving containers. As required by 20 NMAC 4.1, Subpart V, 264.171, revised November 1, 1995, any container that is not in good condition (e.g., severe rusting, apparent structural defects) will be overpacked or the wastes will be repackaged in new containers that are in good condition before being stored at any of the container storage areas at TA-55. These waste management practices facilitate safe handling of containers in these storage areas.

Runoff from the units at TA-55 addressed in this permit application to other areas of the facility or to the environment is and will be prevented. Secondary containment is provided at TA-55 at each hazardous and mixed waste unit included in this permit application where potential liquid-bearing containers are or may be stored. Self-containment systems will be utilized in any of the container storage areas as needed. TA-55-4-401 serves as secondary containment for the two storage tank systems and the cementation unit addressed in this permit application (refer to Sections 4.3 and 4.5). Additional information on the containment structures/systems at TA-55 is provided in Section 4.0. Secondary containment systems will be sufficient to contain at least 10 percent of the volume of potential liquid-bearing containers or the volume of the largest container, whichever is greater, in each container storage area, pursuant to the requirements of

20 NMAC 4.1, Subpart V, 264.175(b)(3), revised November 1, 1995. As discussed in Section 4.3.3, each storage tank system will have adequate secondary containment as required in 20 NMAC 4.1, Subpart V, 264.193, revised November 1, 1995. Runoff control of liquids resulting from fire-suppression activities and from leaks or spills will be accomplished by using a vacuum truck, a portable pump, a high-efficiency particulate air (HEPA) vacuum, and/or sorbents, depending on the volume of accumulated liquid. Accumulated liquids will be removed as soon as possible. Surface runoff (e.g., precipitation) will be managed according to the Clean Water Act's National Pollutant Discharge Elimination System criteria.

Run-on to any of the TA-55 units addressed in this permit application by sheet flooding is and will be prevented. With the exception of the container storage pad, all of the units addressed in this permit application are located indoors (i.e., in TA-55-4 and TA-55-185). The container storage pad is abovegrade and positive surface drainage will direct potential run-on away from this container storage area. In addition, containers stored on the container storage pad are covered (refer to Section 4.1.9). Pursuant to the requirements of 20 NMAC 4.1, Subpart IX, 270.14(b)(19)(xi), revised November 1, 1995, Map 1 in Section 2.0 of this permit application shows the contours and surface drainage around the container storage pad, TA-55-4, and TA-55-185. These features will prevent run-on to the units at TA-55.

For several reasons, it is not anticipated that there will be any impact to ground water or other water supplies as a result of waste-handling operations at TA-55. The depth to ground water at TA-55 is approximately 1,200 ft (IT, 1987). Geologic units underlying TA-55 include layers of unsaturated volcanic tuff and ash, the moisture content of which ranges from 0.2 to 2.0 percent by weight (IT, 1987). Because the moisture content is insufficient for moisture migration through the Bandelier Tuff, no impact to ground water is expected. In addition, all water supply lines are under pressure and are equipped with backflow prevention devices. Pursuant to the requirements of 20 NMAC 4.1, Subpart IX, 270.14(b)(8)(iii), revised November 1, 1995, no impact to water supplies is expected.

Electrical power is supplied to all areas where hazardous and mixed waste units are located at TA-55. Supplied power may be used to operate CAMs, "giraffes" (i.e., airborne particulate monitors), ventilation systems, the PA system, various instruments, and other electrical equipment. In the event of a power failure, portable generators are available from the Nuclear

Materials Technology Division's Facilities Management Group (NMT-8) support office and at TA-55-3. These generators may be used as temporary power sources at any of the units within TA-55. Evacuation alarms located throughout TA-55 are equipped with a battery back-up and will continue to operate for eight hours during a power failure. Operations at any of the units would be discontinued temporarily if electrical power was not restored quickly or if container-handling equipment failed. However, neither a power nor an equipment failure would affect containment at any of the units at TA-55.

To prevent undue exposure of personnel to hazardous or mixed waste, personal protective equipment appropriate for the waste being handled will be worn by all on-site personnel at TA-55 involved in waste management activities at any of the units. Workers involved in waste handling at TA-55 are required to wear protective work uniforms and steel-toed shoes, as appropriate. Hard hats and gloves may also be worn while equipment is being operated and when containers are being loaded or unloaded at the container storage areas.

Releases to the atmosphere are not anticipated at any of the units at TA-55 that are addressed in this permit application. Containers are kept closed during handling and storage except when, upon inspection, it is determined that containers need to be overpacked or the contents repackaged in new containers or when it is necessary to add or remove waste. Daily inspections are conducted to ensure the integrity of all stored containers. The cementation unit located in TA-55-4-401 is operated within a vacuum-pressured glovebox equipped with HEPA filters, as described in Section 4.5.1. As discussed in Section 5.2.1, TA-55-4 is also equipped with a ventilation system that creates zones of increasingly negative air pressure. This system prevents the release of any airborne contaminants from TA-55-4. CAMs, the ventilation alarm system, and/or other air monitoring equipment are located in the vicinity of each unit located in TA-55-4 and, in the event of an unexpected release, all personnel working within or near the area would be notified immediately to evacuate.

5.4 PREVENTION OF ACCIDENTAL IGNITION OR REACTION OF IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTE [20 NMAC 4.1, Subpart IX, 270.14(b)(9), 270.15(c) and (d), 270.16(j), 270.23(a)(2); 20 NMAC 4.1, Subpart V, 264.17, 264.176, 264.177, 264.198, 264.199, and 264.601]

This section provides a description of the precautions used to prevent accidental ignition or reaction of ignitable, reactive, or incompatible wastes at the hazardous and mixed waste units at TA-55.

Ignitable and/or reactive wastes (e.g., discarded materials contaminated with ignitable spent solvents, reactive metal debris) are or may be stored in containers at any of the TA-55 container storage areas. Containers holding ignitable or reactive wastes are or will be located at least 50 ft from the facility's property line at all times (refer to Map 1 of Revision 1.0 of the TA-55 Part A permit application) and will be separated and protected from sources of ignition or reaction. Policies and features are in place at TA-55 that minimize the possibility of accidental ignition. Mechanical equipment operated within TA-55 is grounded to minimize the potential for sparking by dissipating static charges. In addition, smoking is allowed only within designated areas at TA-55 and is not allowed at any of the units addressed in this permit application. "No Smoking" signs are conspicuously placed at units (or accesses of units) at TA-55 that are addressed in this permit application wherever there is a potential hazard from ignitable or reactive waste, as required by 20 NMAC 4.1, Subpart V, 264.17(a), revised November 1, 1995. Together, these measures meet the requirements of 20 NMAC 4.1, Subpart V, 264.17(a) and (b) and 264.176, revised November 1, 1995.

Incompatible wastes, if any, are kept segregated during storage at TA-55 as described in Section 4.2.4. In addition, no incompatible wastes will be mixed, and no waste will be placed in a container that previously held an incompatible waste, as required by 20 NMAC 4.1, Subpart V, 264.177(a) and (b), revised November 1, 1995, and 20 NMAC 4.1, Subpart IX, 270.15(d), revised November 1, 1995. If incompatible wastes are stored in any of the container storage areas addressed in this permit application, the requirements of 20 NMAC 4.1, Subpart V, 264.177(c), revised November 1, 1995, will also be met. Only containers made of or lined with materials that will not react with and are otherwise compatible with the waste to be stored will be used for storage at these container storage areas.

Ignitable and/or reactive hazardous or mixed wastes are not currently stored in the two storage tank systems in TA-55-4-401. If ignitable and/or reactive wastes are managed, they will be managed in compliance with the requirements of 20 NMAC 4.1, Subpart IX, 270.16(j), revised November 1, 1995; 20 NMAC 4.1, Subpart V, 264.17, revised November 1, 1995; 20 NMAC 4.1, Subpart V, 264.198, revised November 1, 1995; and 20 NMAC 4.1, Subpart V, 264.199(a), revised November 1, 1995.

It is not anticipated that incompatible wastes will be placed in the same tank system or that a mixed waste will be placed in a tank system that previously held an incompatible waste. However, in the unlikely event that incompatible wastes may be stored, precautions will be taken in accordance with the requirements of 20 NMAC 4.1, Subpart V, 264.17(b), revised November 1, 1995.

Ignitable and/or reactive wastes are not currently treated in the cementation unit in TA-55-4-401. If ignitable and/or reactive wastes are managed, they will be managed in compliance with the requirements specified in 20 NMAC 4.1, Subpart IX, 270.14(b)(9), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.17, revised November 1, 1995.

It is not anticipated that incompatible wastes will be treated in the cementation unit or that a mixed waste will be treated in a vessel that previously held incompatible wastes. All wastes to be cemented are certified by TA-55 waste management personnel prior to treatment. Additionally, the cementation treatment process itself is administratively controlled to prevent commingling of incompatible wastes. However, in the unlikely event that incompatible wastes may be treated, precautions will be taken in accordance with the requirements of 20 NMAC 4.1, Subpart V, 264.17(b), revised November 1, 1995.

5.5 AIR EMISSIONS STANDARDS FOR EQUIPMENT LEAKS [20 NMAC 4.1, Subpart V, Part 264, Subpart BB]

The waste management units addressed in this permit application are not subject to 20 NMAC 4.1, Subpart V, Part 264, Subpart BB, revised November 1, 1995, air emission standards for equipment leaks, with the exception of the reporting requirements specified in 20 NMAC 4.1, Subpart V, 264.1064(k), revised November 1, 1995. None of the equipment associated with the

waste management units at TA-55 contain or contact hazardous or mixed waste with organic concentrations of at least 10 percent by weight.

In accordance with 20 NMAC 4.1, Subpart V, 264.1064(k), revised November 1, 1995, TA-55 will use knowledge of the nature of the hazardous/mixed waste stream(s) or knowledge of the process by which hazardous/mixed waste was produced to document their exemptions to these standards. Production process information documenting that no organic compounds are contained in or contacted by equipment associated with waste management units will be recorded in TA-55's facility operating record.

A new determination will be made whenever there is a change in a process at TA-55 that produces hazardous/mixed waste that could result in an increase in the total organic content of waste contained in or contacted by equipment currently determined not to be subject to these requirements.

5.6 ORGANIC AIR EMISSION STANDARDS [20 NMAC 4.1, Subpart V, Part 264, Subpart CC]
Some of the waste management units described in this permit application (e.g., container storage areas) could potentially manage hazardous wastes subject to the Code of Federal Regulations, Title 40 (40 CFR), Part 264, Subpart CC, standards for volatile organic emissions after the effective date of regulations. Applicability of these requirements to mixed waste has been temporarily deferred. Subpart CC standards for containers, as currently set forth by the U.S. Environmental Protection Agency (59 *Federal Register* 62896), require that containers be covered so that there are no detectable emissions. This requirement is met through the management practices currently in place at the TA-55 container storage areas.

The standards for volatile organic emissions are not applicable to containers of waste with less than 100 parts per million by weight (ppmw) volatile organics, containers of less than 0.1 cubic meters (m^3) (approximately 26 gal) capacity, or containers that have received waste prior to the effective date of regulation. Containers of less than 0.46 m^3 (approximately 119 gal) capacity and that meet U.S. Department of Transportation (DOT) specifications under 49 CFR Part 178 will be closed during storage pursuant to 40 CFR 264.1086(b)(1)(ii). Containers of greater than 0.46 m^3 capacity or that are greater than 0.1 m^3 capacity that do not meet DOT specifications and that contain wastes of greater than 100 ppmw volatile organics will be subject to a visual inspection

and monitoring program as required by 40 CFR 264.1088(b). Containers undergoing the waste characterization activities described in this permit application (refer to Section 3.0) may be open for access for the purposes described in 40 CFR 264.1088(c).

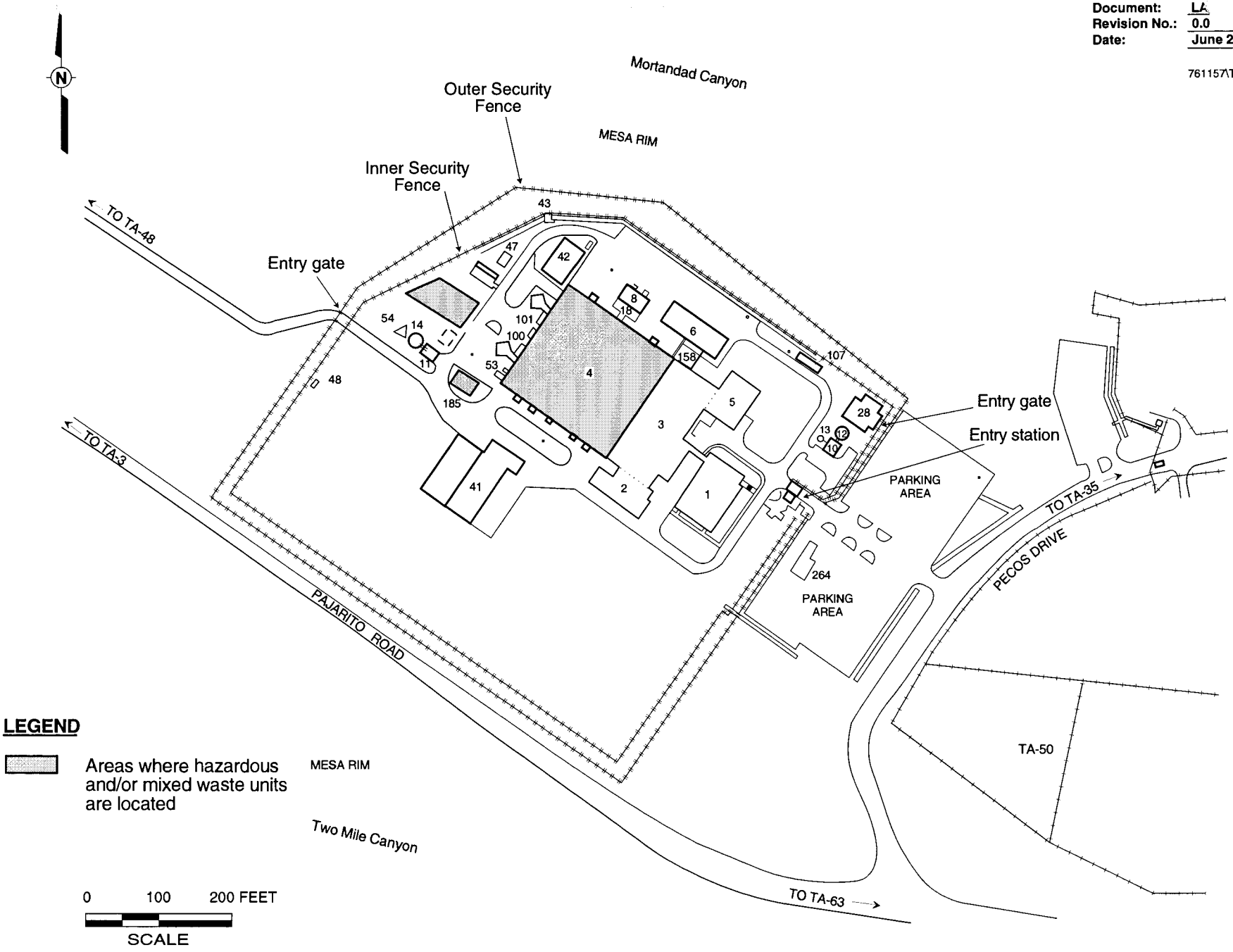


Figure 5-1
Location Map Showing Security Fences, Entry Gates, and Entry Station at Technical Area (TA) 55

6.0 INSPECTION PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart V, 264.15, revised November 1, 1995, "General Inspection Requirements," this section presents inspection requirements for hazardous and mixed waste container storage areas, mixed waste storage tank systems, and a mixed waste cementation unit located at Technical Area (TA) 55 at Los Alamos National Laboratory (LANL). Inspection schedules for the units included in this Part B permit application have been developed to identify equipment malfunctions and deterioration, operator errors, and discharges that might cause or lead to a release of hazardous or mixed waste and pose a threat to human health and the environment. As specified in 20 NMAC 4.1, Subpart IX, 270.14(b)(5), revised November 1, 1995, a copy of the general inspection schedule is being submitted with this permit application. Inspections will be conducted with sufficient frequency to identify problems in time to correct them before they harm human health or the environment.

6.1 GENERAL INSPECTION REQUIREMENTS AND SCHEDULES [20 NMAC 4.1, Subpart IX, 270.14(b)(5); 20 NMAC 4.1, Subpart V, 264.15(a),(b), and (c)]

In accordance with the requirements of 20 NMAC 4.1, Subpart IX, 270.14(b)(5), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, 264.15(a), (b), and (c), revised November 1, 1995, inspection schedules have been developed and are in place at TA-55. The schedules will be followed for the inspection of monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment that are important to preventing, detecting, and responding to environmental or human health hazards.

Inspections at TA-55 are conducted by different groups depending on the item(s) being inspected. Nuclear Materials Technology (NMT) Division personnel inspect the hazardous/mixed waste management units addressed in this permit application, with the exception of the Area 6 container storage area. (Inspection procedures, frequencies, and documentation for this area are detailed in Section 6.5). Inspections conducted by NMT personnel are recorded on LANL's Hazardous and Mixed Waste Facility Inspection Record Form (IRF). An example of the current IRF, which may be amended from time to time, and instructions for its completion are provided as Attachment 6-1. Inspection schedules outlining the items to be addressed on the IRF, as well as

inspection frequencies, are provided in Sections 6.2, 6.3, and 6.4 and summarized in Table 6-1 for the unit types included in this permit application.

NMT's Facilities Management Group (NMT-8) performs facilitywide inspections of equipment/structures that are important in preventing, detecting, and responding to environmental or human health hazards. These inspections address items such as the various alarms, fire suppression/detection equipment, and communication equipment throughout TA-55. These inspections are scheduled and documented by NMT-8 on standardized forms. NMT-8 inspection items and frequencies are contained in Section 6.6.

The activities discussed below are addressed according to the specified regulatory requirements as well as according to existing LANL inspection requirements for hazardous and mixed waste units.

6.1.1 Inspection Records [20 NMAC 4.1, Subpart V, 264.15(d)]

For a minimum of three years from the date of inspection, NMT personnel will retain the original inspection records. They will send copies of the inspection records to LANL's Hazardous and Solid Waste Group (ESH-19). ESH-19 will maintain their copies of the inspection records for a minimum of three years from the time the copy is received.

Inspection records generated by NMT-8 (see Section 6.6) are maintained at TA-55 by the Internal Records Management group for a minimum of three years. In addition, inspection records generated by NMT groups will be available for review in the event that the New Mexico Environment Department, the U.S. Environmental Protection Agency, or the U.S. Department of Energy (DOE) inspects the facility for compliance with inspection requirements.

6.1.1.1 Inspection Record Form

Because the IRF is a comprehensive form that applies to all categories of both hazardous and mixed waste units, not all sections of the form apply to all units. The IRF encompasses requirements in 20 NMAC 4.1, Subpart V, revised November 1, 1995, for permitted hazardous waste units; requirements in 20 NMAC 4.1, Subpart VI, revised November 1, 1995; and additional requirements directed by LANL policy. All 20 NMAC 4.1, Subpart V, revised November 1, 1995, inspection requirements are addressed for the units included in this permit application during each

inspection. Instructions included with the IRF provide specific guidance for each inspection parameter listed.

The IRF will be completed according to the schedules provided in Sections 6.2, 6.3, and 6.4. In the event that the primary inspector is not available to complete the IRF, an alternate will be responsible for its completion. All of the hazardous and mixed waste units at TA-55 require inspections each working day. These inspections are recorded in Parts I and II of the IRF for each working day that waste is treated or stored. For each working day that waste is not treated or stored, a check mark will be placed in the "No Use" block in Part I.

For every item requiring inspection at TA-55, a response indicating the condition of each item must be entered in the column under the appropriate day of the week. The response is either "OK" or "AR" (action required). If the response is "AR", the required action must be noted in Part II of the IRF. If more than one "AR" is listed, "ARs" should be numbered. If inspection results indicate that corrective measures are warranted, any and all actions taken (along with the time, the date, and other pertinent information) will be recorded in Part II of the IRF and on all subsequent IRFs until corrective measures are completed. Only after corrective measures have been completed and recorded on an IRF can an "OK" be entered in the "Condition" column on the IRF.

6.1.2 Inspection Frequency

Inspection frequencies relevant to the hazardous and mixed waste units at TA-55 addressed in this permit application are specified in Sections 6.2 through 6.6 of this plan. Inspection frequencies may be increased at the discretion of NMT groups or ESH-19; if unexpected malfunctions occur; or if an accelerated deterioration rate of the containers, the storage tank systems, the cementation unit, or the secondary containment systems is detected.

6.1.3 Actions Resulting From Inspections [20 NMAC 4.1, Subpart V, 264.15(c), 264.171, 264.196, and 264.601]

The following paragraphs describe the types of actions that may be taken in response to an inspection.

6.1.3.1 Preventive Action

If any defects, deterioration, damage, or potential hazards are discovered during an inspection, appropriate corrective measures (i.e., the transfer of waste from the defective container to an appropriate container in good condition or the cessation of flow to a tank if it is found to be unfit for use or a leak is detected) will be completed promptly to minimize further damage and prevent the need for emergency response. Any preventive action taken in response to an inspection will be noted on the appropriate inspection form.

6.1.3.2 Remedial and Emergency Action

If a hazardous condition is imminent or has already occurred, remedial action will be taken immediately. The condition will be assessed by the group leader (or designee) responsible for the unit. If this assessment indicates that human health and/or the environment has been or may be adversely affected, the contingency plan (Section 7.0 of this permit application) will be implemented immediately. The contingency plan discusses the appropriate responses to emergency situations. Evacuation determinations will be made as outlined in Table 7-4. In the event the contingency plan is implemented, any sampling, decontamination, and verification will be conducted as specified in that plan.

6.2 INSPECTION SCHEDULE AND REQUIREMENTS FOR CONTAINER STORAGE AREAS [20 NMAC 4.1, Subpart V, 264.15(b) and 264.174]

Each container storage area at TA-55 is inspected according to the schedule provided below and summarized in Table 6-1 with the exception of Area 6 in the basement of Building 4 (TA-55-4). The inspection frequency is adequate based on the deterioration rate of equipment/systems and the probability of adverse impact to human health or the environment if failure of the equipment/systems or any operator error goes undetected between inspections. For specific information on the design of hazardous and mixed waste container storage areas at TA-55, refer to Section 4.1 of this permit application.

6.2.1 Daily

Daily inspection requirements are met for container storage areas subject to activities such as loading and unloading, moving existing waste drums, and/or incorporating new drums into a storage area. All container storage areas at TA-55, with the exception of Area 6, are inspected

each working day when in use (i.e., when waste is stored at the area). For the daily inspection, the items in the following blocks on the IRF will be addressed, as appropriate:

Block Number	Item(s)
1–5	General information
6	No use
7	(Un)loading areas
13	Structural integrity of containers
14	Covers/lids of containers
15	Warning signs
16	Labels
17	Accumulation start date
22	Secondary containment structures
23	Appropriate aisle space and stacking
24	Appropriate container segregation
28	Wind sock
30	Pallets
39	Radiation safety
40–48	General information

6.3 INSPECTION SCHEDULE AND REQUIREMENTS FOR STORAGE TANK SYSTEMS [20 NMAC 4.1, Subpart V, 264.15(b) and 264.195(a)]

The two storage tank systems at TA-55 addressed in this permit application are inspected according to the schedule provided below and summarized in Table 6-1. The inspection frequency is adequate based on the deterioration rate of equipment/systems and the probability of adverse impact to human health or the environment if failure of the equipment/systems or any operator error goes undetected between inspections. For specific information on the design, process, or operation of the storage tank systems at TA-55, refer to Section 4.3 of this permit application.

6.3.1 Daily

The storage tank systems (including ancillary equipment) at TA-55 are inspected at least once each operating day for the items listed below.

Block Number	Item(s)
1–5	General information
6	No use (if applicable)
7	(Un)loading areas
9	Aboveground portions of tank systems to detect corrosion or releases of waste and to detect any possible malfunctions to overfill/spill control equipment, tank monitoring and leak detection systems, and data from these systems
13	Structural integrity of tanks, valves, pipes, flanges
15	Warning signs
16	Labels
22	Secondary containment structures
39	Radiation safety
40–48	General information

6.4 INSPECTION SCHEDULE AND REQUIREMENTS FOR THE CEMENTATION UNIT [20 NMAC 4.1, Subpart V, 264.15(b) and 264.602]

The cementation unit is inspected according to the schedule provided below and summarized in Table 6-1. The inspection frequency is adequate based on the deterioration rate of equipment/systems and the probability of harm to human health or the environment if failure of the equipment/systems or any operator error goes undetected between inspections. For specific information on the design, process, or operation of the cementation unit at TA-55, refer to Section 4.5 of this permit application.

6.4.1 Daily

The cementation unit at TA-55 for treatment of mixed waste by solidification is inspected each operational day (i.e., when waste is treated in the unit). For the daily inspection of the cementation unit, the items in the following blocks on the IRF are addressed, as appropriate:

Block Number	Item(s)
1–5	General information
6	No use
7	(Un)loading areas
13	Structural integrity of containers

Block Number	Item(s)
14	Covers/lids of containers
15	Warning signs
16	Labels
22	Secondary containment structures
39	Radiation safety
40–48	General information

6.5 INSPECTION PROCEDURES AND FREQUENCIES FOR AREA 6 AT TA-55 [20 NMAC 4.1, Subpart V, 264.15(b) and 264.174]

A portion of the stored items in Area 6 in the basement of TA-55-4 is regulated pursuant to 20 NMAC 4.1, revised November 1, 1995. Area 6 has 13 rooms located along a central corridor. The radiological dose rate for the rooms averages approximately 10 milliroentgen per hour for beta/gamma radiation and approximately 52 millirem per hour for neutron radiation. Performance of a weekly walk-through inspection of this area pursuant to the requirements of 20 NMAC 4.1, Subpart V, 264.174, revised November 1, 1995, would lead to a significant increase in radiological exposure to workers. The safety of the workers is a high priority at LANL, which implements the "as low as reasonably achievable" (ALARA) principle established by the Atomic Energy Act. Environmental protection is also a high priority at LANL. Because of these concerns, an inspection process has been implemented that will ensure worker safety as well as environmental protection. The core requirements of the inspection are followed for the portion of stored material that is regulated pursuant to 20 NMAC 4.1, revised November 1, 1995, with adjustments to adhere to the ALARA principle.

6.5.1 Daily

Area 6 is sealed, alarmed, monitored by surveillance cameras, and patrolled every four hours during off-shifts. When Area 6 is opened, the loading and unloading areas are inspected, entries/changes during the off-shift are checked, alarms are checked for activation, central hallways are visually inspected, and the Nuclear Material Custodian is contacted to verify that no alarms or problems occurred during the off-shift. This daily check verifies that no materials have been diverted, no releases have occurred, there is no evidence of spill/release in the main hallways, and that databases and exterior phones are operable.

In addition, the following are checked on a daily basis:

- Area 6 telecommunications equipment
- All storage cage doors are closed
- Visual inspection of all storage rooms from the central hallway
- Warning signs and obvious labels are posted, legible, complete, and in good condition
- Emergency equipment is present and in good working order
- There is no liquid on the floor in rooms where liquids are stored or liquids are utilized for cooling plutonium-238
- Emergency lighting is functioning.

Area 6 (i.e., individual storage rooms) is also inspected daily for obvious container deterioration, liquid on the floor or shelves, spilled solids, or any other indication of a damaged container or release that can be determined from the central corridor. Observations are recorded on the LANL IRFs that are maintained at TA-55. The sheets include the date and time of the inspection, the name of the inspector, the observations made, and the date and nature of any remedial action resulting from the inspection.

6.5.2 Area 6 Receipt and Issue Inspection

When containers are placed into or taken out of Area 6, they are visually checked for rust, corrosion, dents, leaks, improper closure, bulges, discoloration, and any other indication that their integrity may be compromised. When containers are replaced or removed, all additional containers at that storage location are also inspected. A device placed on the container by the generator at the point of generation, called a tamper-indicating device (TID), is inspected to ensure the lid of the container has remained sealed. If a container has been opened, the TID will be broken. Container transfers and resulting inspections are noted on the Vault Location Inspection Database maintained at TA-55. This database includes the date of inspection, the location inspected, and the name of the inspector. If a problem with a container is identified, it is removed from Area 6 and inspected in an open-front hood. Information obtained during the inspection is recorded in the Vault Container Inspection Database (VCID).

6.5.3 Material Control and Accountability

A statistically representative number of containers (designed to provide a 95% confidence level that no diversion of materials has occurred) are also inspected during nuclear material safeguard audits, currently conducted on a bi-monthly basis. The containers are removed from Area 6, nondestructively assayed for the quantity of nuclear material present, then placed back in Area 6. Nondestructive assay measurements may include segmented gamma-scan, neutron counting, gamma isotopic coupled with calorimetric assay, or gamma signature. Findings are noted in the VCID. Corrective action is taken if problems are noted. This provides another method to ensure container integrity.

6.5.4 Safeguards

Releases from containers in Area 6 can also be detected through the use of continuous air monitors (CAM) located in each individual storage room within Area 6. CAMs are instruments that continuously monitor airborne radioactive material levels. If the concentration of an airborne material reaches a preset level, an alarm will sound. Because all of the containers in Area 6 contain radioactive material, if container integrity is compromised and the material inside becomes airborne, the CAM will detect the release and sound an alarm. To ensure proper operation of the CAMs, daily functional checks are performed by LANL Health Physics Operations Group (ESH-1) personnel. Positive airflow checks and internal source checks are performed weekly by ESH-1. Each CAM is also calibrated weekly by ESH-1. In addition, CAM air intakes have been placed near the negative air exhaust vent for each room. Placing CAM air intakes near room exhaust points provides the most beneficial location within the room to detect a release because air vented from each room must pass by the CAM intake prior to exhausting from the room. Each room has a single exhaust vent. The frequency of CAM airflow checks, source checks, and calibration may change in the event that the DOE increases ALARA restrictions.

Area 6 has extremely strict security and safeguards. Because of these security measures, the potential for container breaches through inadvertent and uncontrolled access to Area 6 is removed.

6.6 ADDITIONAL INSPECTION ITEMS

The inspection items presented in this section are applicable to all of the hazardous and mixed waste management units at TA-55. These facilitywide inspections are scheduled, conducted, and

documented by NMT-8. The items listed below are inspected and documented on a routine basis:

- evacuation alarms
- ventilation alarms
- fire suppression system
- fire extinguishers
- communication equipment
- eyewashes/safety showers
- fire detection system

These inspection items may be changed at the discretion of NMT-8 to ensure consistency with the inspection items and frequencies specified in the most current version of the "TA-55 Final Safety Analysis Report" and the "TA-55 Technical Safety Requirements."

Table 6-1
Inspection Schedule for Hazardous and/or Mixed Waste Units at Technical Area 55[a]

UNIT TYPE	ENTRIES ON INSPECTION RECORD FORM
CONTAINER STORAGE AREAS (EXCLUDING AREA 6)	
EACH WORKING DAY TA-55	Blocks 1-5, 7, 13, 14, 15, 16, 17, 22, 23, 24, 28, 30, 39, 40–48
STORAGE TANK SYSTEMS	
EACH WORKING DAY	Blocks 1-5, 7, 9, 13, 15, 16, 22, 39, 40-48
CEMENTATION UNIT	
EACH WORKING DAY	Blocks 1-5, 7, 13, 14, 15, 16, 22, 39, 40–48

[a] All inspection requirements apply when hazardous or mixed waste is present at the unit.

ATTACHMENT 6-1

Hazardous and Mixed Waste Facility Inspection Record Form (and Instructions for Use)

HAZARDOUS AND MIXED WASTE FACILITY INSPECTION RECORD FORM

1 FACILITY	2 ☐ <90 DAY, GENERATOR STORAGE ☐ TREATMENT, STORAGE, DISPOSAL	3 START DATE	4 END DATE

5 ☐ Containers ☐ Landfill ☐ Surface Impoundment ☐ Waste Pile ☐ Thermal Treatment ☐ Chem/Phys/Bio. Treat.

☐ Incinerator ☐ Misc. Unit ☐ Tank ☐ UST ☐ Land Treatment ☐ Underground Inj.

PART I - Enter condition of item inspected (OK or AR*) in column for day inspected.

ITEM	INSPECTED FOR	SUN	MON	TUE	WED	THU	FRI	SAT
6 NO USE	CHECK IF NO WASTE IS PRESENT							
7 (UN)LOADING AREA TANKS/CONTAINERS	SPILLS AND DETERIORATION							
8 COMMUNICATION EQUIPMENT (PHONE/RADIO/ALARMS)	PROPERLY FUNCTIONING							
9 TANKS (ALL ABOVE GROUND PORTIONS) MONITORING DATA	DISCHARGE CONTROLS CONDITION, LEAKS, LEVEL (6" FREEBOARD), CORROSION							
10 SURFACE IMPOUNDMENTS AND CONTAINMENT	FREEBOARD (2 ft) SUDDEN DROPS IN LEVEL							
11 PORTA BERM	LEAKS, CONDITION							
12 EYE WASH SAFETY SHOWERS	LEAKS, FUNCTIONING							
13 STRUCTURAL INTEGRITY OF CONTAINERS/TANKS, VALVES, PIPES, AND FLANGES	DETERIORATION AND LEAKS, CORROSION, DAMAGE							
14 COVER/LID OF CONTAINERS	CLOSED AND SECURED							
15 WARNING SIGNS	POSTED & READABLE (BILINGUAL)							
16 LABELS	"HAZARDOUS WASTE" PRESENT ON ALL CONTAINERS/TANKS							
17 ACCUMULATION START DATE	PRESENT ON ALL CONTAINERS, TANKS, NONE EXCEED TIME RESTRICTIONS							
18 RUN ON/OFF CONTROL (AREA L, G, H, P) LANDFILLS, DETONATION PADS	INTEGRITY, EROSION, PONDING							
19 COVER INTEGRITY (AREA L, G, H, P), LANDFILLS	EROSION, SUBSIDENCE, WATER INTRUSION							
20 SECURITY	CONDITION, FENCE/GATES/LOCKS							
21 SITE LIGHTING	FUNCTIONS PROPERLY							

Attachment 6-1

Hazardous and Mixed Waste Facility Inspection Record Form

HAZARDOUS AND MIXED WASTE FACILITY INSPECTION RECORD FORM

ITEM	INSPECTED FOR	SUN	MON	TUE	WED	THU	FRI	SAT
22 CONTAINMENT STRUCTURES	INTEGRITY, STANDING WATER, VEGETATION, EROSION							
23 AISLE SPACE, STACKING	ADEQUACY, APPROPRIATENESS							
24 MANAGEMENT OF CONTAINERS	SEGREGATED ACCORDING TO COMPATIBILITY							
25 HOSE BIBS, WATER SUPPLY	LEAKS, FUNCTIONING							
26 STORAGE SHEDS	FLOOR DAMAGE, LIQUID							
27 ROAD/WORK SURFACES	CRACKS/POTHOLES							
28 WIND SOCK	DAMAGE, FUNCTIONING							
29 SHAFT COVER AND RAIL	PRESENT, DAMAGE							
30 PALLETS	INTEGRITY, DAMAGE							
31 TREATMENT TANKS	PROPER OPERATION, LEAKS							
32 REFRIGERATOR	DAMAGED CONTAINERS, PROPER OPERATION							
33 SPILL CONTROL, FIRE, AND EMERGENCY EQUIPMENT	PRESENT AND IN GOOD WORKING ORDER							
34 INCINERATOR EMERGENCY WASTE FEED CUTOFF/ALARMS	PROPER OPERATING CONDITION OF ALL SHUTDOWN CONTROLS							
35 INCINERATOR PUMPS, VALVES, PIPES, MONITORING CONTROLS	LEAKS/SPILLS/TAMPERING, OPERATING WITHIN SPECS.							
36 PRESSURE VESSELS (S-SITE)	DETERIORATION AND SAND CONDITION							
37 OIL BURN PANS (S-SITE)	DETERIORATION & LEAKS							
38 HE BURN PADS (S-SITE)	DETERIORATION, VEGETATION, SAND COND., EROSION							
39 RADIATION SAFETY	SIGNS, MONITORING (α β γ ^3H)							
40 DATE	DATE OF INSPECTION							
41 TIME	TIME OF INSPECTION							
42 INSPECTOR	INITIALS OF INSPECTOR							

Attachment 6-1 (Continued)

Hazardous and Mixed Waste Facility Inspection Record Form

HAZARDOUS AND MIXED WASTE FACILITY INSPECTION RECORD FORM

PART II - For any AR (Action Required) in PART I above, describe below: action required, action taken, date of action. Attach additional sheets if necessary.

(Note: Items 43-48 must be completed for all inspections.)

[43] INSPECTOR (Printed Name)	[45] Z NUMBER	[46] GROUP	[47] DATE	[48] TIME
[44] INSPECTOR (Signature)				

Attachment 6-1 (Continued)

Hazardous and Mixed Waste Facility Inspection Record Form

Instructions for Use of the Hazardous and Mixed Waste Facility Inspection Record Form

Part I

1. FACILITY: Location information including TA, building, and room if applicable. Other location descriptors may be necessary. (e.g., TA-59-3-114 or TA-59-1-S. Dock)

2. <90 Day, GENERATOR STORAGE should be checked if this location is intended for operation in accordance with generator requirements for storage of hazardous waste for less than 90 days.

   TREATMENT, STORAGE, DISPOSAL should be checked if this location is listed in LANL's Hazardous Waste Facility Permit or Part A application as a permitted or interim status TSD operation.

3. START DATE: The date of the first inspection for the week on that inspection sheet. (Usually the first working day of the week)

4. END DATE: The date of the last inspection for the week on that inspection sheet. (Usually the last working day of the week; however, if handling of hazardous waste occurs during the weekend, inspections must be conducted.)

5. Check the appropriate box for the type of operation. Several boxes may be checked if necessary for those locations where inspections are combined on a single sheet. You must have prior approval from ESH-19 to combine inspections for more than one unit.

6. NO USE: May be checked if the unit did not store, treat, dispose, or otherwise handle hazardous waste for the day/week in question. The individual responsible for the inspection must then only complete boxes 40 through 48 for that day/week. If any hazardous waste is subsequently placed at the site for any reason, a full inspection must be performed immediately and every working day thereafter until all waste is properly disposed of.

7. Loading and unloading areas must be inspected daily when in use for signs of damage or deterioration that may lead to an accident or spill. This includes asphalt pads and areas where containers or tanks are handled or contents thereof are transferred.

8. Communication equipment must be inspected for proper function: Includes all telephones, two-way radios, and alarms for the area being inspected. (An initial consultation with ESH-19 prior to use of the facility/location will determine what equipment is necessary at any particular location.)

9. For tank systems used for treatment or storage of hazardous waste, all aboveground portions of the tank system, including any and all ancillary plumbing, must be inspected daily for signs of leaking, corrosion, deterioration, or improper operation. Tanks must be operated with a minimum freeboard of 6 inches. If the tank system includes discharge controls, overtopping controls, tank level alarms, or other monitoring equipment, including leak detection equipment, all controls and relevant data must be checked to ensure they are operating properly and that operation is within design specifications for the system.

Instructions for Use of the Hazardous and Mixed Waste Facility Inspection Record Form (Continued)

10. Surface impoundments must be operated with a minimum of 24 inches (60 cm) of freeboard from the top of the dike or berm to the surface of the waste therein. Inspectors must look for signs of leaks, deterioration, and erosion of dikes, berms, and any associated plumbing or valves. These could include dying vegetation, gullies, and sudden changes in level.

11. For those locations where inflatable "Porta Berms" are used as secondary containment for tanks and containers of hazardous waste, inspectors must ensure that they are adequately inflated. Inspectors must also check for the presence of liquids in the containment unit that could indicate leaks or spills of hazardous waste. All monitoring and leak detection systems must also be checked.

12. Where required, eyewash and safety showers must be inspected to ensure proper operating condition. Outside locations must be checked for freezing.

13. All containers and tanks must be checked for structural integrity, leaks, corrosion, or damage. This item includes checking condition of all construction materials, fixtures, seams, and auxiliary equipment. See Item 9 above.

14. All tanks and containers used for treating or storing hazardous waste must have the cover or lid securely in place. Containers are not considered to be closed until the lid/cover is fastened in the manner the manufacturer originally intended.

15. Required signs must be readable and prominently posted. TSD facilities and <90 day storage areas must be equipped with bilingual (English/Spanish) signs with the legend "DANGER UNAUTHORIZED PERSONNEL KEEP OUT." TSDs must be identified with signs that read "HAZARDOUS WASTE STORAGE AREA." <90 day storage areas must be identified with a sign with the legend "<90 DAY HAZARDOUS WASTE STORAGE AREA."

16. All containers and tanks must be labeled with the words "HAZARDOUS WASTE" and with other words that identify the contents. Mixed waste must also be labeled as "RADIOACTIVE."

17. All containers and tanks of hazardous waste in TSDs or <90 day storage areas must be marked with the accumulation start date. At TSDs, containers without dates must be dated when they arrive at the facility. For wastes generated at <90 day storage areas and TSDs, containers must be marked with the accumulation start date at the time the container first receives any waste. For <90 day storage areas, no containers may exceed 90 days from accumulation start date to the time they are delivered to a permitted treatment, storage, or disposal unit. Waste management organizations will provide transportation for these wastes.

Instructions for Use of the Hazardous and Mixed Waste Facility Inspection Record Form (Continued)

18. Landfills and detonation pads must have run-on and runoff controls inspected wherever present. Leachate collection systems, where present, must also be inspected. Items to be inspected for are proper operating condition, damage, erosion, contaminant migration, ponding, etc. Detonation pads must be inspected for unburned or undetonated explosives, ordnance, and debris.

19. Landfill covers must be inspected at least weekly and after storms for evidence of erosion, subsidence, and water intrusion.

20. Site security must be verified. Items such as fences, gates, locks, etc., should be checked for proper condition and adequacy.

21. Site lighting must be adequate to prevent accidents related to hazardous waste operations and for any other night operations that may take place within the boundaries of the hazardous waste unit.

22. Secondary containment structures for hazardous waste operations must be inspected to verify proper operating condition and to ensure adequate capacity. Structures must also be inspected for the presence of standing water or hazardous waste. For incinerators and certain operations at TA-55, secondary containment includes inspections of gloves and gloveboxes, hoods, and ventilation systems where necessary.

23. Adequate aisle space must be maintained to allow for inspection and for the unobstructed movement of personnel and emergency equipment in an emergency. All containers of hazardous waste must be stored in a manner that ensures a minimum of 2 feet of aisle space between containers. Drums containing free liquids or those holding hazardous waste (excluding mixed wastes) may not be stacked over two drums high.

24. All hazardous waste containers holding materials that may be incompatible with any other materials at that location must be separated from those materials by dikes, berms, or other physical barriers to prevent a possible reaction.

25. TSD facilities must have water at an adequate volume and pressure for fire protection available. Hose bibs should be inspected for proper operating condition and adequate pressure. Outside water supplies must be checked for freezing.

26. The storage sheds must be inspected for damage, free liquids that might indicate a leak, and chemical compatibility of materials stored therein.

27. Road and work surfaces, process floors, or other work surfaces at TSDs must be inspected for damage or erosion that could lead to a spill or accident, and for adequate secondary containment.

28. Wind socks, where required, at TSDs must be inspected to ensure that they are present and in proper operating condition.

Instructions for Use of the Hazardous and Mixed Waste Facility Inspection Record Form (Continued)

29. Disposal shafts and shafts used for retrievable storage should have their covers securely in place and guard rails must be installed and in good condition.

30. Hazardous waste containers at TSDs and <90 day storage areas must be stored on pallets if they are stored outside without a roof.

31. Hazardous waste treatment tanks must be operated within design specifications and in accordance with SOPs and work plans. Tanks must be inspected for leaks or damage prior to operation.

32. Refrigerators used for storing hazardous waste, or samples thereof, must be inspected for proper operating condition and leaking or damaged containers.

33. Hazardous waste TSDs and <90 day storage areas must have adequate fire and spill control equipment for the types and volumes of waste present. Equipment must be present, in good working order, and appropriate for the material in question.

34. Incinerator waste feed cutoffs, emergency shutdown controls, and associated alarms or warning systems must be inspected for proper operating condition.

35. Incinerators, ancillary plumbing and equipment, and all monitoring controls must be inspected to ensure that they are in proper operating condition, and are being operated within design specifications. Inspectors must also look for evidence of leaks, corrosion, spills, or tampering.

36. Pressure vessels must be inspected for signs of deterioration or damage. Condition of the sand and loading must also be checked to ensure adequacy.

37. Oil burn pans must be inspected for deterioration, damage, or leaks. Inspectors must also inspect for unburned explosives and debris.

38. HE burn pads must be inspected for deterioration, damage, leaks, or vegetation that could catch fire. Condition of the sand must also be checked. Inspectors must also inspect for unburned explosives and debris.

39. Radioactive materials must be properly placarded, labeled, and stored within controlled areas in accordance with AR 3-7. Containers should be monitored/swiped for outside contamination if suspected, and all leaks or spills must be monitored to ensure adequate cleanup.

40. Inspectors will record the date of the current inspection.

41. Inspectors will record the time of the current inspection.

42. Inspectors will initial each daily inspection.

Instructions for Use of the Hazardous and Mixed Waste Facility Inspection Record Form (Continued)

Part II

Inspectors must explain in detail any deficiency noted above. Items to be included are: type of problem, any action taken, and the date/time of the action. Additional sheets may be attached as necessary.

43. Printed name of individual performing inspection.

44. Signature of individual performing inspection.

45. Z number of individual performing inspection.

46. Organization responsible for this location.

47. Date record was signed and completed.

48. Time record was signed and completed.

(Note: Items 43-48 must be completed for all inspections.)

7.0 CONTINGENCY PLAN

This section presents general contingency measures for hazardous and mixed waste units at Los Alamos National Laboratory (LANL) as well as specific emergency response information for hazardous and mixed waste units at Technical Area (TA) 55. The contingency plan is intended to meet the requirements specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart V, Part 264, Subpart D, revised November 1, 1995, "Contingency Plan and Emergency Procedures," for hazardous waste treatment, storage, or disposal facilities. In addition, this document is consistent with the LANL Emergency Management Plan (EMP) (LANL, 1995d), prepared by the LANL Emergency Management and Response (EM&R) Office (FSS-20), and the TA-55 Emergency Plan, prepared by the Nuclear Materials Technology (NMT) Division. The provisions of this contingency plan will be carried out immediately to minimize hazards whenever there is a fire, explosion, or release of hazardous or mixed waste or hazardous or mixed waste constituents that could threaten human health or the environment pursuant to 20 NMAC 4.1, Subpart V, 264.51(b), revised November 1, 1995.

7.1 TA-55 EMERGENCIES AND EMERGENCY NOTIFICATION STRUCTURES

The TA-55 Emergency Plan and its procedures provide employees and emergency response personnel with information and procedures related to the prevention, notification, and control of emergencies including emergency notification structures, various emergency responses, available emergency equipment/resources, and required follow-up actions. Descriptions of TA-55 emergency response personnel, emergency equipment, and emergency response procedures are provided in the plan and its procedures.

The chain of command for emergency response at TA-55 varies depending on the extent of the emergency. Many emergencies at TA-55 (e.g., various types of contamination releases) can be resolved primarily by TA-55 emergency response personnel. Figure 7-1 depicts the emergency notification structure for these types of emergencies. If an emergency goes beyond TA-55 resources, additional emergency response personnel (i.e., other LANL and non-LANL emergency response personnel) will be called in to direct and/or aid in the emergency response effort. Figure 7-2 depicts the emergency notification structure for emergencies involving TA-55 and other LANL and non-LANL emergency response personnel.

7.2 HAZARDOUS AND MIXED WASTE EMERGENCY RESPONSE RESOURCES [20 NMAC 4.1, Subpart V, 264.52(c) and 264.53]

The primary resources for management of emergency incidents at LANL reside within the EM&R Office, which is part of the Facilities, Security, and Safeguards (FSS) Division. During most emergency situations, line management (i.e., the Group Leader of the affected area) works with the Duty Emergency Manager from the EM&R Office. The Emergency Manager has primary responsibility for managing emergency response operations, making appropriate notifications, activating the emergency response organizations, and proceeding to the scene. The Emergency Manager has the authority to assume the role of Incident Commander (IC) during an emergency and typically assumes full responsibility for management of the emergency response operations at the scene. As described previously, if an emergency at TA-55 can be resolved primarily by TA-55 emergency response personnel, the Emergency Manager may choose not to assume command of the emergency response but will remain on standby in case additional response resources are needed. In these situations, NMT management personnel (e.g., Group Leaders, Deputy Group Leaders) form a facility command and designate a Facility Incident Commander (FIC). TA-55 emergency response personnel would then report directly to the FIC. Figure 7-1 depicts the structure of a facility command. Additional information on the roles of the various emergency response personnel at TA-55 is provided in Section 7.2.1.

Additional LANL resources that may provide assistance in an emergency include personnel from the Environment, Safety, and Health (ESH) Division and the Chemical Science and Technology (CST) Division at LANL. These groups are discussed in Sections 7.2.3, 7.2.4, and 7.2.5.

Contracted services and other agencies are also available for assistance during emergencies. These are discussed in Section 7.2.6 and include the contracted services of Protection Technology Los Alamos (PTLA) for security, Johnson Controls World Services Inc. (JCI) for facility maintenance, and the Los Alamos County Fire Department (LACFD). Other outside response agencies are discussed in Section 7.2.8 and include the Los Alamos County Police Department (LACPD) and the Los Alamos Medical Center (LAMC). The LACPD and the LAMC each provide assistance under a memorandum of understanding (MOU).

Emergency response protocol at TA-55 is currently being modified to be consistent with the National Interagency Incident Management System (NIIMS). The NIIMS is a national standard

that provides consistency in terminology/methodology and allows for an integrated emergency response both locally and nationally, if necessary.

The IC (i.e., the Duty Emergency Manager or FIC) coordinates all groups and agencies responding to the emergency and personnel operating at the scene in what is called the Unified Command (UC) (refer to Figure 7-2). If the FIC is in charge during an emergency at TA-55, and the Emergency Manager decides that additional resources are needed and assumes the position of IC, then the facility command formed by the FIC becomes the Facility Branch of the UC. The emergency response structure at LANL, as shown in Figure 7-2, is designed to expand and collapse to include the response groups/agencies needed to address any particular emergency.

The IC may appoint and utilize a network of support personnel to assess, plan for, and mitigate emergencies. These personnel include a Safety Officer, Public Information Officer, and a Liaison Officer that report directly to the IC and are responsible for issues related to safety, information, and the interaction of various groups associated with the overall emergency. Also reporting directly to the IC, are an Operations Chief, Logistics Chief, Plans Chief, and an Administrative Chief. The Operations Chief oversees the Fire Branch, Emergency Medical Services Branch, and the Facility Branch (e.g., TA-55 Facility Branch) and is responsible for the actual emergency response. The Logistics Chief is responsible for providing support personnel and equipment necessary for the emergency response. The Plans Chief is responsible for planning the active mitigation and recovery for the emergency and the Administrative Chief is responsible for keeping records of expenditures. In some instances, one person may be assigned more than one of these positions. During an emergency at LANL, assistance may be provided to the IC and the IC's appointees by a large variety of response groups/agencies. The responsibilities and/or assistance available from the various response groups/agencies are listed in Table 7-1 and discussed briefly in Sections 7.2.1 through 7.2.8.

A current copy of this contingency plan will be retained by each of the emergency response groups/agencies and the appropriate facility operators. LANL's Hazardous and Solid Waste Group (ESH-19) is responsible for the controlled distribution of the contingency plan. Amendments to the contingency plan are discussed in Section 7.14.

7.2.1 TA-55 Emergency Response Personnel

Emergency response personnel at TA-55 that collectively form the facility command include the FIC and a Radio Communications Officer, a Safety Officer, and a Recorder that report directly to the FIC. Also supporting the FIC are the Facility Manager, a Personnel Accountability Officer, the TA-55 Emergency Response Team (ERT) liaison, a Radiological Protection Officer, a Nuclear Materials Safeguard and Security Officer, and a Communications Officer. Each of these represents a team as shown in Figure 7-1. Other emergency response support personnel at TA-55 include resident Health Physics Operations Group (ESH-1) personnel, Operations and Maintenance Services (FSS-9) coordinators, and resident JCI personnel.

As described in Section 7.2, the FIC may assume the role of IC for emergencies at TA-55 that can be adequately managed by TA-55 emergency response personnel and resources. The TA-55 FIC is responsible for ensuring the safety of personnel within TA-55 during an emergency. Responsibilities of the TA-55 FIC may include assisting the IC by coordinating assembly area actions, controlling the assembly area, identifying any missing personnel, and assisting in rescue planning and directing on-scene TA-55 emergency personnel. Anytime TA-55 personnel are required to go to the assembly area(s), a facility command is formed that consists of Group Leaders, Deputy Group Leaders, and key facility personnel. This team reports to the TA-55 FIC (or Facility Branch Director if a UC has been formed) to ensure the safety of assembled personnel.

The Facility Operations Team consists of the Facilities Management Group (NMT-8) Group Leader or alternate and is responsible for providing assistance and advice to the FIC on facility issues. The Personnel Accountability Officer and his/her team account for personnel on site at TA-55.

The TA-55 ERT provides the primary source of internal response personnel during an emergency at TA-55. This team consists of qualified volunteers who have received training to meet the criteria for emergency response personnel specified in Title 29 of the Code of Federal Regulations (29 CFR) 1910.120(q)(6)(i) and (ii) and for Emergency Medical Services (EMS) as well as TA-55 site-specific training. In addition, ERT members actively participate in drills and emergency response exercises at TA-55 to practice specific skills and ensure preparedness in the event of an emergency.

The Radiological Protection Officer coordinates monitoring and other ESH support during an emergency. The Nuclear Materials Safeguard and Security Officer is the Materials Access Area Custodian or alternate and coordinates safeguards and security actions during an emergency. The Public Address Officer is responsible for site-wide communications and oversees notification of adjacent areas in the event of an emergency, as necessary.

Additional emergency support at TA-55 is provided by ESH-1, FSS-9, and JCI on-site personnel. ESH-1 radiological control technicians (RCT) assist the TA-55 FIC (or Facility Branch Director) in controlling the assembly areas and providing radiological surveying. Other ESH-1 personnel provide additional radiological support to the TA-55 FIC (or Facility Branch Director). FSS-9 coordinators assist the TA-55 FIC (or Facility Branch Director) in resolving problems involving TA-55 utilities. JCI personnel work with the FSS-9 coordinators on problems requiring craft skills (e.g., plumbing, electrical) as well as provide support to the TA-55 FIC (or Facility Branch Director).

7.2.2 Emergency Management and Response Office [20 NMAC 4.1, Subpart V, 264.52(d) and 264.55]

The Director of LANL has delegated the authority and responsibility for administering and implementing LANL's emergency management program to the FSS Division, which includes the EM&R Office. The EM&R Office coordinates and issues LANL's EMP and provides response coordination for emergencies. The EM&R Office also provides a 24-hour Duty Emergency Manager to respond to emergencies, including hazardous and mixed waste releases. The LANL Emergency Manager is the functional equivalent of the Emergency Coordinator (20 NMAC 4.1, Subpart V, 264.55, revised November 1, 1995). The EM&R Office maintains an Emergency Operations Center (EOC) in a ready condition should a center be required. The primary EOC is located at TA-59, Building 1 (TA-59-1) basement. An alternate EOC is located at TA-49-113. Should an EOC be activated during an emergency, all other emergency personnel including the IC and the entire Facility Incident Command or UC fall under the control and direction of the EOC.

EM&R Office personnel designated as Emergency Managers are listed in Table 7-2. Assignment as the Duty (i.e., primary) Emergency Manager is rotated. The Duty Emergency Manager can be reached by contacting the EM&R Office (667-6211 during working hours, 667-7080 after working hours) or the Central Alarm Station (CAS) operator (911).

The Duty Emergency Manager will respond to emergency incidents that may involve the release of hazardous or mixed waste to the environment, including spills, fires, and explosions. With input from the appropriate LANL groups (e.g., ESH, NMT, CST), the Duty Emergency Manager will initially assess the possible hazards to human health or the environment and, if assuming the role of IC, will use whatever response personnel and/or emergency equipment necessary in order to control and contain the waste, as necessary. In the event of an emergency, the Emergency Manager typically becomes the IC with full responsibility for field activities (including logistics, planning, and operations or establishing these positions within the UC). As described previously, the exception to this is when on-site personnel (e.g., TA-55 personnel) can adequately address the emergency and maintain incident command internally. At the scene of the emergency, the IC will assemble a UC consisting of the senior person from each responding organization, functional specialists, the Duty Emergency Manager (if not the IC), and TA-55 management representatives (i.e., NMT Division Director or alternate, Facility Manager or alternate). Additional technical or management representation may be integrated into the emergency response, as needed. The UC will receive direction from the IC and the members of the UC will work together to mitigate emergency situations.

The Duty Emergency Manager responding to an emergency will have access to a copy of the appropriate building emergency plan(s) (BEP) relating to the area in which the incident is occurring. These plans are maintained by the EM&R Office at TA-59 as well as located on site for use by emergency response personnel. The various response groups will obtain specific information relating to the facilities involved (including the layout of all affected buildings; the location of evacuation routes, equipment, and personnel; properties of the materials/wastes managed at the facility; and the hazards associated with these materials/wastes) from the BEP(s) and other site-specific information.

7.2.3 Hazardous Materials Response Group

The Hazardous Materials (HAZMAT) Team is comprised of personnel from the Hazardous Materials Response Group (ESH-10). The HAZMAT Team is responsible for the aggressive mitigation of chemical, radiological, hazardous waste, and mixed waste emergencies, including field decontamination of responders and response equipment. The HAZMAT Team may provide the LACFD with limited field decontamination support for victims. The HAZMAT Team is capable of providing a contamination-control station at the scene of a hazardous material incident to

process people working in a contaminated area and is prepared to perform decontamination of personnel. LANL standards require that the HAZMAT Team meet the training criteria for emergency response personnel specified in 29 CFR 1910.120(q)(6)(iii), (iv), and (v). The HAZMAT Team acts as part of the UC reporting through the HAZMAT Group Supervisor (HMGS). The LANL HMGS coordinates the HAZMAT Team and radiological field monitoring activities.

During an emergency response, ESH-10 may also provide site field monitoring to determine the nature and extent of contamination, provide information on correct handling of chemicals, make recommendations on protective clothing and equipment, and provide exposure and treatment information to responders. To operate effectively, ESH-10 may obtain resources from other ESH groups, such as ESH-1 and the Industrial Hygiene and Safety Group (ESH-5).

7.2.4 Other ESH Response Groups

At the scene, representatives and technical advisors from ESH groups and other response personnel are coordinated by the IC. In addition to their post-emergency duties, the groups discussed below may also be responsible for on-scene emergency operations such as planning. Depending on the type of emergency and the associated hazards, an individual from the most relevant group in the ESH Division will assume the position of the Environmental Safety and Health Advisor, will provide technical support, and will ensure LANL compliance with applicable federal, state, and local regulations.

7.2.4.1 Air Quality Group

The Air Quality Group (ESH-17) provides field surveys of air to determine environmental effects of exposure after an emergency. In addition, ESH-17 provides expertise in meteorology to establish short- and long-term environmental effects of emergency conditions.

7.2.4.2 Water Quality and Hydrology Group

After an emergency, the Water Quality and Hydrology Group (ESH-18) provides sampling of water to determine environmental effects of an emergency and performs assessments for reporting requirements. ESH-18 also provides expertise in hydrogeology to establish short- and long-term environmental effects of emergency conditions.

7.2.4.3 Hazardous and Solid Waste Group

ESH-19 provides guidance on regulatory requirements to other LANL groups. After an emergency, ESH-19 provides field sampling (e.g., of soil, surface water runoff, and sediments) to determine environmental effects of exposure.

7.2.4.4 Environmental Assessments and Resource Evaluations Group

The Environmental Assessments and Resource Evaluations Group (ESH-20) provides field surveys of biota to determine environmental effects of exposure after an emergency.

7.2.5 Other LANL Response Resources

7.2.5.1 CST Division

Waste management groups within CST Division may provide guidance on the proper treatment, storage, and transportation of hazardous and mixed waste at LANL.

7.2.6 Contracted Response Groups

Contracted response groups report to the Emergency Director in the EOC if the EOC is activated (in a smaller emergency, the EOC is not activated). They report directly to the IC in the event of a smaller emergency. If the IC deems it necessary, the IC may designate an Operations Chief to aid in the coordination and direction of these groups.

7.2.6.1 Protection Technology Los Alamos

PTLA is responsible for LANL security and provides this service under contract to LANL. During an emergency, PTLA activities include maintaining security, directing traffic within LANL, and controlling access to the emergency scene. PTLA maintains the necessary equipment (such as crowd-control equipment and patrol vehicles) to perform these functions. In addition, the CAS at TA-64-1 is manned by PTLA personnel 24 hours a day.

7.2.6.2 Johnson Controls World Services Inc.

JCI provides a maintenance support force under contract to LANL. This support force is under LANL's direction in an emergency. JCI conducts inspections of LANL equipment, maintains equipment, and participates in post-emergency cleanup under the direction of a Recovery Manager designated by the IC. (The duties of the Recovery Manager are discussed in

Section 7.11.) The Utilities Control Center (UCC) at TA-3-223 is maintained by JCI personnel 24 hours a day.

7.2.6.3 Los Alamos County Fire Department

The LACFD provides fire protection and ambulance coverage for the residential communities of Los Alamos and White Rock and for LANL. In case of an emergency within LANL, the LACFD coordinates fire suppression and EMS efforts, while the IC retains overall responsibility for the emergency response effort. The U.S. Department of Energy (DOE) requires that LACFD personnel meet the training criteria for emergency response personnel specified in 29 CFR 1910.120(q)(6)(i) and (ii). A copy of the contract between the DOE and the Incorporated County of Los Alamos is provided as Appendix F.

7.2.7 LANL Support Groups

7.2.7.1 Health Physics Operations Group

ESH-1 provides field personnel to perform routine site evaluation and monitoring to determine the nature and extent of radiological contamination. ESH-1 also provides routine guidance on radiological decontamination. Field personnel conduct these activities under the supervision of certified health physicists. In addition, this group augments the assessment and monitoring functions of the HAZMAT Team.

7.2.7.2 Occupational Medicine Group

LANL maintains its own medical facility operated by the Occupational Medicine Group (ESH-2). ESH-2 provides appropriate medical treatment for occupation-related illnesses and injuries and monitors employees to assess the effectiveness of health protection programs. In addition to promoting early identification and prevention of illnesses or injuries that may arise from exposures to hazardous or radioactive materials, ESH-2 maintains records of the health status of employees and related occupational medicine activities.

ESH-2 maintains a central medical facility with a fully equipped emergency room and decontamination facilities at TA-3, Building 409 (SM-409). The location of this and other emergency facilities are shown on Figure 7-3. Medical staff at these facilities include physicians, physician's assistants, registered nurses, x-ray technicians, clinical laboratory technicians, and clinical testing technicians. All full-time physicians and nurses receive radiation accident training.

ESH-2 also maintains access to a software program called the TOMES system at the central medical facility in SM-409. This extensive database provides the clinical staff with timely exposure and treatment information. ESH-2 is supported by ESH-5, as described below.

7.2.7.3 Industrial Hygiene and Safety Group

ESH-5 provides support to ESH-2 with its ability to obtain additional exposure and treatment information via telephone access to the National Library of Medicine's TOXLINE and CHEMLINE, the Toxicity Databank files POISONDEX and TOMESPLUS (Micromedics), and the CC/INFO database files on Material Safety Data Sheets. In addition, ESH-5 maintains access to the National Institute of Occupational Safety and Health Technical Information Center and the Registry of Toxic Effects of Chemical Substances. During routine operations, ESH-5 performs site evaluations and field testing to determine the nature and extent of chemical contamination and specifies protective clothing and equipment.

7.2.7.4 Criticality Safety Group

The Criticality Safety Group (ESH-6) provides technical expertise on the prevention and mitigation of criticality incidents in the event of an emergency.

7.2.7.5 Occurrence Investigation Group

The Occurrence Investigation Group (ESH-7) is responsible for the Occurrences Reporting and Processing System at LANL and has the lead in reporting the occurrence of an on-site emergency. ESH-7 is in part responsible for tracking follow-up corrective actions. ESH-7 personnel assist the facility manager in investigating the occurrence, determining the causal factors, identifying the appropriate corrective actions, and assisting in the preparation of reports documenting the occurrence to DOE. This group tracks the target and actual completion dates for all corrective actions associated with an emergency and maintains the information in an on-site database.

7.2.8 Outside Response Agencies

During an emergency, outside response agencies report directly to the IC. An Operations Chief, designated by the IC, may aid in coordinating and directing the groups responding to an emergency.

7.2.8.1 Los Alamos County Police Department

The LACPD has only minimal interaction with LANL in an on-site emergency. This interaction is limited to traffic control on DOE roads with public access and to criminal investigations. A copy of the MOU between the DOE and the Incorporated County of Los Alamos for mutual aid assistance is included as Appendix G.

7.2.8.2 Los Alamos Medical Center

LANL maintains a fully equipped decontamination room adjacent to the emergency room at LAMC. In the event that a case is sent to LAMC, support for the emergency room staff is provided by ESH-2 medical personnel. ESH-1, ESH-5, and ESH-10 personnel also provide assistance to the emergency room staff. This assistance is coordinated through the EM&R Office. A copy of the MOU between the DOE Los Alamos Area Office (LAAO) and LAMC is included as Appendix H.

7.3 EMERGENCY EQUIPMENT AND COMMUNICATIONS [20 NMAC 4.1, Subpart V, 264.52(e)]

7.3.1 Emergency Equipment

20 NMAC 4.1, Subpart V, Subpart D, revised November 1, 1995, requires a listing of all emergency response equipment available that can be used in the event of an emergency. Attachment 7-1 lists all emergency equipment available in the vicinity of the hazardous and mixed waste container storage areas, storage tank systems, and cementation unit located at TA-55 that are addressed in this permit application. Attachment 7-1 also includes emergency equipment available in the HAZMAT vehicles and trailers as well as supplemental emergency equipment maintained by the TA-55 ERT, the LACFD, JCI, and ESH-2.

7.3.2 Emergency Communications [20 NMAC 4.1, Subpart V, 264.56(a)]

Effective emergency response at LANL requires an efficient communication system that will integrate required personnel into the emergency response. The initial phase of an emergency may involve a small number of individuals at the affected area and notification of the Duty Emergency Manager. For small-scale emergencies, local communication equipment/systems will be utilized. When responding to hazardous and/or mixed waste emergencies, the EM&R Office may provide communications between response units and emergency organizations.

7.3.2.1 TA-55 Operations Center

The TA-55 Operations Center is located at TA-55-4 and is manned by NMT-8 personnel 24 hours a day. In an emergency at TA-55-4, the TA-55 Operations Center is responsible for providing information to the IC and FIC (or Facility Branch Director) about the TA-55-4 safety systems and their operating status as well as providing information to LACFD personnel and other emergency responders before they enter TA-55-4.

A description of additional communication equipment/systems at TA-55, located in the vicinity of the units addressed in this permit application, is provided in Attachment 7-1.

7.3.2.2 Emergency Central Alarm Station

The LANL emergency CAS is located at TA-64-1. This station is manned by PTLA personnel 24 hours a day and is equipped with telephones (including direct-line telephones), medium- and short-range radios, a National Warning System (NAWAS) station, and an emergency power system. The fire alarm board at the control room gives the location of automatic and manual fire alarm equipment. The CAS receives alarms from several sources and, in turn, notifies the Duty Emergency Manager of a hazardous or mixed waste emergency. Sources include:

- Telephone communication (911)
- Automatic fire alarms
- Manual pull alarms
- Computer interface (to warn of critical events at selected facilities)
- Security alarms
- Radio communications.

Upon receipt of an alarm, the CAS operator then notifies the LACFD and the Duty Emergency Manager. The Emergency Manager, the HMGS, the EOC communicator, and/or the CAS operator may request emergency response groups to respond. Should the LANL 911 system fail, the Los Alamos County System, located at the LACPD Station, will be used to activate emergency response groups.

7.3.2.3 Utilities Control Center

JCI personnel maintain the UCC at TA-3-223 24 hours a day. Alarms at this facility are connected to LANL experiments, equipment, and/or buildings to record outages and hazardous

conditions. Any conditions that activate these alarms will be reported immediately to building management or to the CAS operator for notification and response.

7.3.2.4 Additional Communication Systems

Internal communication systems at LANL include:

- The Centrex telephone system
- A telephone paging system
- A variety of FM VHF simplex repeater systems, including:
  - Multiple base stations
  - Mobile and hand-held units
  - Links to New Mexico public safety agencies
- A UHF radio system, including:
  - Multiple antenna sites
  - Mobile and base units
  - Links with the LACPD, the LACFD, and the State Medical System
- A 400-megahertz trunked radio system that includes a link with the LACFD
- Transmission and reception (through EOC) for:
  - Secure telephone
  - Secure fax
  - Secure still video
- Access to all radio systems outlined above (through EOC).

Off-site communications with federal, state, tribal, county, and other agencies are available through the following:

- A Centrex telephone system
- Private telephone lines (if Centrex fails)
- Two NAWAS stations
- A link to KRSN radio (local radio station)
- The local cable television
- A Community Alert Network.

The LANL EOC, maintained by the EM&R Office, operates radio systems on key LANL and off-site channels. Emergency personnel responding to on-site incidents have the benefit of

wide-area radio coverage using EOC facilities. After hours, the Duty Emergency Manager is responsible for activating whatever support personnel, equipment, or services are needed.

7.4 CONTINGENCY PLAN IMPLEMENTATION [20 NMAC 4.1, Subpart V, 264.56]

The following sections discuss guidelines used to initiate this contingency plan, emergency notification, emergency manager actions, and the responses to be taken in various types of emergencies.

7.4.1 Guidelines For Implementation [20 NMAC 4.1, Subpart V, 264.51(b) and 264.56]

The decision to implement this contingency plan depends upon whether an imminent or actual incident involving a release of hazardous or mixed waste to the environment could threaten human health or the environment. The Duty Emergency Manager or FIC will use the guidelines listed below to decide whether to implement this plan.

This contingency plan will be implemented immediately in the following situations involving releases or potential releases of hazardous or mixed waste:

- Spills:
  - If a hazardous or mixed waste spill cannot be contained with secondary containment or application of sorbents.
  - If precipitation threatens to move spilled material off site.
  - If a hazardous or mixed waste spill causes the release of flammable material, creating a fire or explosion hazard.
  - If a hazardous or mixed waste spill results in toxic fumes that threaten human health.
  - If an earthquake or other natural disaster threatens containment integrity.
- Explosions:
  - If an unplanned explosion involving hazardous or mixed waste occurs.
  - If an imminent danger of an explosion involving hazardous or mixed waste exists.

- Fires:
  - If a fire involving hazardous or mixed waste occurs.
  - If any building, grass, forest, or nonhazardous waste fire exists that threatens to volatilize or ignite hazardous or mixed waste.

7.4.2 Emergency Notification [20 NMAC 4.1, Subpart V, 264.56(a) and (b)]

During working hours, immediately upon discovery of an imminent or actual incident involving hazardous or mixed waste, on-site personnel will notify line management and the EM&R Office. During nonworking hours, personnel will report all incidents involving hazardous or mixed waste to the Duty Emergency Manager or the CAS operator. In the case of a fire involving hazardous or mixed waste, notification of these individuals is superseded by the LANL fire alarm system. A fire is reported by dialing 911 (from telephone exchanges 667 and 665) or 667-7080 (from all exchanges), activating automatic alarms, or activating a fire pull box. All fire alarms alert the CAS operator, the LACFD, and PTLA. In case of a fire involving hazardous or mixed waste or a hazardous or mixed waste unit, the CAS operator will contact the Duty Emergency Manager.

Upon recognition of a hazardous or mixed waste emergency, the first arriving emergency-trained person will become the temporary IC. Once the EM&R Office is notified of the emergency, the Duty Emergency Manager will proceed to the scene and be briefed by the FIC, building/area personnel, and/or other emergency units/teams. The Emergency Manager may then assume the position of IC. If necessary, the IC may recommend that the EOC be activated and that the necessary members of the emergency management team be determined. The IC will form a UC and contact the HMGS. The HMGS will notify the appropriate emergency response groups. The IC may determine from the list of response groups described in Table 7-1 which groups to contact in an emergency. Each response group maintains an on-call person and/or a call-down procedure to respond to emergencies.

The EM&R Office will be notified of any potential hazardous or mixed waste emergency (e.g., spills, fires, explosions). The IC and the HMGS will use whatever means are available (including the assistance of other response groups, computer data searches, and sampling) to determine if a hazardous or mixed waste is being or has been generated and/or released. ESH-10, ESH-19, and waste management groups within CST Division have the expertise to determine the nature and extent of contamination and the characteristics of the hazardous or mixed waste involved.

7.4.3 Emergency Manager Actions [20 NMAC 4.1, Subpart V, 264.56 (b-h)]

Upon notification of an incident, the Duty Emergency Manager may:

- Proceed directly to the scene.
- Call the HMGS.
- Assess the nature of the incident (e.g., through communication with the temporary IC).
- Assume incident command.
- Make an initial assessment of the incident and, in conjunction with the UC, obtain resources to determine the source, quantities, and types of hazardous or mixed waste involved and the areal extent of any released materials.
- Based on the guidelines in Section 7.4.1 of this plan, determine if implementation of this contingency plan is warranted.
- Recommend activation of the EOC, if necessary.

Upon deciding to implement this contingency plan, the IC will, when appropriate:

- Assess the hazards to human health and the environment, including both direct and indirect effects, such as generation of toxic, irritating, or asphyxiating gases and/or hazards of runoff of water or chemicals used for fire suppression. An individual designated by the IC will use the guidelines in Section 7.4.1 to assess the hazards to human health and the environment. If any of the criteria under Section 7.4.1 are met and if the responsible Group or Section Leader has not already accomplished evacuation of the area, the IC will initiate evacuation of the immediate area.
- Determine if evacuation of the local area is advisable and, if so, immediately notify appropriate response groups and the LACPD, if appropriate. The IC may activate one or more of the following community alert mechanisms: the Community Alert (telephone) Network, the KRSN radio remote input system, or the cable TV capture system.
- Notify required response personnel and DOE/LAAO. In the case of fire, the IC will confirm that the LACFD Senior Officer at the scene is aware of the special hazards associated with hazardous or mixed waste.
- Warn the remaining on-scene and response personnel of imminent or actual hazards using internal radio communication systems or the public address (PA) system. A radio/PA system at key facilities throughout LANL may be used for emergency notification.
- In emergency situations, the appropriate ESH representative will notify the New Mexico Environment Department (NMED) at (505) 827-9329 and the National Response Center

at (800) 424-8802, reporting:
- The name and telephone number of the ESH representative
- The name and address of the facility
- The time and type of incident
- The name and quantity of material involved, to the extent known
- The extent of injuries, if any
- The possible hazards to human health or the environment outside the facility.

- Advise the response groups of hazards in order to minimize personnel exposure and expedite mitigation.

- When an emergency occurs at hazardous or mixed waste treatment units, ensure that CST waste management personnel or, in the case of TA-55, the NMT emergency response personnel monitor for leaks, pressure buildup, gas generation, or equipment ruptures.

Once control of the emergency is established, the IC will take all reasonable measures to minimize the occurrence, recurrence, or spread of fires, explosions, or releases. In addition, the IC will delegate cleanup and decontamination responsibilities to include:

- Arranging for site cleanup.

- Providing for proper handling of recovered waste, contaminated soil, or contaminated surface/ground water.

- Providing for decontamination of equipment, as needed.

- Arranging for replacement and/or repair of equipment, as needed.

- Ensuring that testing is conducted to verify successful cleanup.

Within 15 days of the incident, DOE/LAAO will submit a report to the Secretary, NMED. The contents of this report are generated by several LANL groups responding to the emergency, as detailed in Section 7.13.

7.5 SPILLS [20 NMAC 4.1, Subpart V, 264.56(e)]

Sudden releases may include spills of hazardous or mixed waste that pose a significant threat to human health or the environment. Spill incidents resulting in a sudden release of hazardous or mixed waste that present a potential threat to human health or the environment, as listed in Section 7.4.1, require implementation of this contingency plan.

Hazardous and mixed wastes are stored on site at LANL in a variety of containers including, but not limited to, 55-gallon drums, lab packs, tanks, and small laboratory bottles. At TA-55, hazardous and/or mixed waste is stored in container storage areas and transuranic (TRU) mixed waste is stored in storage tank systems and treated (i.e., solidified) in a cementation unit. Volumes of hazardous or mixed waste managed will vary from unit to unit. The general steps in handling hazardous and/or mixed waste spills are as follows:

- Isolate the immediate area and deny entry to all unauthorized personnel
- Contain the spill by spreading sorbents or forming temporary dikes to prevent further migration (performed by properly trained personnel, if safe)
- Monitor the spill area and sample the spilled waste and contaminated media
- Package the waste and contaminated media in sound containers
- Decontaminate the area and all involved equipment and personnel (follow with testing to assure adequate cleanup)
- Remove the waste and contaminated media (performed by appropriate waste management personnel).

If a small spill occurs at TA-55 and is not an immediate threat to human health, the individual who discovers the spill will notify the TA-55 Operations Center. The TA-55 Operations Center will then contact the TA-55 Spill Coordinator at 667-2317. If any size spill occurs at TA-55 and the spill source is not identifiable or if the spill may pose a threat to human health, the individual who discovers the spill will notify the TA-55 Operations Center. The TA-55 Operations Center will immediately call up the Facility Incident Command and will contact the TA-55 Spill Coordinator, the ERT, and the CAS operator, who will notify the EM&R Office. The spill area will be evacuated until spill mitigation measures are determined and implemented. If initial mitigation of the spill is necessary and can be accomplished safely before the Emergency Manager arrives, a qualified member of the affected area's operating group may proceed with initial mitigation.

The emergency preparedness procedures related to flammable organic solvent spills require stabilization of the spilled material with an organic solvent spill kit. Other chemical spills are to be stabilized using acid and caustic spill kits or by the addition of sorbents. During spill control and cleanup, all personnel will wear personal protective equipment (PPE), as specified by ESH-5.

ESH-5 will conduct monitoring to ensure that chemical exposure is minimized. ESH-1 will conduct health physics monitoring whenever mixed waste is involved to ensure that radiation exposure is also minimized. The stabilized material may be treated as hazardous or mixed waste, depending on the components present. Runoff from spills of listed hazardous or mixed waste that have migrated outside waste storage and/or treatment areas must be contained and managed as hazardous or mixed waste, as appropriate. If the spill was from a characteristic hazardous or mixed waste and if analysis shows that the runoff does not exhibit the characteristic (i.e., ignitability, corrosivity, reactivity, and/or toxicity), then the runoff need not be managed as characteristic waste. Temporary dikes may be constructed to contain runoff.

7.5.1 Spill Control Procedures

When a flammable organic solvent spill, a highly acidic spill, or a highly caustic spill has been stabilized with the contents of an organic solvent spill kit, an acid spill kit, or a caustic spill kit, respectively, the resulting material may be sorbed using a nonbiodegradable sorbent. Nonbiodegradable sorbent can be used to control spills if it is known to be compatible with the spilled material. Approved drums or packaging will be used to collect all spilled material and contaminated sorbent. For corrosives, the drums will be lined with polyethylene drum liners. Attachment 7-1 lists emergency equipment available for spill control at each waste management unit addressed in this permit application. The ultimate disposition of any contaminated sorbent or waste material will be determined by appropriate waste management personnel, according to hazardous waste regulatory requirements.

7.5.1.1 Tank System Spill Control and Reporting

A tank system will be removed from service immediately using approved shutdown procedures if a leak or spill occurs from the tank system or its secondary containment system or if the system is determined to be unfit for use. Further addition of waste to the tank system or containment system will cease and the system will be visually inspected to determine the cause of the leak or spill. If a leak occurs from a tank system, as much of the waste as is necessary to prevent further release of waste will be removed within 24 hours after detection or as early as practicable, and the system will be inspected and repaired. All released waste will be removed within 24 hours or as soon as possible if a leak occurs to a tank's containment system.

If a spill from a tank is not immediately contained and cleaned up and exceeds a quantity of 1 pound, the release will be reported to the NMED within 24 hours of its detection in accordance with the requirements of 20 NMAC 4.1, Subpart V, 264.196(d)(1), revised November 1, 1995. In addition, a written report will be submitted to the NMED within 30 days describing the likely migration route of the release; soil characteristics at the site; monitoring and sampling data relevant to the release; proximity to downgradient drinking water, surface water, and populated areas; and response actions taken or planned.

7.5.1.2 Tank System/Secondary Containment Repair and Closure

If the integrity of a tank system, including its secondary containment, has not been damaged by a spill, the system may be returned to service. Service may not resume until after all released waste is removed and repairs, if necessary, are made. Any tank system that cannot satisfy the criteria described above will undergo closure in accordance with the requirements of 20 NMAC 4.1, Subpart V, 264.197, revised November 1, 1995.

7.5.1.3 Certification of Major Repairs

If a tank system undergoes extensive repairs (e.g., installation of an internal liner, tank system piping retrofit) the tank system will not be returned to service until a certification by an independent, qualified registered professional engineer is obtained, verifying that the repaired system is capable of handling wastes without release for the intended life of the system. This certification will be submitted to NMED within seven days after returning the tank system to use.

7.5.2 Decontamination Verification

Decontamination will be accomplished at the spill site. After the spilled material has been sorbed, the material will be containerized. If the spill occurs on a cemented or asphaltic concrete area, water or an appropriate solvent will be used to clean the area. Liquids (i.e., spilled material and cleaning water or solvents used to clean a spill) will be sorbed with a compatible, nonbiodegradable sorbent and will be containerized. If a spill is from an identifiable source, then the spilled material will be analyzed for the hazardous waste constituents known to be components of the waste managed at that unit. The appropriate analytical method(s) given in Table 7-3 will be utilized. If the spill is from other than an identifiable source, then the spilled material will be analyzed for all of the parameters listed in Table 7-3. All personnel conducting decontamination verification will wear PPE. ESH-1 will conduct health physics monitoring

whenever mixed waste is involved to ensure that radiation exposure is minimized. Any hazardous or mixed waste collected from decontamination activities will be handled appropriately.

In order to establish baseline data, a sample of decontamination water or solvent and nonbiodegradable sorbent material will be taken prior to the start of the decontamination effort. A sample of the material used to sorb the final wash water will then be taken. No hazardous waste constituents should be present in this sample at levels above those found in the baseline data. If the sample exhibits any of the characteristics of a hazardous waste as defined in 20 NMAC 4.1, Subpart II, Subpart C, revised November 1, 1995, or if a hazardous constituent listed in 20 NMAC 4.1, Subpart II, Appendix VIII, revised November 1, 1995 (and not detected in the baseline data) is present above established health-based levels, the decontamination procedure will be repeated. An alternative demonstration of decontamination may be proposed and justified to NMED, who will evaluate the proposed alternative in accordance with the standards and guidance then in effect. If the proposed alternative is accepted, decontamination levels will meet the levels approved by NMED. Each sample will be collected with an appropriate sampling device (e.g., thief or trier) as specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (U.S. Environmental Protection Agency [EPA], 1994c).

If the spill occurs on soil, any free liquid present will be sorbed with a compatible nonbiodegradable sorbent, and the resulting material will be containerized. For such a spill, all contaminated soil will be excavated and containerized. ESH-5 will conduct industrial hygiene monitoring, and if mixed waste is involved, ESH-1 will conduct health physics monitoring to minimize exposure during soil removal operations. To establish comparative background data, one or more samples will be collected from an unaffected area near the spill site. The spill site will then be characterized, and the data will be compared to the background data to ensure that all contaminated material has been removed.

If a spill occurs in an area with sealed floors, verification sampling will be performed after decontamination. Swipe samples or other types of sampling appropriate for the contaminant will be collected at random in the area and analyzed. For a spill that occurs in an area that does not have sealed floors, random samples of the floor material, such as concrete chips, will be collected and analyzed for decontamination verification. Contaminated floor material will be removed if the level of contamination remains above that detected in the background data after repeated

decontamination attempts. If a spill occurs on asphaltic concrete, the asphaltic concrete will be decontaminated, and a sample of the final wash water and/or the material used to sorb the final wash water will be collected and analyzed for decontamination verification.

7.6 EXPLOSION

Explosions and resultant releases may result in a significant threat to human health or the environment. The potential exists for hazardous or mixed waste to be released during an explosion. Implementation of this contingency plan is required whenever a sudden release that cannot be contained or that presents a threat to human health or the environment occurs as a result of an explosion.

In the case of such an explosion at LANL, all personnel will immediately evacuate the area. Any injured personnel will be decontaminated at the site, if required and if time allows. An LACFD ambulance will transport these personnel to an ESH-2 facility or to LAMC for treatment. If an injury is severe and requires immediate medical evacuation, the injured person will be wrapped to contain contamination, if necessary. In the case of an actual or potential explosion at TA-55, on-site personnel will contact the TA-55 Operations Center and the EM&R Office immediately so that the Emergency Manager can ensure that all necessary emergency response personnel are alerted. The LACFD is notified automatically upon central alarm system activation. The Emergency Manager assumes incident command and will remain near but at a safe distance from the site in order to inform personnel responding to the explosion of the known hazards.

If a fire results from an explosion, the LACFD Senior Officer will, upon arrival at the scene, evaluate all available information and determine the appropriate firefighting methods and tactics. The LACFD Senior Officer will direct firefighting operations under the direction of the IC.

7.7 FIRE

Fires and resultant releases of hazardous or mixed waste may result in a significant threat to human health or the environment. Implementation of this contingency plan is required whenever a fire incident results in a sudden release of hazardous or mixed waste that cannot be contained or that presents a threat to human health or the environment.

Fire alarms will be sounded automatically or manually to alert personnel that a fire hazard exists and to evacuate the area immediately if in the vicinity. Descriptions and information related to the various fire alarms at TA-55 are included in Section 5.0 and Attachment 7-1 of this permit application. Personnel response to fires at specific areas at TA-55 is described in more detail in the TA-55 Emergency Plan and its procedures.

Depending on the size of the fire and the fuel source, portable fire extinguishers may be used. However, LANL policy does not encourage the use of portable fire extinguishers by employees unless properly trained. Instead, LANL policy encourages immediate evacuation of the area and notification of the LACFD. For any such fire at TA-55, including a fire that involves hazardous or mixed waste, the TA-55 Operations Center, the responsible Group Leader, and the EM&R Office must be contacted immediately. The Emergency Manager will alert the LACFD and all other necessary emergency response personnel. If the fire spreads or increases in intensity, all personnel must evacuate to an area designated by the responsible Group or Section Leader or Emergency Manager. The Emergency Manager assumes incident command and will remain near the scene to advise personnel responding to the fire of the known hazards.

Upon arrival at the scene, the LACFD Senior Officer will evaluate all available information and determine the appropriate firefighting methods and tactics. The LACFD Senior Officer will direct firefighting operations under the direction of the IC.

7.8 UNPLANNED NONSUDDEN RELEASES

Nonsudden releases include those incidents that, if uncontrolled, impact the environment over a long period of time. Such incidents include minor leaks from containers, loss of secondary containment integrity, and incomplete treatment.

7.8.1 Responsibility

At TA-55, the FIC is responsible for correction of a nonsudden release from a hazardous or mixed waste unit if the correction can be performed safely with normal maintenance and management procedures. Personnel from the EM&R Office may provide assistance in mitigating releases. Any correction methods for nonsudden releases that have resulted in an impact to the environment will be coordinated with the NMED.

7.8.2 Nonsudden Releases

In general, the response to a nonsudden release will be (1) to contain the release, (2) to correct the cause of the release, and (3) to clean up any release to a level that protects human health and the environment.

NMT Division personnel will conduct regularly scheduled inspections at TA-55 to detect any failure of containment at the hazardous and mixed waste storage and treatment units addressed in this permit application. Inspections of containers and tank systems will be conducted to ensure that they are not leaking. In addition, NMT Division personnel will inspect the secondary containment systems regularly to ensure that the integrity of the containment systems at TA-55 has not deteriorated. If an inspection reveals that a container or a tank system at TA-55 is leaking or that secondary containment has deteriorated, NMT Division personnel will ensure that maintenance or replacement of containment is performed, as appropriate.

7.8.3 Nonsudden Release Surveillance

In addition to routine inspection and site-specific sampling and testing, LANL has established an areawide environmental monitoring network maintained by ESH. Monitoring and sampling locations for various types of measurements are organized into three main groups. Regional monitoring stations located within the five counties surrounding Los Alamos County are placed up to 80 kilometers (50 miles) from LANL. These stations serve to determine background conditions. Perimeter stations, located within approximately 4 kilometers (2.5 miles) of the LANL boundary, document conditions in residential areas surrounding LANL. On-site stations, most of which are accessible only to employees during normal working hours, are within the LANL boundary.

Routine surveillance conducted at these stations includes measuring radiation and collecting samples of air particulates, surface waters, ground waters, soil, sediment, and foodstuffs for subsequent analysis. Additional samples provide information about particular events, such as major runoff events and nonroutine releases. Data from these efforts are used for comparison with standards, for background levels, and for radiation dose calculations.

7.9 EXPOSURE TO HAZARDOUS OR MIXED WASTE

If a person is exposed to hazardous or mixed waste at TA-55, the affected person, a co-worker, or line management will notify the TA-55 Operations Center and the EM&R Office. Appropriate first aid should be administered immediately. An EM&R Office representative will notify ESH-10 directly, as soon as possible, so that exposure levels and decontamination requirements can be established. The exposed person will then be quickly transported to the ESH-2 medical facility or to LAMC for evaluation. If possible, the material involved in the exposure will be ascertained and the information given to the medical staff.

Other potential exposures will necessitate evacuation of the area, if appropriate, or under any of the following conditions:

- Irritation of the eyes, breathing passages, or skin
- Difficulty in breathing
- Nausea, lightheadedness, vertigo, or blurred vision.

The exposed person will be transferred to the ESH-2 medical facility or to LAMC. An ESH-1, ESH-5, or ESH-10 representative will attempt to ascertain what, if any, actual exposure occurred and what medical treatment is appropriate.

7.10 EVACUATION [20 NMAC 4.1, Subpart V, 264.52(f)]

A facility will be evacuated upon the voice command to evacuate the area or upon the sounding of the evacuation or fire alarm. At TA-55, the general evacuation alarm as well as other alarms (e.g., continuous air monitor alarm, ventilation alarm), as described in Section 5.0 and Attachment 7-1 of this permit application, will indicate when personnel should evacuate a specific area (e.g., a room or a building). Specific procedures for evacuation of TA-55 personnel are described in the TA-55 Emergency Procedures.

7.10.1 Emergency Process Shutdown Prior To Evacuation

Personnel are instructed to shut down equipment prior to evacuating a building unless an immediate building evacuation is announced or signaled. To ensure efficient shutdown, training and exercises addressing the shutdown process are performed. In the case of an immediate evacuation, a selected team may shut down designated equipment in an evacuated area. The team will be equipped with the proper equipment, clothing, and breathing apparatus. If they are

on location, ESH-1, ESH-5, and/or ESH-10 will provide advice and assistance. Process-shutdown procedures apply mainly to hazardous or mixed waste treatment units (e.g., cementation unit at TA-55-4) and are described below.

7.10.1.1 TA-55-4 Cementation Unit

In the event of a fire or an emergency evacuation, the cementation unit located in Room 401 at TA-55-4 will be shut down if time and conditions allow. Shutdown is accomplished by depressing a shutdown button. This action puts the cementation unit into a safe, standby position.

7.10.2 Evacuation Plan

Emergency situations may warrant the shutdown and evacuation of areas or buildings in order to protect personnel and property, to anticipate the emergency condition, or to enhance the appropriate response. Table 7-4 lists the criteria for evacuation, persons responsible for initiating evacuations, and reentry conditions. Figures 7-4 through 7-7 show evacuation routes and muster areas for the TA-55 waste management units addressed in this permit application.

To initiate the evacuation of a building/area, the evacuation or fire alarm is sounded and/or the PA system may be used. Evacuation alarms cannot be silenced and reset by site personnel. Only the Fire Alarm Maintenance Section at 667-4027 and the LACFD Battalion Chief at 667-7026 can silence and reset alarms. To evacuate a portion of a building or area, use of the PA system may be more appropriate. The TA-55 Operations Center personnel use the PA system at TA-55 to notify the occupants of the area to be evacuated and to advise personnel throughout the building of the existence of a problem in a specific area. Once evacuation has been initiated and if conditions allow, personnel will turn off all equipment that could contribute to the hazard if left unattended. All personnel will then proceed from the affected area to an assembly/muster area.

In the event of the evacuation of a building, an outbuilding, or an outlying work area, the FIC will designate a control point at the closest safe location (e.g., considering wind direction). The designated area will be outside the affected area and will serve as an assembly/muster area where the FIC or designee can oversee evacuation operations and work to prevent further spread of the hazard.

As personnel exit an affected building/area, a primary sweep of the building/area will be performed to ensure that all personnel have evacuated. If the building/area is evacuated, an FIC designee will take attendance at the assembly/muster area and report personnel accountability to the FIC. The evacuation procedure follows:

- Person discovering the accident or emergency will call 911 and ensure that the TA-55 Operations Center line management is notified (if the incident occurs at TA-55) and the EM&R Office is notified.
- Site-specific BEPs and/or emergency action procedures will be followed concerning evacuation, sweep, personnel accountability, and equipment shutdown procedures.

For a small-scale evacuation, a responsible on-site person may direct the evacuation. For a large-scale evacuation, the central alarm system may be activated. The EM&R Office will be notified immediately and will dispatch the Duty Emergency Manager. A responsible on-site person may begin the evacuation process until the Duty Emergency Manager arrives at the scene to assume that responsibility.

7.11 SALVAGE AND CLEANUP [20 NMAC 4.1, Subpart V, 264.56(g) and (h)]

Appropriate representatives from the ESH groups will survey the affected area before salvage and cleanup begin. They will conduct visual inspections and sampling of the affected area to determine whether cleanup is complete. If gases or fumes, electrical or radiological problems, or other conditions present a hazardous situation, personnel or selected teams equipped with proper breathing apparatus and PPE will reenter the area to perform designated decontamination tasks, repairs, and salvage to allow the return to normal operations. After an emergency, the IC will turn the operation over to the Recovery Manager, who will:

- Provide for proper handling of recovered waste, contaminated soil or surface water, or any other material that results from a spill, fire, or explosion. Contaminated material will be managed appropriately and temporarily stored at one of the hazardous or mixed waste storage areas at LANL. Waste management personnel will be responsible for determining the final disposition of the waste. This determination will be made in compliance with hazardous waste standards.
- Arrange to monitor for damage or improper operation of the unit and associated equipment as a result of the emergency or of plant shutdown in response to the emergency.

- Arrange for site cleanup procedures to be completed and ensure that no waste that may be incompatible with the released material is treated or stored in the same area.

- Ensure that emergency equipment is cleaned, decontaminated, and fit for its intended use before operations are resumed. Equipment will be inspected visually and then sampled, if necessary, to determine the type and degree of contamination and to determine appropriate cleanup measures.

The Recovery Manager is the functional equivalent of the Emergency Coordinator for post-emergency actions.

Prior to resuming operations, facility management (e.g., NMT Division) will verify that the previously mentioned tasks have been performed. The owner/operator (DOE/LAAO) will notify appropriate state and local authorities that cleanup procedures are completed and that emergency equipment is clean and fit for its intended use.

The IC assumes the coordination of post-emergency actions (particularly during the time period immediately following the emergency) until a Recovery Manager is appointed. The Recovery Manager then assumes this coordination role. The post-emergency actions include cleanup operations, repairing vital equipment, or interim hazard-removal operations (such as arranging for the demolition of unstable walls). The services of the affected operational organizations (e.g., NMT), ESH groups, JCI, and other on-site resources will also be used to estimate cleanup costs and operational impact.

7.12 POST-EMERGENCY ASSESSMENT

When the emergency is over, the cause of the emergency and the effectiveness of the response are investigated in an effort to prevent future emergencies and to facilitate more effective responses to them. Following each event requiring the implementation of this contingency plan, the EM&R Office will schedule and conduct a critique with representatives from all response groups, with representatives in the building/area in which the emergency occurred, and with LANL management to determine the adequacy of the response.

7.13 EMERGENCY RESPONSE RECORDS AND REPORTS [20 NMAC 4.1, Subpart V, 264.56(j)]

Any emergency that requires implementation of this contingency plan will be documented by the Group or Section Leader responsible for the hazardous or mixed waste unit (e.g., the NMT Group or Section Leader at TA-55) associated with the emergency, and reported in writing within 15 days to the NMED. The incident report, submitted by DOE/LAAO, will include the following data:

- Name, address, and phone number of owner or operator
- Name, address, and phone number of the facility
- Date, time, and type of incident (e.g. fire, explosion, spill)
- Name of material(s) involved
- Quantity of material(s) involved
- Extent of injuries (if any)
- Assessment of actual or potential hazards to human health or the environment
- Estimated quantity and disposition of material recovered from the incident.

Various LANL personnel responding to the emergency will record the details of any incident requiring implementation of this plan. The CAS operator, the EOC communicator, the Emergency Manager, and/or the Group or Section Leader responsible for the hazardous or mixed waste management area in which the emergency occurred will record the date, time, location of the incident, wastes/materials involved, injuries (if any), property damage (if any), and a detailed description of the incident. This information will be maintained in the facility operating record required by 20 NMAC 4.1, 264.73 (see Section 4.7.1). ESH-7 will supply information concerning any follow-up actions. Appropriate LANL personnel will provide details regarding the removal and disposition of hazardous and mixed wastes associated with the emergency.

7.14 CONTINGENCY PLAN AMENDMENT [20 NMAC 4.1, Subpart V, 264.54]

This contingency plan will be reviewed periodically (i.e., at least every two years) by the EM&R Office, CST waste management groups, ESH-19, and NMT Division personnel, and, if necessary, will be reviewed as appropriate by ESH-10. The plan will be amended immediately if determined to be inadequate to handle releases (spills, explosions, and/or fires), and whenever:

- The facility permit is revised

- There is change in the design or operation of the facility (e.g., quantities of waste handled and handling techniques) that increases the likelihood of an emergency and requires changes in emergency response
- The list of Emergency Managers changes
- The list of emergency equipment changes significantly.

This plan is a controlled document distributed by ESH-19. Amendments to this contingency plan will be distinguished by the revision number and date of revision noted in the upper right-hand corner of each page. Amendments will be issued to all contingency plan holders and will include a cover letter that describes the plan changes and the rationale for those changes.

Table 7-1

Response Groups and Agencies Available to the Emergency Management and Response Office for Guidance and/or Emergency Assistance

LANL[a]-Controlled Response Group	Telephone	Responsibilities
NMT, Nuclear Materials Technology Division	667-2556	Provides initial emergency site evaluation at Technical Area (TA) 55 and conducts activities related to the prevention, notification, and control of emergencies at TA-55. In the event of an emergency at TA-55, monitors for leaks, pressure buildup, gas generation, or equipment ruptures, if necessary. Maintains and operates TA-55 Emergency Response Team. Writes TA-55 emergency plans and procedures.
ESH-1, Health Physics Operations	667-5296	Provides routine guidance on radiological decontamination. Provides routine site evaluation and monitoring to determine the nature and extent of contamination (radiological).
ESH-2, Occupational Medicine	667-7251	Provides emergency medical treatment.
ESH-5, Industrial Hygiene and Safety	667-4644	Provides guidance on industrial hygiene equipment and on operational safety.
	665-4427	Provides routine site evaluation/support field testing to determine the nature and extent of contamination (chemical).
ESH-6, Criticality Safety	667-4789	Provides technical expertise on the prevention and mitigation of criticality incidents.
ESH-7, Occurrence Investigation	667-0598	Reports occurrences and tracks follow-up actions.

Refer to footnotes at end of table.

Table 7-1 (Continued)

Response Groups and Agencies Available to the Emergency Management and Response Office for Guidance and/or Emergency Assistance

LANL[a]-Controlled Response Group	Telephone	Responsibilities
ESH-10, Hazardous Materials Response	665-5237	Provides emergency site evaluation/field monitoring (chemical and radiological). Specifies protective clothing and equipment. Dispatches Hazardous Materials Response Team. Provides support for chemical, radiological, hazardous, and mixed waste incidents and decontamination of responders and response equipment.
ESH-17, Air Quality	665-8855	Provides information on meteorological conditions.
ESH-18, Water Quality and Hydrology	665-0453	Provides information on hydrologic conditions.
ESH-19, Hazardous and Solid Waste	667-0666	Provides guidance on regulatory requirements. Conducts field surveys to determine spread of contamination and adequacy of cleanup.
ESH-20, Environmental Assessments and Resource Evaluations	667-0730	Provides information on biotic conditions.
CST, Chemical Science and Technology Division	667-7579 667-6095	Provides guidance on proper treatment, storage, and off-site shipment of hazardous and mixed waste.
PTLA, Protection Technology Los Alamos	667-4437	Provides traffic control, security.
JCI, Johnson Controls World Services Inc.	667-6191	Dispatches maintenance personnel and equipment. Assists in waste cleanup under direction of Recovery Manager.

Refer to footnotes at end of table.

Table 7-1 (Continued)

Response Groups and Agencies Available to the Emergency Management and Response Office for Guidance and/or Emergency Assistance

Non-LANL[a]-Controlled Response Group	Telephone	Responsibilities
Los Alamos County Fire Department	667-7080	Dispatches firefighting personnel, equipment, and Emergency Medical Services.
Los Alamos County Police Department	662-8222	Provides traffic control on public access roads.
Los Alamos Medical Center[b]	662-4201 662-2455	Provides medical services. Provides and maintains Emergency Room.

[a] Los Alamos National Laboratory.
[b] Medical services related to hazardous and mixed waste injuries are provided under the direction of ESH-2.

Table 7-2

Emergency Management and Response Office Emergency Managers[a]

Emergency Managers[b]	Laboratory Telephone	Home Telephone	Home Address
Gary W. Bequette	667-6211	662-5636	1781 37th St., Los Alamos, NM
Cheryl S. Bequette	667-6211	662-5636	1781 37th St., Los Alamos, NM
Eugene Darling	667-6211	662-2521	1860 Camino Redondo, Los Alamos, NM
Douglas Tuggle	667-6211	672-1231	117 Grand Canyon Drive, White Rock, NM
George Van Tiem[c]	667-6211	662-4623	197 El Viento St., Los Alamos, NM
Ed Nettles[c]	667-6211	662-5690	1461 Oakwood Lp., Los Alamos, NM

[a] To ensure immediate response, the Emergency Manager may be reached at the Emergency Management and Response Office (667-6211 or after hours, 667-7080).
[b] Assignments as the designated (i.e., primary) Emergency Manager are rotated. A current schedule is maintained at the Emergency Management and Response Office (667-6211 or after hours, 667-7080) and at the Central Alarm Station (911).
[c] Alternate Emergency Manager.

Table 7-3

Waste Analysis Parameters and Test Methods[a]

Parameter	Test Method	Reference[b]
Ignitability	Pensky-Martens closed-cup method	(L, S) SW1010 (L, S) ASTM D93-80
Reactivity	Test method to determine hydrogen cyanide released from waste Test method to determine hydrogen sulfide released from waste	(L, S) SW, Section 7.3
Corrosivity	Electrometric (pH of aqueous solution)	(L) SW9040B
Toxicity characteristic	Toxicity characteristic leaching procedure (TCLP) extraction	(S) SW1311
Metals:	Graphite furnace atomic absorption (AA) spectroscopy, gaseous hydride AA, or direct aspiration AA	
Arsenic		(L, S) SW7060A, SW7061A
Barium		(L, S)SW7080A, SW7081
Cadmium		(L, S) SW7130, SW7131A
Chromium		(L, S) SW7190, SW7191
Lead		(L, S) SW7420, SW7421
Selenium		(L, S) SW7740, SW7741A
Silver		(L, S) SW7760A, SW7761
Mercury	Manual cold-vapor technique	(L) SW7470A, (S) SW7471A
Volatile organics	Gas chromatography/mass spectrometry (GC/MS) GC/MS capillary column technique	(L, S) SW8240B (L, S) SW8260A
Semivolatile organics	GC/MS GC/MS capillary column technique	(L, S) SW8250A (L, S) SW8270B
Organochlorine pesticides	TCLP extraction and GC	(L, S) SW8080A
Chlorinated herbicides		(L, S) SW8150B
Heat value	Bomb calorimeter	(L) A006, ASTM D240
Organic chloride	Halide titration of combustion residue	(L, S) A004, ASTM D2361

Refer to footnotes at end of table.

Table 7-3 (Continued)

Waste Analysis Parameters and Test Methods[a]

Parameter	Test Method	Reference[b]
Ash content	Residue after combustion in muffle furnace	(L) A001, ASTM D482 (S) A001, ASTM D3174
Cyanide, free and total	Distillation and colorimetric ultraviolet	(L, S) SW9010A, SW9012
Total chromium	Colorimetric method for hexavalent chromium	(L, S) SW7196A
Sulfide	Colorimetric titration	(L, S) SW9030A
Total metals[c]	Acid digestion Inductively coupled plasma atomic emission spectroscopy	(L) SW3010A, (S) SW3050A (L, S) SW6010A
Arsenic		(L, S) SW6010A
Barium		(L, S) SW6010A
Beryllium		(L, S) SW6010A
Cadmium		(L, S) SW6010A
Chromium		(L, S) SW6010A
Lead		(L, S) SW6010A
Nickel		(L, S) SW6010A
Selenium		(L, S) SW6010A
Silver		(L, S) SW6010A
Thallium		(L, S) SW6010A
Zinc		(L, S) SW6010A
Mercury	Manual cold-vapor technique	(L) SW7470A, (S) SW7471A
Free liquids	Paint Filter Liquids Test	(L, S) SW9095

[a] At Los Alamos National Laboratory, current analytical capabilities include limited analyses of mixed waste samples. These analyses include gross alpha, beta, and gamma screening.

[b] "A" (e.g., A006) refers to U.S. Environmental Protection Agency, 1984, "Sampling and Analysis Methods for Hazardous Waste Combustion," *EPA-600/8-84-002.*
"ASTM" refers to American Society for Testing and Materials standards.
"SW" refers to U.S. Environmental Protection Agency, 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846.*
(L) refers to liquid waste.
(S) refers to solid waste.

[c] See also atomic absorption methods.

Table 7-4

Evacuation Determination and Reentry Conditions

Reason for Evacuation	Evacuation Determination Made by	Reentry Conditions[a]
Fire	Fire or evacuation alarm, Group Leader or alternate, Lead Engineer, Senior Staff Member present, Senior Technician, or Emergency Manager	Following survey by the Chief Fire Officer, ESH-1[b], ESH-5[c], and/or ESH-10[d], and R&D[e] supervision
Explosion	Same as above	Same as above
Loss of ventilation	Group Leader or alternate, Senior Staff Member, Lead Engineer, or Senior Technician	Following survey by ESH-1 and/or ESH-5, and R&D supervision
Loss of electric power	Same as above	Same as above
Extensive contamination	Same as above or ESH-1 Representative	Same as above or ESH-10
Airborne contamination	Same as above or Radiation Monitor	Same as above or ESH-10
Escape or release of toxic or hazardous gas or fumes	Group Leader or alternate, Senior Staff Member, Lead Engineer, Senior Technician, or Emergency Manager	Same as above plus ESH-5 or ESH-10
Bomb or bomb threat	EM&R[f] or PTLA[g] representative, R&D Section Leader or alternate, Senior Staff Member, or Lead Engineer	Following determination by the Emergency Manager or HDT[h] Leader

[a] All reentries are authorized by the Incident Commander.
[b] "ESH-1" refers to the Health Physics Operations Group.
[c] "ESH-5" refers to the Industrial Hygiene and Safety Group.
[d] "ESH-10" refers to the Hazardous Materials Response Group.
[e] "R&D" refers to the Research and Development Section.
[f] "EM&R" refers to the Emergency Management and Response Office.
[g] "PTLA" refers to Protection Technology Los Alamos.
[h] "HDT" refers to the Hazardous Devices Team.

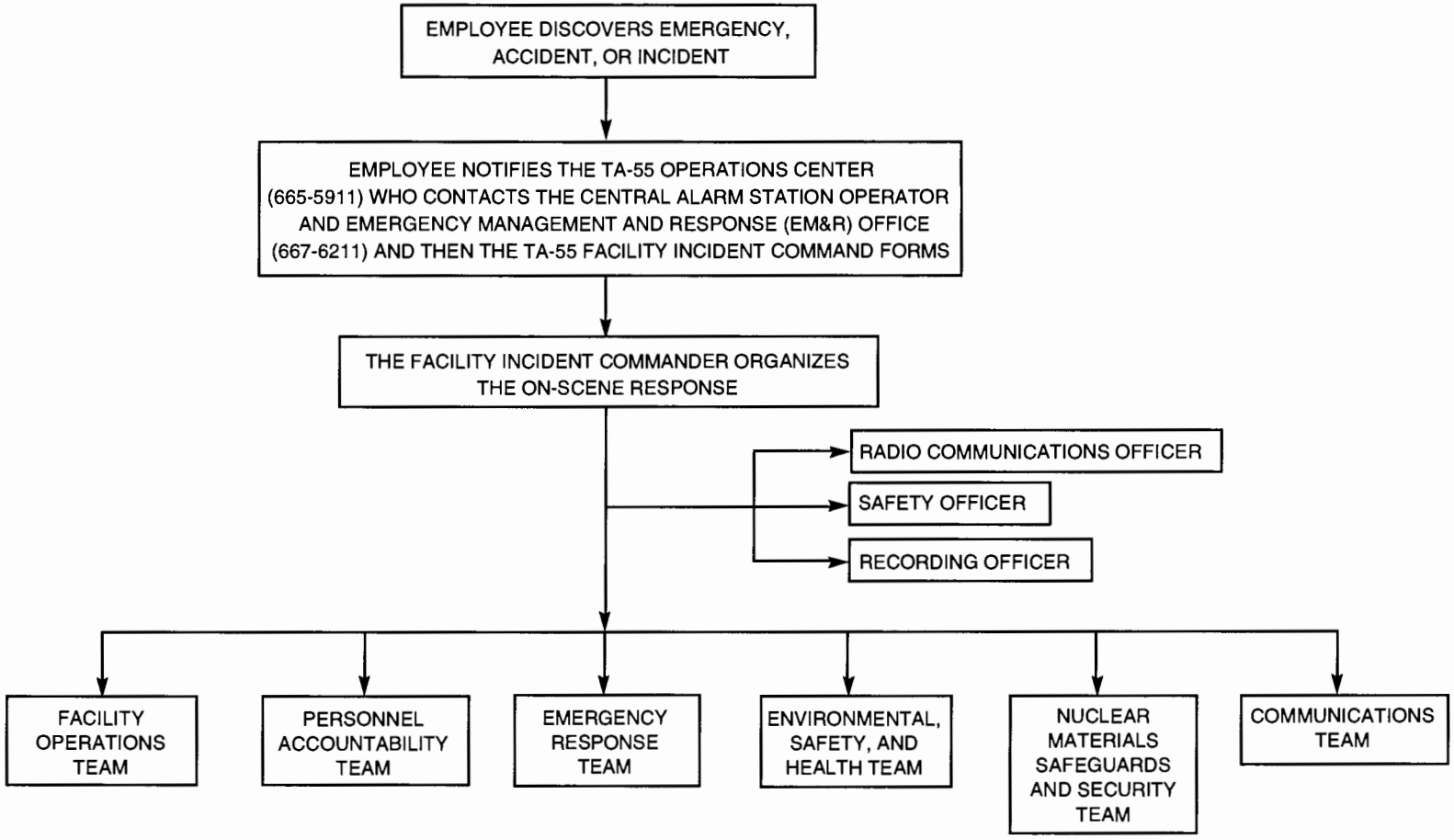


Figure 7-1
Emergency Notification Structure for Technical Area (TA) 55 - Specific Emergency Responses

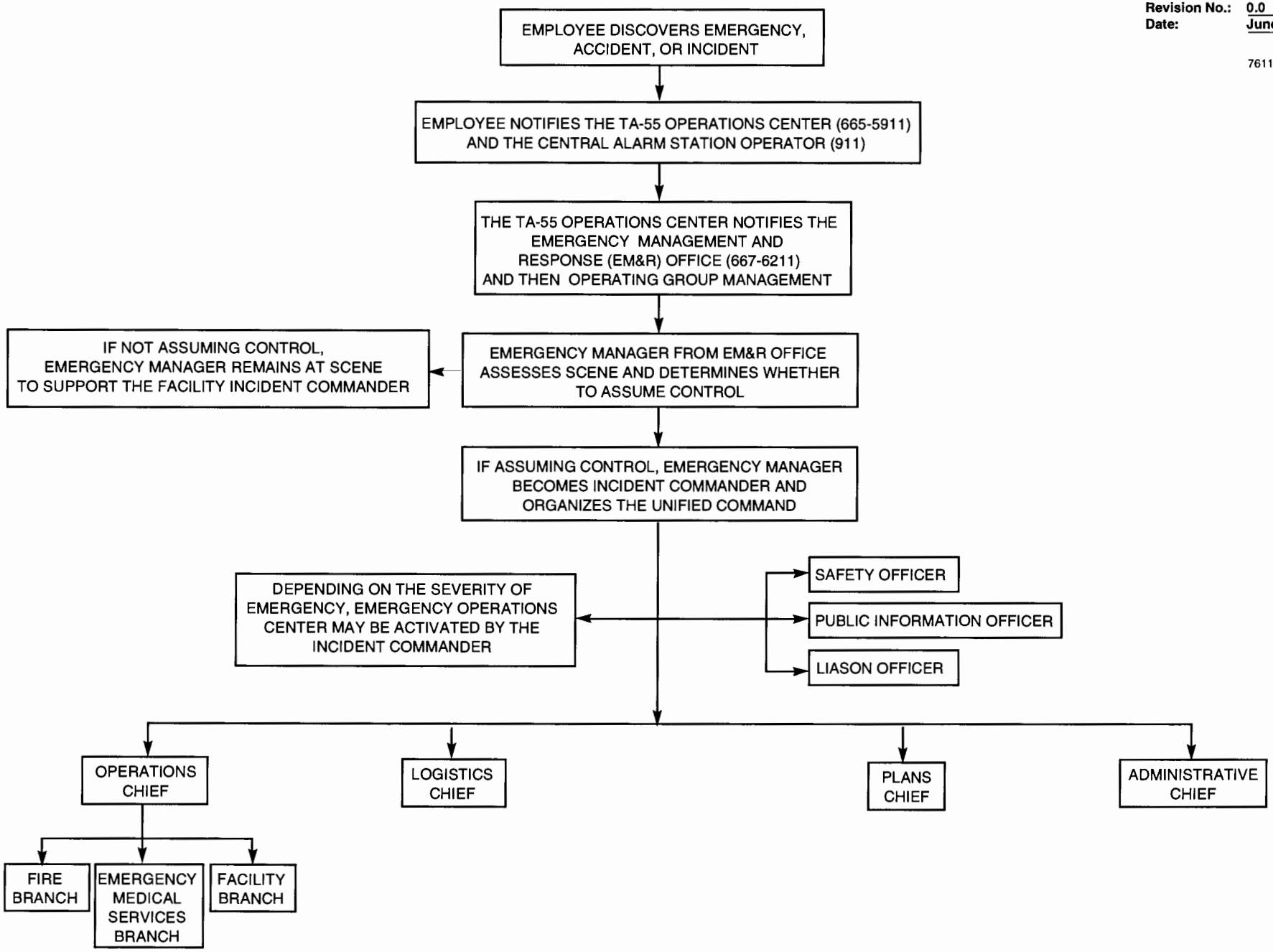
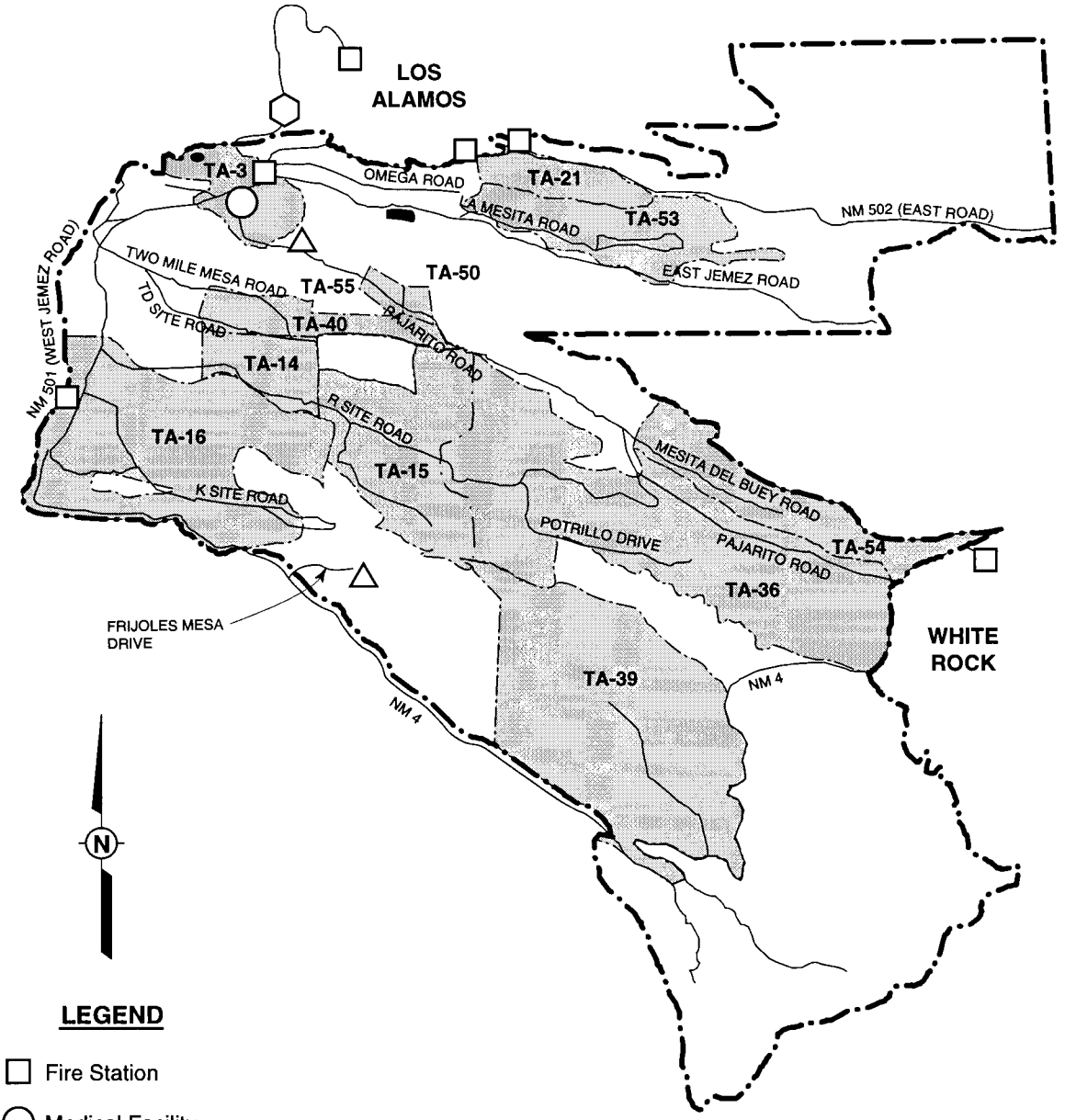


Figure 7-2
General Hazardous and Mixed Waste Emergency Notification Structure



LEGEND

- Fire Station
- Medical Facility
- Hospital
- Emergency Operations Center
- Shading indicates areas in which hazardous or mixed waste management units are located or planned for construction.
- Not Los Alamos National Laboratory property.

TA = technical area

4800 0 4800 Feet
Approximate Scale

Figure 7-3
Emergency Facilities

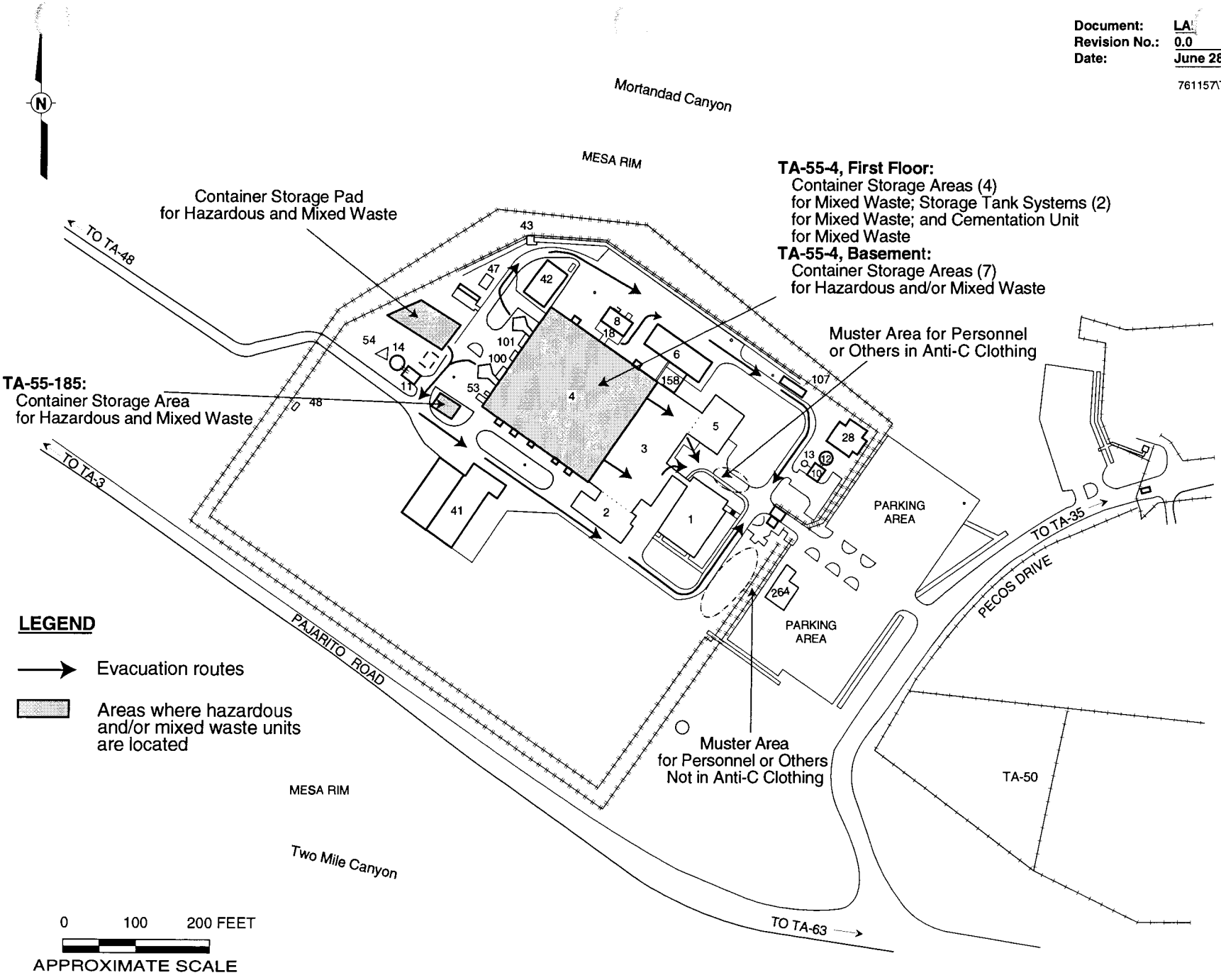


Figure 7-4
Evacuation Routes and Muster Area at Technical Area (TA) 55

Figure 7-6
Evacuation Routes at Technical Area (TA) 55, Building 4, First Floor

[This figure has been provided to the New Mexico Environment Department under separate cover as Unclassified Controlled Nuclear Information (UCNI) defined by Section 148 of the Atomic Energy Act.]

Figure 7-7
Evacuation Routes at Technical Area (TA) 55, Building 185

[This figure has been provided to the New Mexico Environment Department under separate cover as Unclassified Controlled Nuclear Information (UCNI) defined by Section 148 of the Atomic Energy Act.]

Figure 7-5
Evacuation Routes at Technical Area (TA) 55, Building 4, Basement

[This figure has been provided to the New Mexico Environment Department under separate cover as Unclassified Controlled Nuclear Information (UCNI) defined by Section 148 of the Atomic Energy Act.]

ATTACHMENT 7-1

Emergency Equipment

Attachment 7-1

Emergency Equipment

Hazardous Materials (HAZMAT) Vehicles and Associated Emergency Equipment:

HAZMAT vehicles and trailers are located at Technical Area (TA) 64, Building 39 (TA-64-39). They are available to the Environment, Safety, and Health (ESH) Hazardous Materials Response Group (ESH-10) for emergency response to all of the TAs at Los Alamos National Laboratory (LANL). ESH-10 is responsible for maintaining the supplies of appropriate emergency equipment in each vehicle and trailer.

The HAZMAT vehicles and trailers are equipped with safety and emergency equipment, personal protective clothing, and other supplies, which may include, but are not limited to:

assorted personal protective equipment, T-shirts, and gloves
safety goggles, safety glasses, and face shields
boots and booties
totally encapsulating suits and boots
Level A and B suits
flash suits
self-contained breathing apparatus (SCBA) and SCBA bottles
respirators and cartridges
hazardous chemical reference books and other reference materials
shovels
siphon pumps
assorted spill kits and sorbents
chemical burn and neutralizing solutions
two-way radios, cellular phones, and other communication equipment
bottles of leak detector and leak repair kits
emergency repair packs
HAZMAT bags
gas detectors and chemical detectors
radiological equipment
sponges and cleaners
warning signs and barricade tape
traffic control barriers
flashlights
cameras and film
knives
portable power supplies
warning and signal horns
harnesses and belts
portable emergency oxygen
decontamination equipment
sampling equipment
lifting equipment
assorted tools, tape, and other supplies.

Attachment 7-1

Emergency Equipment (Continued)

TA-55

Emergency equipment at TA-55-4 (First Floor), available for the mixed waste container storage areas (Areas 8 and 9 as shown on Figure 7-6 of this permit application), mixed waste storage tank systems, and mixed waste cementation unit in Room 401; and the mixed waste container storage areas (Areas 10 and 11) in Rooms 432 and 433:

FIRE CONTROL EQUIPMENT:

Ten fire extinguishers

Locations:

3 17-pound Halon in Room 401
2 15-pound Metal-X in Room 429
1 20-pound BC (carbon dioxide [CO_2]) in Room 429
1 17-pound Halon in Room 429
1 13.5-pound Halon in Room 432
2 13.5-pound Halon in Room 433

Description of General Capabilities:

The fire extinguishers are portable, manually-operated units. They may be used by any employee in case of fire. The fire extinguishers in Rooms 401 and 429 are for use only in case of fire outside the gloveboxes that house the cementation unit and the oxygen sparging unit. Magnesium oxide sand is available in Room 429 for use in case of fire inside the glovebox.

Fire alarm systems

Locations:

1 pull box outside of Room 401 within the airlock at the west end of the corridor
1 pull box outside of Room 429
5 drop box alarm push-button stations in Room 401
3 drop box alarm push-button stations in Room 429

Description of General Capabilities:

Fire alarms may be activated by any employee in the event of fire to notify the Central Alarm Station (CAS).

An automatic fire suppression sprinkler system is located in Rooms 401, 429, 432, and 433.

Automatic thermal alarms are located in the gloveboxes in Rooms 401 and 429.

Seven fire hydrants are located outdoors on the north, south, and west sides of TA-55-4.

Attachment 7-1

Emergency Equipment (Continued)

Emergency equipment at TA-55-4 (First Floor, Rooms 401, 429, 432, and 433), continued:

SPILL CONTROL EQUIPMENT:

Rooms on the first floor of TA-55-4 where container storage areas are located (i.e., Rooms 401, 429, 432, and 433) have recessed (i.e., concave) floors that can contain large volume spills. There are curbs between the rooms that will contain any spills that may occur within the rooms.

A mobile spill cart is located in the east-west corridor of TA-55-4 between Rooms 420 and 429. This spill cart may be transported to any spill location and contains the following items: protective suits; polyethylene booties, latex, polyethylene, and neoprene gloves; chemical protective goggles; gas mask canisters; masking, vinyl, and caution tape (acid/caustic); spill pillows; neutra acid and neutra base with spray triggers; base neutralizer; tools; cheesecloth; and a vinyl bag.

Spill pillows may be used to construct simple berms.

COMMUNICATION EQUIPMENT:

Three telephones are located in or near Room 401. These telephones are capable of handling incoming and outgoing calls and paging within the 400 area.

Two telephones are located in Room 429. They are capable of handling incoming and outgoing calls and may be used for paging in the 400 area.

One telephone is located in Room 432 and Room 433, respectively. These telephones are capable of handling incoming and outgoing calls and paging with the 400 area.

A telephone is located at each of the two west exit doors of TA-55-4.

Two-way radios are available, as needed, from the Facilities Management Group (NMT-8) at the TA-55-4 Operations Center for personnel working in Rooms 401, 429, 432, and 433.

Alarms at TA-55-4:
Fire alarm is a zone-wide whooping sound.
Drop box fire alarm; if a drop box push-button station is used, a zone-wide, high-pitched constant tone will also be activated.
Evacuation alarm is a facility-wide mid-range pulsating tone.
Continuous air monitor (CAM) alarm is a local high-pitched pulsating tone.
Ventilation alarm is a local slow, repeating chime tone.

The public address (PA) system may also be used to announce an evacuation.

Attachment 7-1

Emergency Equipment (Continued)

Emergency equipment at TA-55-4 (First Floor, Rooms 401, 429, 432, and 433), continued:

DECONTAMINATION EQUIPMENT:

Two safety showers are located in Room 401.
Two safety showers are located in Room 429.
One safety shower is located in Room 433.
Three eyewashes are located in Room 401.
One eyewash is located in Room 429.
Material Safety Data Sheets (MSDS) for each chemical handled are available in Rooms 401, 429, and 433.

Description of General Capabilities:
Safety showers and eyewashes are used by personnel who may receive a chemical splash to the skin or eyes. Specific MSDSs should be obtained prior to working with mixed waste or mixed material to determine if the application of water is indicated for decontamination.

PERSONAL PROTECTIVE EQUIPMENT:

Four SCBA are located in the hallway outside of Rooms 401 and 429. Three SCBA are located in the northside hallway in TA-55-4. They are available for personnel working in or near Rooms 401, 429, 432, and 433.

Additional SCBA are available in TA-55-1 (Room 122).

Change/decontamination rooms with protective clothing available are located on the first floor of TA-55-4 (Rooms 132 and 133) and in TA-55-3 (Rooms 107 and 140). Protective clothing is also available in the Health Physics Operations Group (ESH-1) locker located in the hallway near Room 401 for use by personnel working in or near Rooms 401, 429, 432, and 433.

Respirators located in TA-55-3 (Room 107) and in TA-55-4 (Room 515) are available for all personnel working in or near TA-55-4. Particulate and toxic gas canisters are available in TA-55-4 (Room 515).

Attachment 7-1

Emergency Equipment (Continued)

Emergency equipment at TA-55-4 (First Floor, Rooms 401, 429, 432, and 433), continued:

OTHER:

The ESH-1 locker located in the hallway near Room 401 contains the following items: hoods, sleeves, paper coveralls, probes, Nu-con smears, Nu-con smear holders, radiation tags, labels, radioactive contamination tape, shurtape (silver), earphones, fixed head filters (holders), and chemical spill pillows. These items are available for personnel working in or near Rooms 401, 429, 432, and 433.

Vehicles for evacuation of personnel are available through the EM&R Office at TA-59-1.

Two portable emergency generators (110 volts [V]) are available from the NMT-8 Support Office at TA-55-3.

One emergency cabinet with fire and rescue equipment located in the hallway near Room 401 contains the following items: rescue rope, masking tape, surgeon gloves, high tension gloves, lantern and batteries, blanket, hard hat, Kwik® heat pad, first aid kits, extra oxygen bottles, bolt cutters, pik-headed axe, collapsible stretcher, and extendable Tel-o-Pole®.

One Emergency Response Team (ERT) supply cart is located in the hallway between Rooms 420 and 429.

See page 1 of this Attachment for equipment available in the HAZMAT vehicles and trailers.

Attachment 7-1

Emergency Equipment (Continued)

TA-55

Emergency equipment at TA-55-4 (Basement), available for the hazardous and mixed waste container storage areas (Areas 1 through 5 and Area 7 as identified in Figure 7-5 of this permit application), and the container storage area for mixed waste (Area 6):

FIRE CONTROL EQUIPMENT:

Sixteen fire extinguishers

Locations:

9 15-pound CO_2 in basement: 1 north of Area 1; 1 west of the north entrance to Area 6 at Pillar K-3; 1 east of Area 5; 1 at battery-charging station at Pillar O-6; 1 west of the south entrance to Area 6 at Pillar D-3; 1 west of Area 4 at Pillar K-14; 1 west of Area 1 in Room 46; 1 south of Area 6 in Room 38 at Pillar D-2; 1 at Johnson Controls World Services Inc. (JCI) maintenance area
1 13.5-pound Halon east of Area 1 at Pillar E-10
2 13-pound Halon fire extinguishers in Area 6
1 ABC fire extinguisher immediately outside the north entrance of Area 6
1 13.5-pound Halon north of Area 3 adjacent to the fire door
1 13.5-pound Halon north of Area 2 at Pillar E-5
1 13.5-pound Halon east of Area 5

Description of General Capabilities:

The fire extinguishers are portable, manually-operated units. They may be used by any employee in case of fire.

Fourteen fire alarm pull boxes

Locations:

1 pull box on each side of the fire doors (4 total)
1 pull box north of Area 6
1 pull box just north of Area 7
1 pull box north of Area 5
1 pull box west of Area 5
1 pull box in stairwell east of Area 4
1 pull box in stairwell east of Area 3
2 pull boxes in basement corridor for Area 6
1 pull box in basement office for Area 6
1 pull box in Room 46

Description of General Capabilities:

Fire alarms may be activated by any employee in the event of fire to notify the CAS.

An automatic fire suppression sprinkler system is located throughout the basement at TA-55-4, including Area 6 and the office and corridor associated with Area 6.

Attachment 7-1

Emergency Equipment (Continued)

Emergency equipment at TA-55-4 (Basement container storage areas), continued:

FIRE CONTROL EQUIPMENT, continued:

Seven fire hydrants are located outdoors on the north, south, and west sides of TA-55-4.

SPILL CONTROL EQUIPMENT:

A mobile spill cart is located in the east-west corridor of TA-55-4 between Rooms 420 and 429. This spill cart may be transported to any spill location and contains the following items: protective suits; polyethylene booties, latex, polyethylene, and neoprene gloves; chemical protective goggles; gas mask canisters; masking, vinyl, and caution tape (acid/caustic); spill pillows; neutra acid and neutra base with spray triggers; base neutralizer; tools; cheesecloth; and a vinyl bag.

Area 6 has a recessed floor, which allows for containment of spilled material.

COMMUNICATION EQUIPMENT:

Eight telephones and seven intercom stations are located throughout the basement of TA-55-4. The telephones are capable of handling both incoming and outgoing calls. The intercom system is connected to the TA-55-4 Operations Center and allows the Operations Center to easily mobilize emergency response support.

Four two-way radios are available from NMT-8 at the TA-55-4 Operations Center for personnel working in the basement at TA-55-4.

Personal pagers are issued to and carried by assigned personnel working in the basement of TA-55-4. These pagers are accessed by telephone.

Alarms at TA-55-4:
Fire alarm is a zone-wide whooping sound.
Drop box fire alarm; if a drop box push-button station is used, a zone-wide high-pitched constant tone will also be activated.
Evacuation alarm is a facility-wide mid-range pulsating tone.
The CAM alarm is a local high-pitched pulsating tone.
Ventilation alarm is a local slow, repeating chime tone.

The PA system activated from the TA-55-4 Operations Center may be used to announce an evacuation.

Attachment 7-1

Emergency Equipment (Continued)

Emergency equipment at TA-55-4 (Basement container storage areas), continued:

COMMUNICATION EQUIPMENT, continued:

There is a site-wide paging system activated from the TA-55-4 Operations Center that can be heard throughout TA-55-4.

DECONTAMINATION EQUIPMENT:

Eight eyewashes are located throughout the basement of TA-55-4; two eyewashes are located just outside of Area 6.
One safety shower is located in the office for Area 6.
MSDSs are available in Area 2 and in the Waste Management and Environmental Compliance Group office at TA-55-2.
Description of General Capabilities:
The safety shower and eyewashes are used by personnel who receive a chemical splash to the skin or eyes. Specific MSDSs should be obtained prior to working with hazardous and/or mixed waste or hazardous and/or mixed material to determine if the application of water is indicated for decontamination.

A mobile decontamination cart is located north of Area 2 in the basement. The decontamination cart may contain the following items: paper hoods and coveralls, protective booties, gloves, masking tape, radiation tape, mops, buckets, plastic sheeting, soap, liquid cleaner, markers, miscellaneous tools, towels, nose swabs, extension cords, bags, and cheesecloth.

PERSONAL PROTECTIVE EQUIPMENT:

Two SCBA are located in the basement north of Area 2.
Additional SCBA are available in TA-55-1, Room 122.
Change/decontamination rooms with protective clothing available are located on the first floor of TA-55-4 (Rooms 132 and 133) and in TA-55-3 (Rooms 107 and 140).

Respirators located in TA-55-4 (Room 515) and in TA-55-3 (Room 107) are available for all personnel working in or near TA-55-4. Particulate and toxic gas canisters are available in TA-55-4 (Room 515).

Attachment 7-1

Emergency Equipment
(Continued)

Emergency equipment at TA-55-4 (Basement container storage areas), continued:

OTHER:

Vehicles for evacuation of personnel are available through the NMT-8 Support Office.

Portable emergency generators (110 V) are available from the NMT-8 Support Office at TA-55-3.

One Emergency Medical Services (EMS) first aid cart and one ERT emergency equipment cabinet are located east of the south entrance to Area 6.

See page 1 of this Attachment for equipment available in the HAZMAT vehicles and trailers.

Attachment 7-1

Emergency Equipment (Continued)

TA-55

Emergency equipment at TA-55, available for the hazardous and mixed waste container storage pad located west of TA-55-4:

FIRE CONTROL EQUIPMENT:

Ten fire extinguishers:
Locations:
1 15-pound CO_2 fire extinguisher located on Dock S-4 outside the south side of TA-55-4
6 13-pound Halon located in TA-55-42 at the northwest corner of TA-55-4
3 15-pound CO_2 located in TA-55-42 at the northwest corner of TA-55-4
Description of General Capabilities:
The fire extinguishers are portable, manually-operated units. They may be used by any employee in case of fire.

Seven fire hydrants are located along the north, south, and east sides of TA-55-4.

One fire hydrant is located just east of the container storage pad.

Five fire alarm pull boxes are located in TA-55-42 at the northwest corner of TA-55-4.

One fire alarm pull box is located outside on the south side of TA-55-4.

SPILL CONTROL EQUIPMENT:

Sorbent material is located in the storage shed at the container storage pad.

COMMUNICATION EQUIPMENT:

Two Centrex telephones are located at the west exit doors of TA-55-4.
Description of General Capabilities:
Telephones are used for internal and external communication.

Two-way radios are available from NMT-8 at the TA-55-3 Operations Center and will be used by personnel working at the container storage pad.

Personal pagers are issued to and carried by assigned personnel working at the container storage pad. These pagers are accessed by telephone.

Attachment 7-1

Emergency Equipment (Continued)

Emergency equipment at TA-55 (container storage pad), continued:

COMMUNICATION EQUIPMENT, continued:

Alarms at TA-55:
Fire alarm is an area-wide whooping sound.
Evacuation alarm is a facility-wide mid-range pulsating tone.
The PA system activated from the TA-55-4 Operations Center may be used to announce an evacuation. PA speakers are located on the west side of TA-55-4.
Two intercom systems to the TA-55-4 Operations Center are located on the south and north sides of TA-55-4.
Operations Center personnel will contact emergency response organizations.

DECONTAMINATION EQUIPMENT:

One safety shower is located outdoors on the container storage pad.
Two safety showers are located outdoors on the south side of TA-55-4.
One eyewash is located outdoors on the container storage pad.
Two eyewashes are located outdoors on the south side of TA-55-4.
MSDSs are available in the Waste Management and Environment Compliance Group office at TA-55-2.
Description of General Capabilities:
The safety showers and eyewashes are used by personnel who receive a chemical splash to the skin or eyes. Specific MSDSs should be obtained prior to working with hazardous and/or mixed waste or hazardous and/or mixed material to determine if the application of water is indicated for decontamination.

PERSONAL PROTECTIVE EQUIPMENT:

SCBA are available in TA-55-1, Room 122.

Change rooms with protective clothing available are located on the first floor of TA-55-4 (Rooms 132 and 133) and in TA-55-3 (Rooms 107 and 140).

Respirators are located in TA-55-4 (Room 515) and in TA-55-3 (Room 107) for all personnel working in or near TA-55-4.

Attachment 7-1

Emergency Equipment (Continued)

Emergency equipment at TA-55 (container storage pad), continued:

OTHER:

A four-wheel-drive front-end loader is available from NMT-8 in TA-55-3.

Vehicles for evacuation of personnel are available through the NMT-8 Support Office.

Portable emergency generators (110 V) are available from the NMT-8 Support Office at TA-55-3.

See page 1 of this Attachment for equipment available in the HAZMAT vehicles and trailers.

Attachment 7-1

Emergency Equipment (Continued)

TA-55

Emergency equipment at TA-55, available for the hazardous and mixed waste container storage area located at TA-55-185:

FIRE CONTROL EQUIPMENT:

Seven fire hydrants are located along the north, south, and east sides of TA-55-4.

One fire alarm pull box is located inside TA-55-185.

Five fire alarm pull boxes are located in TA-55-42 at the northwest corner of TA-55-4.

One fire alarm pull box is located outside on the south side of TA-55-4.

SPILL CONTROL EQUIPMENT:

TA-55-185 will be equipped with spill control equipment (similar to that located at other TA-55 units addressed in this permit application) once wastes are managed there.

COMMUNICATION EQUIPMENT:

One telephone is located inside TA-55-185.
Two Centrex telephones are located at the west exit doors of TA-55-4.
Description of General Capabilities:
Telephones are used for internal and external communication.

Two-way radios are available from NMT-8 at the TA-55-4 Operations Center for personnel working at TA-55-185.

Personal pagers are issued to and carried by assigned personnel working at TA-55-185. These pagers are accessed by telephone.

Alarms at TA-55:
Fire alarm is an area-wide whooping sound.
Evacuation alarm is a facility-wide mid-range pulsating tone.

The PA system activated from the TA-55-4 Operations Center may be used to announce an evacuation.

Attachment 7-1

Emergency Equipment (Continued)

Emergency equipment at TA-55 (TA-55-185 container storage area):

COMMUNICATION EQUIPMENT, continued:

PA speakers are located on the west side of TA-55-4, near TA-55-185. Two intercom systems to the TA-55-4 Operations Center are located on the south and north sides of TA-55-4. Operations Center personnel will contact emergency response organizations.

DECONTAMINATION EQUIPMENT:

TA-55-185 will be equipped with a portable safety shower and eyewash station once wastes are managed there.

PERSONAL PROTECTIVE EQUIPMENT:

SCBA are available in TA-55-1, Room 122.

Change rooms with protective clothing available are located in TA-55-3 (Rooms 107 and 140). A portable change room/decontamination system provided during an emergency by the HAZMAT Team may also be used.

Respirators located in TA-55-4 (Room 515) and in TA-55-3 (Room 107) are available for all personnel working in or near TA-55-185.

OTHER:

A four-wheel-drive front-end loader is available from NMT-8 in TA-55-3.

Vehicles for evacuation of personnel are available through the NMT-8 Support Office.

Portable emergency generators (110 V) are available from the NMT-8 Support Office at TA-55-3.

See page 1 of this Attachment for equipment available in the HAZMAT vehicles and trailers.

Attachment 7-1

Emergency Equipment
(Continued)

Emergency equipment and personnel controlled by the TA-55 Emergency Response Team:

TA-55 Emergency Response Team:

PERSONNEL:

Emergency Medical Technician (EMT) Intermediates
EMT Basics
EMS First Responders
HAZMAT Specialists
HAZMAT Technicians
HAZMAT First Responder Operational

SPECIAL EQUIPMENT-PORTABLE:

Two-way trunked radios, the LANL Emergency Management channel and the Los Alamos County Fire Department (LACFD) trunked radio system
Cart with emergency equipment and oxygen (O_2)
Cabinet with emergency equipment and O_2
Portable emergency response bag with medical supplies
Portable manual suction unit
Portable stretchers (stokes baskets, back boards, gurney, folding)
Wheelchairs
O_2 tanks
Manual resuscitators
Portable sphygmomanometers
Stethoscopes
Anticontamination apparel
Eye irritation solution
Industrial first-aid kits
Extrication and cervical collars
Protective apparel

Attachment 7-1

Emergency Equipment
(Continued)

Emergency equipment and personnel controlled by the TA-55 Emergency Response Team (continued):

TA-55 Emergency Response Team (continued):

SUPPLIES-GENERAL:

Bedding/pillows
Rescue blankets
Burn blankets
Thermal/icing pouches
Multitrauma dressings, surgical and first-aid supplies
Disposable ice bags

TRANSPORTATION:

Full ambulance service is available from the LACFD.

COMMUNICATION:

Same communication equipment/capabilities as stated previously for TA-55-4.

Attachment 7-1

Emergency Equipment
(Continued)

Supplemental emergency equipment and personnel available from the LACFD:

Engine companies - 1,250 gallons per minute
- Engines 1, 3, 4, 5, 6, 10, and 40

Engine 50 (Reserve) - 1,000 gallons per minute

Mini-pumpers
- MT-1, -3, -4, and -5

Modular ambulances
- 3 First line - M1, M3, M4
- 1 Reserve Unit - M10

Rescue vehicles
- 1 First Line
- 1 Newly Purchased

Crash-Fire-Rescue (CFR) unit
- CFR 6
- CFR 60 (small, fast attack unit)

SCBA units

SCBA air tanks

105-foot tower ladder with pump - 1,500 gallons per minute

Personnel with 120 hours EMT training

Personnel with Advanced Life Support training

Water tankers
- T-1 = 1,500 gallons
- T-3 = 2,500 gallons
- T-4 = 3,000 gallons
- T-5 = 2,500 gallons
- T-50 = 1,500 gallons

Attachment 7-1

Emergency Equipment (Continued)

Supplementary emergency equipment and personnel available from JCI:

TRANSPORTATION:

Pickups, 1/2 through 3/4 ton
Trucks, 1 through 3 ton
Vans, panels, and carryalls

SPECIAL EQUIPMENT:

Road grader, Cat, self-propelled blade, with radio
Graders, John Deere, self-propelled, with radio
Loaders, bucket, Melroe, Bobcat, 1/3 cubic yards
Loader, bucket, Cat, 2-3/4 cubic yards, with radio
Loader, Fiat-Allis, 3 cubic yards
Loader, bucket, Cat, 2-1/2 cubic yards
Loader, bucket, Cat, 3-1/4 cubic yards
Loader, bucket, Yale, 3 cubic yards, with radio
Loader, bucket, backhoe, Case, 1-1/2 cubic yards
Loaders, bucket, backhoe, Case, 7/8 cubic yards
Loader, backhoe, Ford, 1 cubic yard
Loader, bucket, backhoe, JCB, 7/8 cubic yards
Snowplows, Bombardier, with blade
Bulldozer, D-8, Crawler
Bulldozers, TD-25, International
Scraper, Terex, self-propelled
Scraper, Fiat-Allis, self-propelled
Bulldozer, 280, rubber-tired, with radio
Semitrailers
Chain saws
Flusher, street, 3,000-gallon truck, tanker, 500-gallon, FMC
Mobile transceivers (2-way, KOB-753)
Generators
Handsets (2-way)
Pageboys (1-way)
Welders, mounted on trailers and trucks

Attachment 7-1

Emergency Equipment
(Continued)

Supplementary emergency equipment and personnel available from JCI (continued):

PERSONNEL:

Heavy equipment operators
Clerks
Dispatchers
Mechanics
Power saw operators
Radio and telephone operators
Truck drivers

Other Equipment

Portable toilets
Light bank set 2/3 kilowatt generator
Hand-held two-way radios
6" x 8" landscape timbers
15-ton dump truck
8-ton dump truck
Fuel truck, 3,000 gallons (diesel)
Service truck (POL)
Combination fuel truck (392 gallons diesel) (392 gallons gasoline)

Snow Removal Equipment

Truck-mounted snow plows
Motor graders w/wing plow attachment
Truck-mounted sand/salt spreaders
Sand/salt spreader/plow
Front end loaders
Rubber-tired bulldozer
Farm tractors w/blade attachments
Skid steer loaders
Rubber-tracked bombardiers
Hand-operated snow blowers
Road-configured snow blower
Wheel Horses w/blade attachments

Attachment 7-1

Emergency Equipment
(Continued)

Supplementary emergency equipment and personnel available from JCI (continued):

Snow Removal Personnel

Laborers
Teamsters
Operators
Mechanics
Supervisors

Spill Response Equipment

Spill trailer
Material storage shed
Submersible pump
Acid/caustic pump
Wet/vacuums
Vacuum

Spill Response Material

Sorbent sheets
Zorball (sacks)
55-gallon barrel w/bung
55-gallon barrel w/o bung
3" x 96" spill booms
Sand bags
Gallon ND-165 degreaser
White mop heads w/handles

Personnel

Teamsters
Operators
Laborers
Supervisors

Attachment 7-1

Emergency Equipment
(Continued)

Supplementary emergency equipment and personnel available from JCI (continued):

Utilities Equipment

Line truck (digger derrick)
Basket truck
Backhoe
Boom truck
Dump truck
Sewage trucks
Potable water truck
Trailer-mounted generator (110V)
Truck-mounted welders
Thawing machine

Utilities Personnel

Operators
Pipefitters
Laborers

Attachment 7-1

Emergency Equipment
(Continued)

Emergency equipment and personnel at the Central Medical Facility, Occupational Medicine Group (ESH-2):

At TA-3 (SM-409) Central Clinic:

PERSONNEL:

Physicians
Physician's Assistants
Nurses
X-ray Technicians
Clinical Laboratory Technicians
Clinical Testing Technicians

SPECIAL EQUIPMENT-PORTABLE:

Multichannel emergency receiver-base station
Two-way radio on the State Med Net, the LANL Emergency Management channel, and the LANL Health-Safety Net
Cardiac monitors and defibrillators
Crash cart emergency equipment with E-tank O_2
Portable physicians' bag with medications
Portable suction unit
Portable stretchers (ambulance, gurney, folding)
Wheelchairs
O_2 tanks
Manual resuscitators
Intravenous (IV) stands
IV solutions
Otoscopes/ophthalmoscopes
Portable sphygmomanometers
Stethoscopes
Anticontamination apparel
Eye irritation solution
Industrial first-aid kits
Extrication and cervical collars, crutches, canes
Suture sets
Protective apparel
Morgan lends and irrigation sets
Decontamination equipment (portable)

Attachment 7-1

Emergency Equipment
(Continued)

Emergency equipment and personnel at the Central Medical Facility, ESH-2 (continued):

At TA-3 (SM-409) Central Clinic (continued):

SUPPLIES-GENERAL:

Bedding/pillows
Rescue blankets
Burn blankets
Thermal/icing pouches
Multitrauma dressings, surgical and first aid supplies
Disposable ice bags

SPECIAL FACILITIES - NONPORTABLE:

Completely equipped emergency room with ambulance entrance
Emergency lighting system
Complete X-ray suite
Protective clothing and wound counters
12-lead electrocardiographs
Fully equipped crash cart with Life Pak, intubation equipment, emergency medications, etc.
Fully equipped decontamination room at Los Alamos Medical Center (LAMC) adjacent to the LAMC emergency room

TRANSPORTATION:

Full ambulance service is available within minutes to the central facility.

COMMUNICATION:

Base station on State Medical Net and LACFD trunked radio system.

8.0 PERSONNEL TRAINING

This section describes the general personnel training program for Los Alamos National Laboratory (LANL). Training requirements for facility personnel are specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart V, 264.16, revised November 1, 1995, "Personnel Training," and are addressed in this permit application as specified in 20 NMAC 4.1, Subpart IX, 270.14(b)(12), revised November 1, 1995. The primary objective of the training program is to prepare persons to operate and maintain safely those areas managing hazardous and/or mixed waste in accordance with 20 NMAC 4.1, Subpart V, revised November 1, 1995. This training program applies to all employees of the U.S. Department of Energy, the University of California, and any of their subcontractors who work regularly at LANL and who handle or generate LANL hazardous and/or mixed waste. The degree of training varies with the job duties. However, all personnel who may handle or generate LANL hazardous and/or mixed waste receive an introduction to hazardous waste management regulations.

8.1 HAZARDOUS AND MIXED WASTE MANAGEMENT/RESPONSIBILITIES

Waste management activities at Technical Area (TA) 55 are handled by the Nuclear Materials Technology (NMT) Division. However, waste management groups within the Chemical Science and Technology (CST) Division and the Hazardous and Solid Waste Group (ESH-19) are responsible for most waste management activities outside TA-55 at LANL. With the noted exceptions, CST waste management groups are responsible for all day-to-day operational aspects of waste management. ESH-19 is responsible for providing waste management regulatory guidance to all LANL personnel and operations. Other personnel at LANL responsible for waste management activities are discussed in the following paragraph and in Section 7.0 of this permit application.

Other LANL groups and various support personnel assist in waste management activities and provide support to ESH-19 and CST. Johnson Controls World Services Inc. (JCI) provides trained personnel to assist CST in waste-handling activities. Personnel in the Health Physics Operations Group (ESH-1), Occupational Medicine Group (ESH-2), Industrial Hygiene and Safety Group (ESH-5), Occurrence Investigation Group (ESH-7), Hazardous Materials Response Group (ESH-10), Air Quality Group (ESH-17), Water Quality and Hydrology Group (ESH-18), Environmental Assessments and Resource Evaluations Group (ESH-20), and personnel in

ESH-19 are trained in their specialities to provide emergency response support. Protection Technology Los Alamos (PTLA) is responsible for LANL security, traffic control, and site access control.

The Emergency Management and Response (EM&R) Office provides emergency planning and response at LANL and has the overall responsibility for LANL's Emergency Management Plan (EMP) training. The Environment, Safety, and Health (ESH) Division Training Group (ESH-13) is responsible for developing and delivering LANL-wide environment, safety, and health (ES&H) training. Environmental courses are designed with substantial input from ESH-19, the CST waste management groups, and others, as appropriate.

8.2 TRAINING CONTENT, FREQUENCY, AND TECHNIQUES [20 NMAC 4.1, Subpart IX, 270.14(b)(12); 20 NMAC 4.1, Subpart V, 264.16(a)(b) and (d)]

The training program instituted at LANL includes a combination of LANL-wide courses (received internally or through external vendors and usually classroom-based), facility-specific training (developed and delivered within a particular facility), and on-the-job training (performance-based courses that focus primarily on procedures performed by individual workers). Each of these types of training is described briefly in Sections 8.2.1 through 8.2.3. All LANL, JCI, and PTLA employees will receive the appropriate level of training within six months of their date of hire or transfer. Personnel will not work in unsupervised positions until they successfully complete the appropriate level of training for their positions and responsibilities.

Records of LANL-wide training currently sponsored or administered by ESH-13 are entered by that group into the Employee Development System (EDS), the official LANL training database. These records document that the required training has been successfully completed by the worker. Training records of former workers are kept for at least three years from the date last worked at the facility. It is required that records documenting successful completion of facility-specific, on-the-job, or externally provided training be kept by the sponsoring organizations. Group or section training personnel or document control custodians will maintain, at a minimum, hard copies of training records for currently employed workers until the facility closes.

Attachment 8-1 summarizes the components of the LANL-wide training program as administered through ESH-13. This table includes a listing of the relevant training courses, a summary of

topics, and a designation of the relevant courses for each job category. Categories of workers summarized in Attachment 8-1 include hazardous/mixed waste workers, managers and supervisors of hazardous/mixed waste workers, emergency responders, and uncontrolled area potential release site workers. Attachment 8-2 summarizes the components of facility-specific and on-the-job training (OJT) that workers must receive. Each training element was designed to ensure that every worker involved in hazardous and/or mixed waste operations is properly trained in procedures relevant to the positions in which they are employed. Tracking the completion of training is possible through the EDS training plans.

Hazardous/mixed waste workers are responsible for handling and/or managing hazardous/mixed wastes and assisting in spill and emergency response activities, as required.

Managers and supervisors of hazardous/mixed waste workers are directly responsible for day-to-day operations related to waste management activities and assuring that personnel safety and training requirements are met.

Emergency responders are trained emergency response personnel (e.g., ESH-10, TA-55 Emergency Response Team) that respond to emergencies (e.g., spills, fires, explosions) involving hazardous and/or mixed wastes and provide support for emergency response activities.

Uncontrolled area potential release site workers conduct investigations and remedial activities at potential release sites and are responsible for proper waste management from generation to disposal including waste characterization, treatment, and storage.

Training materials of LANL-wide training courses are on file in the ES&H Training Center and are available for review by all hazardous/mixed waste management and handling personnel, emergency response personnel, and regulatory agencies. Course content will be reviewed annually and updated as required to remain current with hazardous waste management regulations. Alternative forms of training (e.g., paper-based self-study courses, computer-based training) may be taken to meet specific training requirements. Such alternate forms of training must be approved by ESH-13 personnel and determined to be equivalent in content to more traditional classroom-based training courses. Files listing the requisite skills, education, and training for workers who handle hazardous and mixed waste and the duties and responsibilities

for each job description, as well as the name of each worker filling a job description are maintained, as required by 20 NMAC 4.1, Subpart V, 264.16(d)(2), revised November 1, 1995. This information is located in the EDS as well as maintained at the facility by the group or section document control custodian.

8.2.1 LANL-Wide Training

The Resource Conservation and Recovery Act (RCRA) Personnel Training course provides an overview of state and federal hazardous waste management regulations and emphasizes compliance with the requirements that apply to job-related activities, such as the safe handling of hazardous and mixed waste. Program instructors are trained in hazardous and mixed waste management programs and procedures and in RCRA *(42 United States Code [USC] 6901 et seq.)* provisions. The course is designed to provide training that is appropriate for the worker's responsibilities. ESH-13, with guidance from ESH-19, provides an annual refresher of applicable hazardous waste management requirements. Personnel who handle LANL hazardous and mixed waste and/or clean up spills or releases of hazardous and mixed waste and the managers and supervisors of these workers also receive instruction on appropriate topics listed in Attachment 8-1. In addition, personnel responsible for requisitioning the transport, treatment, or storage of hazardous and mixed waste receive supplementary training, as necessary, as listed in Attachment 8-1. Training is typically provided by LANL training instructors or by external vendors knowledgeable about a particular subject.

8.2.2 Facility-Specific Training

All waste-handling personnel will participate in facility-specific training at their work locations. Attachment 8-2 addresses program requirements that ensure that hazardous and mixed waste management and handling personnel know the specific requirements for their facilities (as appropriate to their job) and are able to respond effectively to emergencies. Personnel will become familiar with emergency and monitoring equipment use, inspection, repair, and replacement at their facility (as appropriate to their job). In addition, they will receive instruction on contingency plan contents and implementation (as they apply to their facility) including, but not limited to, communications or alarm systems, response to fire and explosions at their facility, and key parameters for automatic waste-feed cutoff systems and shutdown of facility operations.

8.2.3 On-the-Job Training

Performance-based OJT is developed in conformance with LANL standards. Supervisors or other experts who can evaluate worker proficiency provide training appropriate for the procedures required of each function-specific position. To become proficient in hazardous and/or mixed waste procedures, workers receive this performance-based training, as necessary.

OJT topics include implementing facility-specific procedures, maintaining operating records, fulfilling reporting requirements, and conducting inspections specific to the facility. Workers whose duties include waste packaging and transportation support receive training on packaging, labeling, recordkeeping, and waste segregation for transportation within their facility. Emergency responders receive facility-specific training regarding emergency response and shutdown procedures at the facility to which they are assigned.

8.2.4 Training Coordinator [20 NMAC 4.1, Subpart V, 264.16(a)(2)]

The ESH-13 Group Leader directs the LANL-wide ES&H training program. The Group Leader is trained in the operation of hazardous and mixed waste management facilities, waste management practices, and emergency procedures and is responsible for coordinating training courses. Line managers are responsible for ensuring that personnel under their supervision receive necessary training.

8.3 EMERGENCY TRAINING [20 NMAC 4.1, Subpart V, 264.16(a)(3) and (c)]

If called upon by the EM&R Office, additional non-LANL emergency response personnel (e.g., JCI, PTLA) may assist the LANL Emergency Manager at the scene of a hazardous or mixed waste emergency. These professionals are trained in their specialties (e.g., heavy equipment operation, hazardous material cleanups, traffic control, security). JCI personnel are also trained in personal safety. At all times during an emergency, these workers are under the direct supervision of the Incident Commander in the Unified Command or the designated Crisis Manager, as appropriate. Section 7.0 of this permit application (i.e., the Contingency Plan) provides a more detailed discussion of emergency procedures, personnel, and equipment.

To ensure maximum protection of life and property and to mitigate the consequences of an emergency situation, facility personnel involved in waste handling and emergency response must be knowledgeable of appropriate building and operating area emergency procedures. These

workers receive training in facility-specific emergency procedures or participate in the LANL-wide emergency training program. Group leaders and immediate supervisors are responsible for ensuring that education and training in facility-specific emergency procedures are provided to all personnel under their supervision. Training in facility-specific emergency procedures is given by the operating group. Periodic announced and unannounced emergency drills and exercises are used to familiarize workers with emergency procedures. Training is also provided to workers through prominent instructional displays and through presentations and discussions in safety meetings.

Each new or transferred worker is indoctrinated by an immediate supervisor regarding the general and specific emergency procedures related to the work area. The immediate supervisor also advises each worker of changes to any emergency procedures and provides an annual refresher of procedures affecting the work area. The organization that develops and delivers facility-specific training maintains these training records.

Specialized training is given to personnel assigned special functions or specific emergency duties. Emergency response personnel are required to attend courses on implementation of the hazardous/mixed waste contingency plan, spill response, and Occupational Safety and Health Administration (OSHA) emergency response provisions. The EM&R Office provides training related to implementing LANL's EMP. In addition, all waste management and handling personnel participate in a training program in which they are instructed in emergency procedures pertinent to their work areas. The operating group provides this site-specific instruction.

8.4 IMPLEMENTATION OF TRAINING PROGRAMS

General Employee Training (GET), an ES&H orientation course, is given on the first day of employment to all new employees. GET is also required of contract workers and visitors who work on site at LANL for ten or more consecutive days. GET includes, but is not limited to, ES&H policy, OSHA rights and regulations, industrial safety, waste minimization, general radiation protection, industrial hygiene, emergency management, and fire protection. Personnel who will handle or be associated with LANL hazardous waste are required to take the hazard communications and waste generator training courses. All workers who will handle or be associated with mixed waste also receive courses in hazard communications and waste generator

training as well as radiation worker protection. Workers will not work without direct supervision or at a new position until they have been trained.

The Waste Generation Overview training course provides hazardous and mixed waste generators with information needed to identify wastes that are subject to hazardous waste regulations in 20 NMAC 4.1, Subpart II, revised November 1, 1995. The training defines hazardous waste and hazardous constituents (including hazardous components in mixed waste) and addresses how to identify hazardous waste and hazardous constituents. A second course, Waste Documentation Forms, focuses on documenting characterized waste according to LANL requirements and to requirements specified by 20 NMAC 4.1, revised November 1, 1995. Both training courses inform hazardous and mixed waste generators of their responsibilities and requirements and support the documentation of process knowledge, which generators may use to characterize hazardous and mixed waste. All workers who handle LANL hazardous and/or mixed waste at treatment, storage, or disposal units and less-than-ninety-day storage areas are required to have RCRA Personnel Training, and those who work at treatment, storage, or disposal units are required to have Hazardous Waste Operations and Emergency Response (HAZWOPER) Occasional Site Worker Training.

All hazardous and mixed waste management and handling personnel must attend annual refresher courses. These courses are intended to update personnel on LANL procedures and changes in RCRA *(42 USC 6901 et seq.)* provisions and to provide them with an overview of their introductory training. Line managers and group leaders will ensure that personnel participate in the appropriate introductory and annual training courses.

ATTACHMENT 8-1

Los Alamos National Laboratory-Wide Training Program

Attachment 8-1

Los Alamos National Laboratory-Wide Training Program

COURSES[a]	Hazardous/Mixed Waste Worker	Manager/Supervisor of Hazardous/Mixed Waste Workers	Emergency Responder[b]	Uncontrolled Area Potential Release Site Worker
Criticality Safety Training (presents nuclear theory, criticality reactions, characteristics, exposure protection principles, and criticality prevention measures)	*[c]	*	*	*
General Employee Training (includes familiarization with standard operating safety guidelines)	X[d]	X	X	X
Hazard Communication Introduction (includes information on explosion/fire hazards, chemical burns, chemical compatibility, eye/skin hazards and protection, respiratory hazards and protection)	X	X	X	X
HAZWOPER[e]: First Responder (Operations Level) (provides an overview of hazardous materials emergency response including recognition and identification of hazardous materials and associated risks, required actions, and relationships with other emergency responders)			X	
HAZWOPER: General Site Worker (provides general information on hazardous waste operations and emergency response for general site workers engaged in corrective action, remediation, or decontamination and decommissioning activities)				X
HAZWOPER: Occasional Site Worker (provides general information on hazardous waste operations and emergency response for occasional and regular site workers)	X	X		
HAZWOPER: Refresher for General Site Workers (provides general information on hazardous waste operations to general site workers)				X
HAZWOPER: Refresher for TSD[f] Workers (provides general information on hazardous waste operations to TSD workers)	X	X		

Refer to footnotes at end of attachment.

Attachment 8-1 (Continued)

Los Alamos National Laboratory-Wide Training Program

COURSES[a]	Hazardous/Mixed Waste Worker	Manager/Supervisor of Hazardous/Mixed Waste Workers	Emergency Responder[b]	Uncontrolled Area Potential Release Site Worker
OSHA[g] Rights and Responsibilities (provides general information on worker's rights in relation to OSHA)	X	X	X	X
RCRA[h] Personnel Training (includes an overview of Code of Federal Regulations Title 40, Parts 260-265, 268; New Mexico Administrative Code, Title 20, Chapter 4, Part 1, revised November 1, 1995; Department of Transportation shipping regulations; internal and external protocol for facility inspections; operating equipment, communication systems, security systems; contingency plan; and emergency equipment use, inspection, and repair)	X	X	*	*
RCRA Refresher Training (includes regulatory and legislative updates, occurrence reports and lessons learned, audit findings, modification/review of the contingency plan; provides required retraining)	X	X	*	*
Refresher General Employee Radiological Training (provides refresher general radiological training)	X[i]	X[i]	X[i]	X[i]
Radiological Worker I and II Training (requires recertification every two years)	*	*	X	X
Refresher Radiological Worker I and II Training (provides refresher radiological training)	*	*	X	X
Waste Generation Overview (includes waste management regulations and policies, definition of hazardous waste, waste minimization, cycle of waste management at Los Alamos National Laboratory, storage and disposal)	X	X	X	X
Waste Management Coordinator Requirements (provides training on waste management to coordinators)	*	*		*
Cardiopulmonary Resuscitation: Adult (requires annual recertification)	*	*	*	*

Refer to footnotes at end of attachment.

Attachment 8-1 (Continued)

Los Alamos National Laboratory-Wide Training Program

COURSES[a]	Hazardous/Mixed Waste Worker	Manager/Supervisor of Hazardous/Mixed Waste Workers	Emergency Responder[b]	Uncontrolled Area Potential Release Site Worker
First Aid: Standard (requires recertification every three years)	*	*	*	*
Health Physics Checklist Indoctrination (provides health physics information to new workers)	*	*	X	X
HMPT[j] Training - General (includes introduction to HMPT regulations, identification and segregation of hazardous materials, packaging, placarding/labeling, manifesting/recordkeeping)	*	*		
Lockout/Tagout (provides information on lockout/tagout procedures and policy)	*	*	*	*
Respirators: Air-Purifying (provides required annual retraining for operation and inspection of device, changing filters, donning and doffing)	*	*	X	*
Respirators: Self-Contained Breathing Apparatus (provides required annual retraining for operation and inspection, changing compressed air bottles, donning and doffing, safety features, care and cleaning, fitting)	*	*	X	*
Waste Documentation Forms (includes use of Waste Profile Form, use of waste disposal forms, use of manifest system, as applicable)	*	*		*

a Additional training courses (not listed in this attachment) may also be taken by personnel depending on the types of hazards (e.g., chemical) associated with a particular job description.
b Emergency responders at TA-55 are typically members of the TA-55 Emergency Response Team.
c * indicates that a course may be required for specific job tasks and/or work areas.
d X indicates a required course.
e HAZWOPER = Hazardous waste operations and emergency response
f TSD = Treatment, storage, and disposal
g OSHA = Occupational Safety and Health Act
h RCRA = Resource Conservation and Recovery Act *(42 USC 6901 et seq.)*
i The Refresher General Employee Radiological Training is not required for personnel who have successfully completed Radiological Worker I and II Training.
j HMPT = Hazardous materials packaging and transportation

ATTACHMENT 8-2

Facility-Specific and On-the-Job Training for Hazardous and Mixed Waste Handling Operations

Attachment 8-2

Facility-Specific and On-the-Job Training for Hazardous and Mixed Waste Handling Operations

The following categories of facilities will provide facility-specific training for all workers (to the level appropriate for a particular job) and on-the-job training on procedures directly applicable to an individual's work assignment:

- Treatment units
- Incinerators
- Open burning and explosives detonation areas
- Container and tank storage areas
- Other categories, as necessary.

Facility-specific training will include the following topics:

- Supervised operation of the facility
- Emergency shutdown and evacuation procedures
- Accidental release and spill response procedures
- Familiarization with emergency equipment use, inspection, and repair
- Use of communication/alarm system
- Contingency plan training
- Operations manual specific to the facility
- Specialized equipment at the facility
- Information about the particular chemical and radioactive hazards present at the facility.

On-the-job training will consist of training individuals to be familiar with and use the standard operating procedures and/or safe operating procedures that apply to their jobs.

9.0 CLOSURE PLAN

This section describes the activities necessary to close the hazardous and mixed waste units at Los Alamos National Laboratory (LANL) Technical Area (TA) 55 addressed in this permit application. The activities detailed in this section are included to address the closure requirements specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart IX, 270.14(b)(13), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, Part 264, Subpart G, revised November 1, 1995. This section is organized as follows:

- General closure information applicable to all of the hazardous and mixed waste units addressed in this permit application (Section 9.1)
- Closure procedures specific to container storage areas (Section 9.2)
- Closure procedures specific to storage tank systems (Section 9.3)
- Closure procedures specific to the cementation unit (Section 9.4)
- Specific sampling and analytical procedures to be used during closure activities at the hazardous and mixed waste units addressed in this permit application (Section 9.5).

Closure activities to be conducted at other units throughout LANL are described in LANL's Hazardous Waste Facility (HWF) Permit, in other facility-specific Part B permit applications/permit modification requests, and in closure plans for nonpermitted units.

Closure will include removal of waste from the unit to be closed (see Sections 9.2.3, 9.3.3, and 9.4.3) and decontamination of structures and equipment that have been contaminated by hazardous or mixed waste materials (see Sections 9.2.4, 9.3.4, and 9.4.4). Closure activities will minimize the need for further maintenance, preclude the release of hazardous waste or constituents to environmental media, and be protective of human health.

Radiation exposures during closure activities will be maintained as low as reasonably achievable (ALARA), as required by the Atomic Energy Act, to protect worker and public health and safety. Until closure is complete and has been certified in accordance with 20 NMAC 4.1, Subpart V, 264.115, revised November 1, 1995, a copy of the approved closure plan and all approved

revisions will be on file at LANL and will be available to the New Mexico Environment Department (NMED) or the U.S. Environmental Protection Agency (EPA) upon request.

9.1 GENERAL CLOSURE INFORMATION

This section is prepared in accordance with the requirements of 20 NMAC 4.1, Subpart IX, 270.14(b)(13), revised November 1, 1995, and 20 NMAC 4.1, Subpart V, Part 264, Subparts G, I, J, and X, revised November 1, 1995, as applicable.

A copy of the closure plan and any approved revisions will be maintained at LANL. The primary contact person is:

G. Thomas Todd, Area Manager
Los Alamos Area Office (LAAO)
U.S. Department of Energy (DOE)
528 35th Street
Los Alamos, New Mexico 87544
Tel. (505) 667-5288

9.1.1 Closure Performance Standard [20 NMAC 4.1, Subpart V, 264.111]

The hazardous and mixed waste units at TA-55 included in this permit application will be closed to meet the following performance standards, as applicable to the specific unit to be closed:

- Minimize the need for further maintenance
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere
- Comply with the container management requirements of 20 NMAC 4.1, Subpart V, 264.178, revised November 1, 1995, as applicable
- Comply with the tank systems requirements of 20 NMAC 4.1, Subpart V, 264.197, revised November 1, 1995, as applicable
- Comply with the miscellaneous units requirements of 20 NMAC 4.1, Subpart V, 264.601 through 264.603, revised November 1, 1995, as applicable.

This will be accomplished by removal of waste from the units and decontamination, if necessary, of the areas that may have come into contact with wastes. Decontamination activities will ensure the removal of waste residues from the units included in this permit application to established cleanup levels. Closure of any unit will be deemed complete when decontamination has been verified (see Sections 9.2.6, 9.3.6, and 9.4.6); all equipment and structures associated with operation of the unit have been decontaminated, if necessary; and closure certification has been submitted to and approved by the NMED.

9.1.2 Partial and Final Closure Activities [20 NMAC 4.1, Subpart V, 264.112(d)]

This closure plan has been written for implementation of partial closure (i.e., closure of a regulated hazardous/mixed waste management unit at a TA that contains other active regulated hazardous/mixed waste management units) rather than final closure of TA-55. Partial closure will consist of closing one or more of the regulated hazardous/mixed waste units at TA-55, while leaving the other regulated hazardous/mixed waste units at TA-55 in service. In the event of a partial closure, the procedures described in the following sections will apply to the hazardous/mixed waste unit(s) to be closed. Partial closure (hereafter referred to as closure) will be complete when decontamination has been verified (see Sections 9.2.6, 9.3.6, and 9.4.6); the waste management area and related equipment and structures have been decontaminated, if necessary; the closure certification has been submitted; and the NMED has approved the closure. Final closure will occur when TA-55's remaining regulated hazardous/mixed waste management units are closed either by waste removal and decontamination or by closure in place.

9.1.3 Closure Schedule [20 NMAC 4.1, Subpart V, 264.112(b)(6) and 264.113]

Written notification will be provided to the NMED 45 days before the start of closure activities. Closure will not commence until all of the wastes have been removed from the unit scheduled to be closed. Closure activities will begin in accordance with the approved closure plan, as required by 20 NMAC 4.1, Subpart V, 264.113(a), revised November 1, 1995, within 90 days after final receipt of waste at the hazardous or mixed waste unit. This timeframe will be met as long as facilities are available for treatment or disposal of these wastes. In the event that closure activities cannot begin at the unit within 90 days, LANL will notify the Secretary of the NMED in accordance with the extension requirements cited in 20 NMAC 4.1, Subpart V, 264.113(a), revised November 1, 1995. Closure activities and reporting requirements will then be completed within 180 days of the receipt of the final volume of waste at the unit to be closed. Closure will

be conducted in accordance with the schedules presented in Tables 9-1, 9-2, and 9-3, as appropriate. In the event that closure of the unit is prevented from proceeding according to schedule, LANL will notify the Secretary of the NMED in accordance with extension request requirements in 20 NMAC 4.1, Subpart V, 264.113(b), revised November 1, 1995. In addition, the demonstrations in 20 NMAC 4.1, Subpart V, 264.113(a)(1) and (b)(1), revised November 1, 1995, will be made in accordance with 20 NMAC 4.1, Subpart V, 264.113(c), revised November 1, 1995.

9.1.4 Amendment of the Closure Plan [20 NMAC 4.1, Subpart V, 264.112(c)]

If it is necessary to amend the closure plan for any hazardous or mixed waste unit addressed in this plan, LANL will submit, in accordance with 20 NMAC 4.1, Subpart V, 264.112(c), revised November 1, 1995, a written notification of or a request for a permit modification describing any change in operation or facility design that could affect the closure plan. The written notification or request will include a copy of the amended closure plan for approval by the NMED. The DOE will submit a written notification of or a request for a permit modification to authorize a change in the approved plan if:

- There are changes in operating plans or facility design that affect the closure plan
- Unexpected events occur during closure that require modification of the approved closure plan.

The DOE will submit a written request for a permit modification with a copy of the amended closure plan at least 60 days prior to the proposed change in unit design or operation or no later than 60 days after an occurrence of an unexpected event that affects the closure plan. If the unexpected event occurs during closure, the permit modification will be requested within 30 days of the occurrence. If the Secretary of the NMED requests a modification of the closure plan, a modified plan in response to the request will be submitted within 60 days of notification or within 30 days of notification if a change in facility condition occurs during final closure.

9.1.5 Financial and Liability Requirements [20 NMAC 4.1, Subpart V, 264.140(c)]

In accordance with 20 NMAC 4.1, Subpart V, 264.140(c), revised November 1, 1995, LANL, as a federal facility, is exempt from the requirements to provide financial assurance mechanisms and liability insurance for closure actions.

9.1.6 Closure Certification [20 NMAC 4.1, Subpart V, 264.115]

Within 60 days after completion of closure activities for any hazardous or mixed waste unit, the DOE will submit to the Secretary of the NMED, via certified mail, a certification that the unit has been closed in accordance with the specifications of the applicable, approved closure plan. The certification will be attested to by an independent, registered professional engineer and will be signed by the appropriate DOE and LANL officials, in accordance with 20 NMAC 4.1, Subpart V, 264.115, revised November 1, 1995. Documentation supporting the independent, registered engineer's certification will be furnished to the Secretary of the NMED with the original certification. A copy of the certification and supporting documentation shall be maintained by both the DOE/LAAO and LANL's Hazardous and Solid Waste Group (ESH-19).

9.1.7 Security

Because of the nature of operations at TA-55, this site will be under the permanent care of the DOE or another authorized federal agency. Fences and site security will be maintained in perpetuity to prohibit public access and to meet DOE requirements for radiation protection.

9.1.8 Quality Assurance/Quality Control

A qualified individual, or individuals, shall be designated to independently oversee the closure activities and to report directly to senior management on the quality of the closure performance. This individual will personally observe a portion of the key activities, assure that sample blanks are used and analyzed, and review the analytical reports for accuracy and adequacy. A written quality assurance (QA)/quality control (QC) plan prepared in accordance with the most current version of "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846) (EPA, 1994c) shall be prepared and followed, with variations from the plan documented and explained. The designated individual shall prepare a written statement for the final report commenting on the level of decontamination verification achieved.

9.1.9 Closure Report

Upon completion of the closure activities for any hazardous or mixed waste unit addressed in this permit application, a closure report shall be submitted to the Secretary of the NMED. The report shall document the closure and contain, at a minimum, the following:

- The certification described in Section 9.1.6
- Any variance from the approved activities and the reason for the variance
- A tabular summary of all sampling results, showing:
  - Sample identification
  - Sampling location
  - The datum reported
  - Detection limit for each datum
  - A measure of analytical precision (e.g., uncertainty, range, variance)
  - Identification of analytical procedure
  - Identification of analytical laboratory.
- A QA/QC statement on analytical data validation and decontamination verification
- The location of the file of supporting documentation, including:
  - Field logbooks
  - Laboratory sample analysis reports
  - QA/QC documentation
  - Chain-of-custody forms.
- Disposition location of regulated hazardous/mixed waste resulting from closure activities
- A certification of accuracy of the report.

9.1.10 Survey Plat and Post-Closure Requirements [20 NMAC 4.1, Subpart V, 264.116, 264.117 through 264.120]

LANL intends to remove hazardous and mixed waste and associated constituents from the units to be permitted and to decontaminate all structures and equipment to established cleanup levels or dispose of the structures and equipment if decontamination cannot be achieved. If decontamination to established cleanup levels is not achievable or if disposal is not practicable, LANL will amend this closure plan to address appropriate closure procedures or post-closure care requirements pursuant to 20 NMAC 4.1, Subpart V, 264.117 through 264.120, revised November 1, 1995.

A survey plat, post-closure certification, and post-closure notices will not be required for the units addressed in this permit application because all waste will be removed and the units will be decontaminated or disposed of at closure.

9.2 CLOSURE PROCEDURES FOR CONTAINER STORAGE AREAS [20 NMAC 4.1, Subpart V, 264.112]

TA-55 lies at an elevation of between 7,100 feet (ft) and 7,300 ft above mean sea level. It is located on a finger mesa between a branch of Mortandad Canyon on the north and Two Mile Canyon on the south. Figure 9-1 shows the location of TA-55 at LANL. Waste management activities at TA-55 include storage and treatment of solid and liquid mixed waste and storage of solid and liquid hazardous waste. Container storage areas at TA-55 addressed in this permit application include the following: Areas 1 through 7 in the basement of TA-55, Building 4 (TA-55-4); Areas 8 through 11 on the first floor of TA-55-4; a container storage pad near TA-55-4; and a container storage area in TA-55-185. The types of waste that may be managed at these units are summarized as follows:

Unit(s)	Waste Types Stored
Areas 1 through 5	Hazardous waste, transuranic (TRU) mixed waste, and low-level mixed waste
Area 6	TRU mixed waste
Area 7	Hazardous waste, TRU mixed waste, and low-level mixed waste
Areas 8, 9, and 10	TRU mixed waste and low-level mixed waste
Area 11	TRU mixed waste
Container Storage Pad	Hazardous waste, TRU mixed waste, and low-level mixed waste
TA-55-185	Hazardous waste, TRU mixed waste, and low-level mixed waste

The general locations of these container storage areas are shown on Figure 9-2. A detailed description of each hazardous and mixed waste container storage area is provided in Section 4.1 of this permit application.

9.2.1 Estimate of Maximum Waste in Storage

The maximum inventory of waste in storage at any time at the TA-55 container storage areas addressed in this section is estimated at 211,090 gallons (gal). A breakdown of the maximum inventories for each of these areas is as follows:

Unit(s)	Maximum Waste in Storage
Areas 1, 2, and 3	27,500 gal†
Area 4	3,400 gal
Area 5	3,400 gal
Area 6	4,000 gal
Area 7	4,400 gal
Area 8	660 gal
Area 9	280 gal
Area 10	550 gal
Area 11	4,400 gal
Container storage pad	135,000 gal
TA-55-185	27,500 gal

† Total capacity for the three areas combined.

9.2.2 Description of Waste

Hazardous waste currently stored at TA-55 is generated during research and development (R&D) activities, decontamination and decommissioning (D&D) projects, and general facility operations. TRU mixed waste and low-level mixed waste currently stored at TA-55 are generated during R&D activities, processing and recovery operations, D&D projects, and general facility operations. TRU mixed waste and low-level mixed waste are classified as such because Resource Conservation and Recovery Act (RCRA)-characteristic or -listed wastes[1] are or may be present, along with a radioactive component. Information on the hazardous component of these wastes is provided in Section 3.0 of this permit application.

[1]Use of the term "RCRA-characteristic or -listed wastes" refers to hazardous waste or hazardous constituents as defined in 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995.

9.2.3 Removal of Waste

All wastes will be removed from the hazardous/mixed waste unit scheduled to be closed prior to the initiation of closure activities. Containers will be removed from each storage area primarily with forklifts. Small containers may be handled manually or with a dolly. All containers will be placed onto flatbed trucks or trailers for transport. All appropriate shipping papers will accompany the wastes during transport. Containers holding regulated hazardous/mixed wastes will be moved to an approved on-site facility or permitted off-site treatment and/or disposal facility.

9.2.4 Closure Procedures and Decontamination

To the extent possible, all structures and equipment contaminated with hazardous constituents will be decontaminated. Structures, equipment, and media that cannot be decontaminated will be containerized and managed in compliance with appropriate regulations. All sampling conducted during closure and decontamination will be done in accordance with QA/QC procedures (see Section 9.1.8).

Before proceeding with any closure activities, the hazardous and mixed waste units will be surveyed to determine the extent of chemical and radiological contamination, if any. Personal protective equipment (PPE) and monitoring requirements will be determined by LANL's Health Physics Operations (ESH-1) and Industrial Hygiene and Safety (ESH-5) groups following an inspection. Radiation and chemical monitoring will occur throughout closure activities.

Personnel involved in closure activities will wear appropriate PPE, specified by ESH-1 and ESH-5, and will follow good hygiene practices to protect themselves from exposure to hazardous and mixed waste. The level of PPE that will be required will depend upon the levels of radiological and/or chemical contamination that are detected, if any. Minimum PPE requirements will consist of coveralls, steel-toed footwear, and safety glasses or face shields. If an overhead danger is present, a hard hat will be worn. All workers involved in closure activities will be required to have training and medical monitoring. Contaminated PPE will either be decontaminated or managed in compliance with appropriate regulations.

Before decontamination activities begin, two samples of clean water and detergent (wash water) solution squeezed from mops and/or rags (e.g., cheesecloth) prior to use will be collected for analysis of the applicable parameters listed in Table 9-4 to provide a baseline for decontamination

verification. The floor of each container storage area and any walls associated with a container storage area will then be wiped down with a wash-water solution using mops and/or rags to minimize the amount of liquid waste generated as a result of decontamination activities.

Any collected wash water (i.e., wash water squeezed from the mops/rags) will be transferred to appropriate containers, sampled, and analyzed for the applicable parameters in Table 9-4. The wash cycles will continue until the container storage areas and associated walls (if applicable) have been cleaned to established levels (see Section 9.2.6). (One additional sample of clean wash-water solution squeezed from mops and/or rags prior to use will be collected for each additional washdown event.) The used wash water will be managed appropriately in accordance with LANL policy.

It is anticipated that Area 6 will remain an active mixed waste management unit until facility closure and that the area will be decontaminated in the manner described above. If ALARA considerations preclude decontaminating the area in the aforementioned manner, alternative measures will be initiated, as necessary, to ensure that the area is closed in a manner consistent with ALARA requirements and the intent of the closure regulations contained herein.

The outdoor container storage pad located near TA-55-4 will be washed down with a wash-water solution. Portable berms or other containment structures will be used to collect the wash water from the pad. Before the first washdown, a sample of clean wash-water solution will be collected and analyzed for the applicable parameters listed in Table 9-4 to provide a baseline for decontamination verification. The used wash water will also be collected, transferred to approved containers, and sampled and analyzed for the applicable parameters in Table 9-4. The used wash water will be managed appropriately in accordance with LANL policy.

Used wash water samples from the outdoor container storage pad may exhibit anomalously high levels of organic compounds due to leaching of the asphaltic concrete pad materials during washdown. If this is the case, record reviews (e.g., manufacturer's specifications or Material Safety Data Sheets) and additional analyses may be performed to determine if leaching of organic constituents from the pad contributed to the organic compound concentration in the used wash water. If this additional evaluation confirms the asphaltic concrete materials as the source of contamination, baseline concentrations for clean wash water will be adjusted accordingly. The

pad area may undergo up to two wash cycles. If decontamination verification cannot be demonstrated after two wash cycles, the asphaltic concrete material will be removed from the site and managed as appropriate for the waste type.

Soil sampling will be conducted as part of the closure activities for the container storage pad located near TA-55-4 to determine if contaminants have migrated from this container storage area. After pad washdown activities are completed, a statistically representative number of soil samples will be collected from the soil surrounding the asphaltic concrete pad. Samples will be collected six inches from the pad's edge to a depth of six inches and equally spaced to cover the pad's entire perimeter. Samples will be analyzed for the applicable parameters listed in Table 9-4. If contamination is found in any of the soil samples as a result of container storage activities, the contaminated soil will be removed to statistically significant levels based on concentrations in the background soil samples, if appropriate. If the data comparison shows that surface and near-surface soil are contaminated as a result of activities other than container storage activities, the contamination will be addressed when the site undergoes corrective actions pursuant to conditions in Module VIII of LANL's HWF Permit.

9.2.5 Decontamination Equipment

Prior to use, all reusable decontamination equipment will be rinsed with distilled water. Decontamination equipment rinsate blanks will be collected and analyzed in accordance with QA/QC procedures (see Section 9.1.8). Reusable protective clothing, tools, and equipment used during closure activities will be scraped as necessary to remove any residue and cleaned with a wash-water solution. Residue and disposable or reusable equipment that cannot be decontaminated will be containerized and managed appropriately at an approved on-site facility, depending on the regulated components present. Used wash water will be collected and analyzed for the applicable parameters listed in Table 9-4. The used wash water will be managed appropriately in accordance with LANL policy.

9.2.6 Decontamination Verification

Sufficient sampling and analysis will be required to demonstrate that hazardous and mixed waste residue is not present at any container storage area after closure. Two samples of clean wash-water solution squeezed from mops and/or rags prior to use will be collected before initial washdown of the container storage areas. The samples will be analyzed for applicable

parameters listed in Table 9-4 to provide baseline data for decontamination verification. Analytical procedures will conform to methods found in SW-846. Used wash-water solutions will also be analyzed for the applicable parameters listed in Table 9-4. Wash-water solutions will be considered contaminated if the used wash-water solution shows a significant increase (i.e., determined using statistical methods defined in SW-846) in the analytical parameters over the clean wash-water solution. If subsequent washdowns are deemed necessary, an additional sample of clean wash-water solution squeezed from mops and/or rags prior to use will be taken for each additional washdown event.

Successful decontamination meets one of the following criteria:

- No detectable hazardous waste or constituents from container storage activities are found in the final sample
- Detectable hazardous waste or constituents from container storage activities in the final sample are removed to statistically significant levels based on baseline concentrations in the clean wash water or established background soil data
- Detectable hazardous waste or constituents from container storage activities in the final sample are at or below levels agreed upon with the NMED.

If hazardous waste or constituent concentrations from container storage activities do not significantly decrease after several washdowns, LANL will amend this closure plan to address appropriate closure procedures or post-closure care requirements pursuant to 20 NMAC 4.1, Subpart V, 264.117 through 264.120, revised November 1, 1995.

9.3 CLOSURE PROCEDURES FOR THE STORAGE TANK SYSTEMS [20 NMAC 4.1, Subpart V, 264.112]

There are two storage tank systems with a combined total of 6 tanks used for storing TRU liquid mixed waste solutions in Room 401 of TA-55-4 (TA-55-4-401). One of these storage tank systems is glovebox GB-438 and ancillary equipment, which collectively comprise the "evaporator glovebox storage tank system." The remaining five storage tanks, constructed of stainless steel, are associated with the cementation unit in TA-55-4-401 and are located adjacent to that unit. These five stainless-steel tanks and ancillary equipment comprise the "cementation unit storage tank system." Detailed descriptions of these storage tank systems are provided in Section 4.3 of this permit application.

9.3.1 Estimate of Maximum Waste in Storage

The maximum inventory of TRU liquid mixed waste that may be stored in both storage tank systems in TA-55-4-401 at any time is 460 gal.

9.3.2 Description of Waste

TRU liquid mixed waste stored in the storage tank systems in TA-55-4-401 is generated from R&D activities and processing and recovery operations. This TRU mixed waste stream is classified as such because RCRA-characteristic waste[2] is or may be present, along with a radioactive component. Information on the hazardous component of this waste is provided in Section 3.0 of this permit application.

9.3.3 Removal of Waste

Prior to the initiation of closure activities, TRU liquid mixed waste remaining in the storage tank systems will be discharged into the cementation unit and handled according to current waste-specific standard operating procedures (SOP).

9.3.4 Closure Procedures and Decontamination

Before proceeding with any closure activities, the TRU liquid mixed waste storage tank systems will be surveyed to determine the extent of radiological contamination. PPE and monitoring requirements will be determined by ESH-1 and ESH-5 following an inspection. Radiation and chemical monitoring will occur throughout closure activities. Mixed waste sampling conducted during closure and decontamination will be done in accordance with QA/QC procedures (see Section 9.1.8).

Personnel involved in closure activities will wear appropriate PPE, specified by ESH-1 and ESH-5, and follow good hygiene practices to protect themselves from exposure to TRU liquid mixed waste. The level of PPE that will be required will depend upon the levels of radiological and/or chemical contamination. Minimum PPE requirements will consist of coveralls, steel-toed footwear, and safety glasses or face shields. If an overhead danger is present, a hard hat will be worn. All workers involved in closure activities will be required to have training and medical monitoring.

---

[2]Refer to Footnote 1.

Contaminated PPE will either be decontaminated or managed in compliance with appropriate regulations.

All ancillary equipment (i.e., all related components except the glovebox) associated with the evaporator glovebox storage tank system will be flushed with water to rinse out possible hazardous waste and hazardous constituents. The rinse water will be collected, analyzed, and managed appropriately for the waste type. Once the ancillary components of the tank system have been flushed, they will be removed, dismantled, packaged, and managed as TRU waste in accordance with TA-55 TRU waste-specific SOPs. The dismantled, packaged components may be temporarily stored on site at TA-55; however, they will ultimately be transported to an approved on-site facility.

Glovebox GB-438 will be decontaminated using the following decontamination procedures. Before decontamination activities begin, two samples of clean water and detergent (wash water) solution squeezed from rags prior to use will be collected for analysis of the applicable parameters listed in Table 9-4 to provide a baseline for decontamination verification. All of the interior surfaces of the glovebox will be wiped down with a wash-water solution using rags to minimize the amount of liquid waste generated as a result of decontamination activities.

Wash water collected in the glovebox will be analyzed for the applicable parameters listed in Table 9-4. The wash cycles will continue until the inside of the glovebox has been cleaned to established levels (see Section 9.3.6). (One additional sample of clean wash-water solution squeezed from rags prior to use will be collected for each additional washdown event.) The glovebox will then be used in another process at TA-55 or will be dismantled, packaged, and managed as TRU waste. The used wash water will be managed appropriately in accordance with LANL policy.

The cementation unit storage tank system will be flushed with water to remove hazardous waste residues. The rinse water will be collected, analyzed, and subsequently managed appropriately for the waste type. Once the flushing is complete and liquids (to the extent practicable) are removed from this tank system, dismantling will begin. Once dismantled, the various components of the tank system will be packaged and managed as TRU waste in accordance TA-55 TRU

waste-specific SOPs. The dismantled, packaged components may be temporarily stored on site at TA-55 but will ultimately be transported to an approved on-site facility.

Random swipe samples from the floor areas and wall(s) adjacent to each storage tank system will be collected and analyzed for the applicable parameters in Table 9-4. If decontamination measures are deemed necessary based on the analytical results, the following procedures will be initiated.

Before the first washdown, two samples of clean wash water squeezed from mops and/or rags prior to use will be collected and analyzed for the applicable parameters listed in Table 9-4 to provide a baseline for decontamination verification. The floor area and wall(s) in the immediate vicinity of each storage tank system will be scrubbed down using the least amount of wash water possible. The used wash water will be squeezed from the mops and rags and collected. Following the washdown event, the used wash water will be transferred to appropriate containers and analyzed for the applicable parameters listed in Table 9-4. The wash cycles will continue until the floor area and wall(s) adjacent to each storage tank system in TA-55-4-401 have been cleaned to established levels (see Section 9.3.6). (One additional sample of clean wash-water solution squeezed from mops and/or rags prior to use will be collected for each additional washdown event.) The wash water will be managed appropriately in accordance with LANL policy.

9.3.5 Decontamination Equipment

Prior to use, all reusable decontamination equipment will be rinsed with distilled water. Decontamination equipment rinsate blanks will then be collected and analyzed in accordance with QA/QC procedures (see Section 9.1.8). Following decontamination activities, reusable protective clothing, tools, and equipment used during closure activities will be scraped as necessary to remove any residue and cleaned with a wash-water solution. Residue and disposable or reusable equipment that cannot be decontaminated will be containerized and managed appropriately at an approved on-site facility, depending on the regulated components present. Used wash water will be collected and analyzed for the applicable parameters listed in Table 9-4. The used wash water will be managed appropriately in accordance with LANL policy.

9.3.6 Decontamination Verification

Sufficient sampling and analysis will be required to demonstrate that, after closure, the hazardous component of TRU mixed waste residue is not present within glovebox GB-438, on the floor area under the storage tank systems, or on the wall(s) adjacent to the storage tank systems (if necessary). Two samples of clean wash-water solution squeezed from mops and/or rags prior to use will be collected before initial washdowns of the glovebox, the floor area, and/or the wall(s). The samples will be analyzed for the applicable parameters listed in Table 9-4 to provide baseline data for decontamination verification. Analytical procedures will conform to methods found in SW-846. Used wash-water solutions will also be analyzed for the applicable parameters listed in Table 9-4. Wash-water solutions will be considered contaminated if the used wash-water solution shows a significant increase (i.e., determined using statistical methods defined in SW-846) in the analytical parameters over the clean wash-water solution. If subsequent washdowns are deemed necessary, an additional sample of clean wash-water solution will be taken for each additional washdown event.

Successful decontamination meets one of the following criteria:

- No detectable hazardous waste or constituents from tank storage activities are found in the final sample
- Detectable hazardous waste or constituents from tank storage activities in the final sample are removed to statistically significant levels based on baseline concentrations in the clean wash water
- Detectable hazardous waste or constituents from tank storage activities in the final sample are at or below levels agreed upon with the NMED.

If hazardous waste or constituent concentrations from tank storage activities do not significantly decrease after several washdowns, LANL will amend this closure plan to address appropriate closure procedures or post-closure care requirements pursuant to 20 NMAC 4.1, Subpart V, 264.117 through 264.120, revised November 1, 1995.

9.4 CLOSURE PROCEDURES FOR THE CEMENTATION UNIT [20 NMAC 4.1, Subpart V, 264.112]

The cementation unit is located in TA-55-4-401 within glovebox GB-454. TRU solid and liquid mixed wastes are treated by solidification in this unit. A detailed description of this unit is provided in Section 4.5 of this permit application.

9.4.1 Estimate of Maximum Waste Capacity of the Cementation Unit

The maximum inventory of TRU solid and liquid mixed waste that may be contained in the cementation unit at any time is estimated at 110 gal. This capacity differs from the capacity listed in Revision 1.0 of the TA-55 Part A permit application (LANL, 1996) as the latter is designated in gal/day.

9.4.2 Description of Waste

TRU mixed waste treated in the cementation unit by solidification at TA-55-4 is generated primarily from R&D activities and processing and recovery operations. TRU mixed waste is classified as such because RCRA-characteristic waste[3] is or may be present, along with a radioactive component. Information on the hazardous component of this waste is provided in Section 3.0 of this permit application.

9.4.3 Removal of Waste

Prior to the initiation of closure activities, any TRU solid and liquid mixed waste remaining in the cementation unit will be solidified using TA-55 TRU waste-specific SOPs. Once the TRU mixed waste has been treated, the drum(s) of solidified TRU mixed waste will then be removed with a forklift. All containers will be placed onto flatbed trucks or trailers for transport. All appropriate shipping papers will accompany the wastes during transport. Containers holding regulated hazardous/mixed wastes will be moved to an approved on-site facility or an off-site disposal facility, if available.

9.4.4 Closure Procedures and Decontamination

To the extent possible, all contaminated structures and equipment associated with the cementation unit will be decontaminated (if necessary). The drums containing the solidified (i.e., cemented) waste will be removed from the unit and managed as TRU mixed waste. The cementation unit mixer impeller and pH column will be disconnected, packaged, and managed as TRU waste. Water, which is added to the cement during solidification, will be the last substance flowing through the pH column thereby rinsing the column of any hazardous waste residues. All TRU waste will be visually examined by Nuclear Materials Technology (NMT) waste management personnel and must be certified to meet the Waste Isolation Pilot Plant (WIPP)

[3]Refer to Footnote 1.

waste acceptance criteria. All remaining equipment associated with the cementation unit will be removed and dismantled. This D&D waste will then be managed and packaged in accordance with TRU waste-specific SOPs and subsequently stored at an appropriate on-site facility.

Before proceeding with any closure activities, the TRU mixed waste cementation unit will be surveyed to determine the extent of radiological contamination. PPE and monitoring requirements will be determined by ESH-1 and ESH-5 following an inspection. Radiation and chemical monitoring will occur throughout closure activities. All sampling conducted during closure and decontamination will be done in accordance with QA/QC procedures (see Section 9.1.8).

Personnel involved in closure activities will wear appropriate PPE, specified by ESH-1 and ESH-5, and will follow good hygiene practices to protect themselves from exposure to TRU mixed waste. The level of PPE that will be required will depend upon the levels of radiological and/or chemical contamination that are detected, if any. Minimum PPE requirements will consist of coveralls, steel-toed footwear, and safety glasses or face shields. If an overhead danger is present, a hard hat will be worn. All workers involved in closure activities will be required to have training and medical monitoring. Contaminated PPE will either be decontaminated or managed in compliance with appropriate regulations.

Because personnel dismantling the cementation unit will be working through a glovebox, decontamination of the walls and the floor area under the glovebox within TA-55-4-401 is not anticipated. However, personnel will follow specific glovebox maintenance and operation SOPs in case there is an accidental breach in any glovebox component.

Glovebox GB-454 will either be decontaminated, if possible, or dismantled, depending on the anticipated use of the glovebox at closure. If NMT personnel determine that decontamination of glovebox GB-454 is a viable option, the following decontamination procedures will be initiated.

Before decontamination activities begin, any visible material (e.g., cement, scraps) in the glovebox will be removed to the extent practicable and managed as TRU mixed waste. Two samples of clean water and detergent (wash water) solution squeezed from rags prior to use will be collected for analysis of the applicable parameters listed in Table 9-4 to provide a baseline for decontamination verification. All of the interior surfaces of the glovebox will be wiped down with

wash-water solution using rags to minimize the amount of liquid waste generated as a result of decontamination activities.

Wash water collected in the glovebox will be analyzed for the applicable parameters listed in Table 9-4. The wash cycles will continue until the inside of the glovebox has been cleaned to established levels (see Section 9.4.6). (One additional sample of clean wash-water solution squeezed from rags prior to use will be collected for each additional washdown event.) The used wash water will be managed appropriately in accordance with LANL policy.

9.4.5 Decontamination Equipment

Prior to use, all reusable decontamination equipment will be rinsed with distilled water. Decontamination equipment rinsate blanks will then be collected and analyzed in accordance with QA/QC procedures (see Section 9.1.8). Reusable protective clothing, tools, and equipment used during closure activities will be scraped as necessary to remove any residue and cleaned with a wash water solution. Residue and disposable or reusable equipment that cannot be decontaminated will be containerized and managed appropriately at an approved on-site facility, depending on the regulated components present. Used wash water will be collected and analyzed for the applicable parameters listed in Table 9-4. The used wash water will be managed appropriately in accordance with LANL policy.

9.4.6 Decontamination Verification

If NMT personnel determine that decontamination of glovebox GB-454 is a viable option, sufficient sampling and analysis will be required to demonstrate that the hazardous component of TRU mixed waste residue is not present within the glovebox after closure. Two samples of clean wash-water solution squeezed from rags prior to use will be collected before initial washdowns of the glovebox and any equipment associated with the cementation unit (if necessary). The samples will be analyzed for the applicable parameters listed in Table 9-4 to provide baseline data for decontamination verification. Analytical procedures will conform to methods found in SW-846. Used wash-water solutions will also be analyzed for the applicable parameters listed in Table 9-4. Wash-water solutions will be considered contaminated if the used wash-water solution shows a significant increase (i.e., determined using statistical methods defined in SW-846) in the analytical parameters over the clean wash-water solution. If subsequent

washdowns are deemed necessary, an additional sample of clean wash-water solution squeezed from rags prior to use will be taken for each additional washdown event.

Successful decontamination meets one of the following criteria:

- No detectable hazardous waste or constituents from treatment activities are found in the final sample
- Detectable hazardous waste or constituents from treatment activities in the final sample are removed to statistically significant levels based on baseline concentrations in the clean wash water
- Detectable hazardous waste or constituents from treatment activities in the final sample are at or below levels agreed upon with the NMED.

If hazardous waste or constituent concentrations from treatment activities do not significantly decrease after several washdowns, LANL will amend this closure plan to address appropriate closure procedures or post-closure care requirements pursuant to 20 NMAC 4.1, Subpart V, 264.117 through 264.120, revised November 1, 1995.

9.5 SAMPLING AND ANALYTICAL PROCEDURES [20 NMAC 4.1, Subpart V, 264.112(b)(4)]

The following sections describe procedures and methods for sampling, analysis, and documentation applicable to closure activities. While the procedures and methods are specific, other applicable procedures or methods given in SW-846 may be used if conditions or experience show the alternate method to be more appropriate. All sampling and analytical procedures actually used will be annotated in the final closure report. Sampling will be conducted in accordance with procedures given in SW-846 (for chemical analyses) and in accordance with LANL's Inorganic Trace Analysis Group (CST-9) procedures (for radiological analyses).

9.5.1 Soil and Sediment Sampling

Soil samples will only be collected in the vicinity of the hazardous and mixed waste container storage pad located near TA-55-4. All other hazardous and mixed waste units are contained within buildings that will prevent migration of treated or stored liquid or solid waste to soil. As discussed in Section 9.2.4, soil samples will be collected from soil surrounding the container storage pad to determine if contaminants have migrated from the pad.

9.5.1.1 Sampling Procedures

The sampling procedures outlined below will be used to obtain samples to determine the amount of hazardous constituents (if any) in soil in the vicinity of the container storage pad near TA-55-4. Soil samples will be collected from a depth of six inches with a trowel or scoop or with a Veihmeyer™ soil sampler. Sampling procedures will be performed as follows:

- Trowel or Scoop
  - Take small, equal portions of sample from the surface or near the surface of the material to be sampled
  - Combine the samples in a container appropriate for the required analysis
  - Cap the container, attach a label and seal, and preserve as required (see Table 9-5). Record in the field logbook, and complete the sample analysis request sheet and chain-of-custody form. Deliver the samples to CST-9 for radiological screening and to the laboratory for analysis.
- Veihmeyer™ Sampler
  - Assemble the sampler by screwing in the tip and the drive head on the sampling tube
  - Insert the tapered handle (drive guide) of the drive hammer through the drive head
  - Place the sampler in a perpendicular position on the soil to be sampled
  - With the left hand holding the tube, drive the sampler into the soil to the desired sampling depth by pounding the drive head with the drive hammer (do not drive the tube further than the tip of the hammer's drive guide)
  - Record the length of the tube that penetrated the material
  - Move the drive hammer onto the drive head (in this position, the hammer serves as a handle for the sampler)
  - Rotate the sampler at least two revolutions to shear off the sample at the bottom
  - Lower the sampler handle (hammer) until it just clears the two ear-like protrusions on the drive head and rotate about 90 degrees
  - Withdraw the sampler from the material by pulling the handle (hammer) upwards (when the sampler cannot be withdrawn by hand, as in deep soil sampling, use a puller jack and grip)
  - Dislodge the hammer from the sampler, turn the sampler tube upside down, tap the head gently against the hammer, and carefully recover the sample from the tube

- Store the sample in an appropriate sample container (see Table 9-5)
- Label the sample, affix the seals, preserve as required, record in the field logbook, complete the sample analysis request sheet and chain-of-custody form, and deliver the samples to CST-9 for radiological screening and to the laboratory for analysis.

9.5.1.2 Cleaning of Samplers

To prevent cross contamination, it is important to clean the samplers after each sample is collected. An unused, disposable sampler may be presumed clean if still in a factory-sealed wrapper. Unsealed samplers will be cleaned prior to use. Samplers will be washed with a detergent and water solution, rinsed several times with tap water, rinsed with distilled water, drained of excess water, and air-dried or wiped dry.

9.5.2 Liquid Sampling

A composite liquid waste sampler (COLIWASA) or similar device will be used to sample unused wash-water solutions before decontamination begins in order to determine baseline parameters. It will also be used to sample the wash water used for cleaning structures and equipment. As an alternative to the COLIWASA, glass tubes may be used to sample liquids. The primary advantage in using a glass tube is that the tube will be disposed of appropriately after each sample is collected, thus eliminating the potential for cross contamination.

9.5.2.1 Sampling Procedure

Liquid sampling with a COLIWASA will be performed as follows:

- Ensure that the COLIWASA is clean
- Assemble the COLIWASA
- Check that the sampler is functioning properly (adjust the locking mechanism, if necessary, to make sure the neoprene rubber stopper provides a tight closure)
- Wear necessary PPE and observe required sampling precautions
- Put the sampler in the open position by placing the stopper-rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block
- Slowly lower the COLIWASA into the liquid at a rate that permits the level of the liquid inside and outside the sampler tube to be about the same (if the level of the liquid in the

sampler tube is lower than that outside the sampler, the sampling rate is too fast and will result in a nonrepresentative sample)

- When the sampler stopper reaches the bottom of the liquid container, push the sampler tube downward against the stopper to close the sampler
- Lock the sampler in the closed position by turning the T-handle until it is upright and one end rests tightly on the locking block
- Slowly withdraw the sampler from the container with one hand, while wiping the sampler tube with a disposable cloth with the other hand
- Carefully discharge the sample into a sample container by slowly pulling the lower end of the T-handle away from the locking block, while the lower end of the sampler is positioned in the sample container
- Preserve as required (see Table 9-6), cap the container, attach a label and seal, place immediately in an insulated container with ice (if required), record in the field logbook, and complete the sample analysis request sheet and chain-of-custody form
- Unscrew the T-handle of the sampler and disengage the locking block
- Clean the sampler on site and store used rags in plastic bags for subsequent disposal or store the contaminated parts of the sampler in a plastic storage tube or bag for subsequent cleaning.

9.5.2.2 Cleaning of Samplers

The sampler must be clean before use. An unused, disposable sampler may be presumed clean if still in a factory-sealed wrapper. Unsealed samplers will be cleaned prior to use. Samplers will be washed with a detergent and water solution, rinsed several times with tap water, rinsed with distilled water, drained of excess water, and air-dried or wiped dry. A necessary piece of equipment for cleaning the tube of the COLIWASA is a bottle brush that fits tightly inside the diameter of the tube. The brush is connected to a rod of sufficient length to reach the entire length of the sampler tube. To prevent cross contamination, it is important to clean the samplers after each sample is collected. Clean samplers should be stored in clean polyethylene plastic tubes or bags in a clean and protected area.

9.5.3 Sample Handling and Documentation

Samples will be analyzed either at LANL or at a commercial laboratory. In either case, each sample will be labeled, sealed, and accompanied by a chain-of-custody and sample analysis request form. The chain-of-custody form is necessary to trace sample possession from the time

of collection to the time of analysis and must accompany every sample. The original record accompanies shipment; the copy is retained by LANL. If samples are analyzed at LANL, the original will be maintained by LANL. The request for analysis form has two parts: field and laboratory. The field portion of this form must be completed by the person collecting the sample and include most of the pertinent information noted in the logbook. The laboratory portion is intended to be completed by the analytical laboratory personnel when the sample is received. The analytical laboratory retains the original record and sends a copy to LANL.

Sample containers appropriate for the requested analyses will be used for all samples. Sample containers, preservation, and holding times will conform to those specified in SW-846 for the corresponding analyses. Samples will be taken, placed in bottles, sealed, and tagged. Sample container surfaces will be screened for radiological contamination and decontaminated, if necessary. Sample containers will then be immediately packed in vermiculite, sawdust, or if refrigeration is required, an insulated container with ice. Recommended sample containers, preservation, and holding times are presented in Tables 9-5 and 9-6.

The sample container must be sealed with a gummed-paper seal attached to the container in such a way that the seal must be broken in order to open the container. The seal and sample tag must be completed with a waterproof pen. A sample label is necessary to prevent misidentification of samples and should include, if applicable, the grid number referenced to positions staked on the site perimeter. The sample label must be completed to include the project name, sample number, collection date/time, collector's name, sample location, sample media description, preservative, and analysis requested. In the case of soil sampling, field information shall include observations such as the soil texture and surface appearance, ambient temperature and cloud cover at time of sampling, and precipitation conditions 24 hours before sampling.

A field logbook will be kept and will contain all information pertinent to field surveys and sampling. The logbook shall have bound and consecutively numbered pages in 8.5- by 11-inch format. Minimum entries should include:

- Purpose of sample (routine sampling, special sampling)
- Location of sampling (coordinates referenced to staked field points, if soil sample)

- Name and business address of person making log entry
- Type of process producing waste
- Number and volume of sample
- Description of each sampling location, sampling methodology, equipment used, etc.
- Date and time of sample collection
- Sample destination and transporter's name (e.g., name of laboratory, United Parcel Service, etc.)
- Map or photograph of the sampling site, if any
- Field observations, if applicable (e.g., ambient temperature, sky conditions, past 24-hour precipitation)
- Field measurements, if applicable (e.g., pH, conductivity)
- Collector's sample identification number(s)
- Signature of person responsible for the log entry.

Because sampling situations vary widely, no specific rule can be given as to the extent of information that must be entered in the logbook. It is recommended, however, to record sufficient information so that someone can reconstruct the sampling situation without relying on the collector's memory.

9.5.4 Analytical Procedures

All sample analyses will be conducted using methods prescribed in SW-846, including those for QA/QC. Target detection limits, analytical methods, and instrumentation for metals and organics analyses are presented in Tables 9-7 and 9-8, respectively.

9.5.5 Field and Laboratory QA/QC

Field QC activities will include collection of the following QC samples: duplicate samples, trip blanks, field blanks, and equipment rinsate blanks. Field QC samples are summarized in Table 9-9.

Duplicate samples are two or more samples collected simultaneously into separate containers from the same source under identical conditions. Acceptance limits for field duplicate analyses are 0 to 20 relative percent difference per analyte. Frequency of duplicate samples will be 1 in 20 samples or 1 per day if less than 20 samples are collected. Blank samples will include trip blanks, field blanks, and equipment rinsate blanks. A trip blank is a sample container filled with organic-free deionized water. The filled container is taken to the sampling site, remains unopened, and then is shipped to the analytical laboratory along with the samples. A trip blank is submitted whenever samples are collected for volatile organic compounds analysis. A field blank is a sample collected to assess the ambient conditions at the sampling site. It consists of a sample of organic-free deionized water poured into a sample container under normal sampling conditions. An equipment rinsate blank is collected to assess the cleanliness of sampling equipment. The equipment is cleaned according to the procedures described in Sections 9.5.1.2 and 9.5.2.2, then organic-free deionized water is poured over the decontaminated equipment's sampling surface and collected in a sample container. Frequency of blank samples will be 1 in 20 samples or 1 per day if less than 20 samples are collected. Blank samples and duplicate samples of liquid, soil, and sediment will be analyzed for the same parameters as the closure samples. Samples will be provided with unique identification numbers that do not indicate to the laboratory that the samples are for QA/QC purposes.

Instrument calibration and maintenance are field activities subject to QC procedures. Field equipment requiring calibration will be limited to radioactivity detection devices and chemical monitoring equipment. Radiation detection and organic vapor monitoring equipment are the responsibility of field personnel and will be calibrated and maintained using the manufacturer's instructions and appropriate SOPs.

The analytical laboratory shall operate under a quality assurance program plan (QAPP) which meets the requirements in SW-846. QC procedures in the analytical laboratory are guided by the laboratory's QAPP. In the laboratory, QC samples are required to establish the accuracy and precision of the analytical data in order to determine the quality of the data. Laboratory QC procedures are summarized in Table 9-10.

Table 9-1

Closure Schedule for the Container Storage Areas at Technical Area 55

Activity	Maximum Time Required[a]
Let contract request for proposals	-90 Days
Notify the New Mexico Environment Department (NMED)	-45 Days
Receive proposals	-30 Days
Select contractor and award contract	-10 Days
Receipt of final waste	Day 0
Removal of final waste volume	Day 30
Perform washdown of walls adjacent to container storage areas (CSA) and collect samples from rinse water	Day 40
Perform washdown of CSA floors and the outside CSA pad and collect samples from rinse water	Day 45
Receive analyses on samples of rinse water used to wash down the walls	Day 70
Receive analyses on samples of rinse water used to wash down the CSA floors and outside pad	Day 75
Perform additional washdown (if necessary)	Day 100
Perform additional sampling (if necessary)	Day 100
Receive analyses on samples from additional sampling	Day 130
Perform final cleanup (e.g., removal of decontaminated equipment and decontamination wastes)	Day 145
Verify decontamination	Day 150
Submit final report to the NMED	Day 180

[a] The schedule above indicates calendar days from the beginning by which activities will be completed. Some activities may be conducted simultaneously.

Table 9-2

Closure Schedule for the Storage Tank Systems at Technical Area 55

Activity	Maximum Time Required[a]
Let contract request for proposals	-90 Days
Notify the New Mexico Environment Department (NMED)	-45 Days
Receive proposals	-30 Days
Select contractor and award contract	-10 Days
Treatment of final volume of waste	Day 0
Removal of final waste volume	Day 5
Flush tank systems and collect rinse water	Day 10
Sample rinse water from the tank systems	Day 10
Perform washdown of glovebox GB-438 and collect samples from rinse water	Day 15
Perform washdown of walls adjacent to the storage tank systems and the floor areas under these tank systems and collect samples from rinse water	Day 20
Receive analyses on samples of tank rinse water	Day 40
Receive analyses on samples of rinse water used to wash down glovebox	Day 45
Receive analyses on samples collected from washdown of the walls and floor areas associated with the storage tank systems	Day 50
Perform additional washdown (if necessary)	Day 80
Perform additional sampling (if necessary)	Day 80
Receive analyses on samples from additional sampling	Day 110
Equipment disassembly	Day 130
Perform final cleanup (e.g., removal of decontaminated equipment and decontamination wastes)	Day 145
Verify decontamination	Day 150
Submit final report to the NMED	Day 180

[a] The schedule above indicates calendar days from the beginning by which activities will be completed. Some activities may be conducted simultaneously.

Table 9-3

Closure Schedule for the Cementation Unit at Technical Area 55

Activity	Maximum Time Required[a]
Let contract request for proposals	-90 Days
Notify the New Mexico Environment Department (NMED)	-45 Days
Receive proposals	-30 Days
Select contractor and award contract	-10 Days
Treatment and removal of final waste volume	Day 5
Perform washdown of glovebox GB-454 and collect samples from rinse water	Day 15
Receive analyses on samples from rinse water used to wash down glovebox	Day 45
Perform additional washdown (if necessary)	Day 50
Perform additional sampling (if necessary)	Day 50
Receive analyses on samples from additional sampling	Day 80
Equipment disassembly	Day 100
Perform final cleanup (e.g., removal of decontaminated equipment and decontamination wastes)	Day 110
Verify decontamination	Day 125
Submit final report to the NMED	Day 180

[a] The schedule above indicates calendar days from the beginning by which activities will be completed. Some activities may be conducted simultaneously.

Table 9-4

Analytical Parameters and Test Methods[a] for Technical Area 55 Container Storage Areas, Storage Tank Systems, and Cementation Unit

Parameter	Test Method	Reference[b]
Ignitability	Pensky-Martens closed-cup method	(L) SW1010 (L, S) ASTM D93-80
Reactivity	Test method to determine hydrogen cyanide released from waste Test method to determine hydrogen sulfide released from waste	(L, S) SW, Section 7.3
Corrosivity	Electrometric (pH of aqueous solution)	(L) SW9040B
Toxicity characteristic	Toxicity characteristic leaching procedure (TCLP) extraction	(L, S) SW1311
Metals:	Graphite furnace atomic absorption (AA) spectroscopy, gaseous hydride AA, or direct aspiration AA	
Arsenic		(L, S) SW7060A, SW7061A
Barium		(L, S) SW7080A, SW7081
Cadmium		(L, S) SW7130, SW7131A
Chromium		(L, S) SW7190, SW7191
Lead		(L, S) SW7420, SW7421
Selenium		(L, S) SW7740, SW7741A
Silver		(L, S) SW7760A, SW7761
Mercury	Manual cold-vapor technique	(L) SW7470A, (S) SW7471A
Volatile organics	Gas chromatography (GC)/mass spectrometry (MS) GC/MS capillary column technique	(L, S) SW8240B (L, S) SW8260A
Semivolatile organics	GC/MS GC/MS capillary column technique	(L, S) SW8250A (L, S) SW8270B

Refer to footnotes at end of table.

Table 9-4 (Continued)

Analytical Parameters and Test Methods[a] for Technical Area 55 Container Storage Areas, Storage Tank Systems, and Cementation Unit

Parameter	Test Method	Reference[b]
Total metals[c]	Acid digestion	(L) SW3010A, (S) SW3050A
	Inductively coupled plasma atomic emission spectroscopy	(L, S) SW6010A
Arsenic		(L, S) SW6010A
Barium		(L, S) SW6010A
Beryllium		(L, S) SW6010A
Cadmium		(L, S) SW6010A
Chromium		(L, S) SW6010A
Lead		(L, S) SW6010A
Nickel		(L, S) SW6010A
Selenium		(L, S) SW6010A
Silver		(L, S) SW6010A
Thallium		(L, S) SW6010A
Zinc		(L, S) SW6010A
Mercury	Manual cold-vapor technique	(L) SW7470A, (S) SW7471A
Free liquids	Paint Filter Liquids Test	(L, S) SW9095

[a] At Los Alamos National Laboratory, current analytical capabilities include limited analyses of mixed waste samples. These analyses include gross alpha, beta, and gamma screening.

[b] "ASTM" refers to American Society for Testing and Materials standards.
"SW" refers to U.S. Environmental Protection Agency, 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*.
(L) refers to liquid waste.
(S) refers to solid waste.

[c] See also atomic absorption methods.

Table 9-5

Sample Containers, Preservation, and Holding Times for Sediment/Soil/Sludge Samples

Analyte Group	Container	Preservative	Holding Time[a]
Target compound volatile organics[b]	125 milliliter (ml) WM[c]-G[d]	Cool to 4 degrees Celsius (°C)	14 days
Target compound semivolatile organics[b]	250 ml WM-G vial with Teflon™-lined lid	Cool to 4°C	14 days from field collection to preparative extraction 40 days from preparative extraction to determinative analysis
Target analyte metals[b] (except mercury and hexavalent chromium)	500 ml WM-P[e] or G	None	180 days
Mercury	500 ml WM-P or G	Cool to 4°C	28 days
Hexavalent chromium	500 ml WM-P or G	Cool to 4°C	Not established - analyze as soon as possible
Radioactivity screening	120 ml G vial	None	Analyze upon receipt

[a] Holding time information was taken from the U.S. Environmental Protection Agency, 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*.
[b] Target compound volatile and semivolatile organics and target analyte metals are listed by respective test method numbers in U.S. Environmental Protection Agency, 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*.
[c] WM = Wide-mouth
[d] G = Glass
[e] P = Polyethylene

Table 9-6

Sample Containers, Preservation, and Holding Times for Liquid Samples

Analyte Group	Container	Preservative	Holding Time[a]
Target compound volatile organics[b]	2 x 40 milliliter (ml) G[c] vials with Teflon™-lined septa	HCl[d] to pH <2 Cool to 4 degrees Celsius (°C)	14 days
Target compound semivolatile organics[b]	4 x 1 liter AG[e] with Teflon™-lined lid	Cool to 4°C	7 days from field collection to preparative extraction 40 days from preparative extraction to determinative analysis
Target analyte metals[b] (except mercury and hexvalent chromium)	1 liter P[f] or G	HNO_3[g] to pH <2	180 days
Mercury	500 ml P or G	HNO_3 to pH <2, Cool to 4°C	28 days
Hexavalent chromium	500 ml P or G	Cool to 4°C	24 hours
Radioactivity screening	40 ml G vial, no septa	None	Analyze upon receipt

[a] Holding time information was taken from the U.S. Environmental Protection Agency, 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*.
[b] Target compound volatile and semivolatile organics and target analyte metals are listed by respective test method numbers in U.S. Environmental Protection Agency, 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*.
[c] G = Glass
[d] HCl = Hydrochloric acid
[e] AG = Amber glass
[f] P = Polyethylene
[g] HNO_3 = Nitric acid

Table 9-7

Target Detection Limits, Analytical Methods, and Instrumentation for Metals Analysis

Analyte	Target Detection[a] Limit (µg/L)[b]	EPA SW-846[c] Analytical Method	Instrumentation[d]
Arsenic	10	6010A, 7060A, 7061A	ICP, GFAA
Barium	200	6010A, 7080A, 7081	ICP, FLAA, GFAA
Beryllium	5	6010A, 7090, 7091	ICP, FLAA, GFAA
Cadmium	2	6010A, 7130, 7131A	ICP, FLAA, GFAA
Chromium	10	6010A, 7190, 7191	ICP, FLAA, GFAA
Lead	5	6010A, 7420, 7421	ICP, FLAA, GFAA
Mercury	0.2	7470A, 7471A	CVAA
Nickel	40	6010A, 7520	ICP, FLAA
Selenium	5	6010A, 7740, 7741A	ICP, GFAA, GHAA
Silver	10	6010A, 7760A, 7761	ICP, FLAA, GFAA
Thallium	10	6010A, 7840, 7841	ICP, FLAA, GFAA

[a] Detection limits listed are for clean water. Actual detection limits may be higher depending on sample composition and matrix type.
[b] µg/L = micrograms per liter
[c] U.S. Environmental Protection Agency, 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*.
[d] ICP = Inductively coupled plasma emission spectroscopy
GFAA = Graphite furnace atomic absorption spectroscopy
FLAA = Flame atomic absorption spectroscopy
CVAA = Cold-vapor atomic absorption spectroscopy
GHAA = Gaseous hydride atomic absorption spectroscopy

Table 9-8

Target Detection Limits, Analytical Methods, and Instrumentation for Organics Analysis

Analyte (Group)	Target Detection Limits[a]	EPA SW-846[b] Analytical Method	Instrumentation[c]
Target compound list volatiles + ten tentatively identified compounds (TIC)	10 mg/L[d] water 10-120 mg/kg[e] sediment	8240B or 8260A	GC/MS
Target compound list semivolatiles + 20 TICs	10 mg/L water 330-50,000 mg/kg sediment	8250A or 8270B	GC/MS

[a] Detection limits expressed as practical quantitation limits.
[b] U.S. Environmental Protection Agency, 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*.
[c] GC/MS = Gas chromatography/mass spectrometry
[d] mg/L = milligrams per liter
[e] mg/kg = milligrams per kilogram

Table 9-9

Summary of Field Quality Control Samples

Quality Control Sample Type	Sample Matrix	Applicable Analysis	Frequency	Purpose	Acceptance Criteria	Corrective[a] Action
Trip blank	Water	Volatile organic analytes (VOA)	One per shipping cooler containing samples to be analyzed for VOAs	Monitor sample contamination in field and laboratory	[b]	Advisory--no action required
Field blank	Water	VOAs, semivolatile organic analytes (SVOA), metals, radionuclides	One sample daily per analysis (can prepare and hold pending sample results)	Monitor field sample contamination/air contamination	[b]	Advisory--no action required
Field duplicate	Soil/water	VOAs, SVOAs, metals, radionuclides	One for every 20 samples	Monitor sample variability	Analytical method criteria, if applicable	Advisory--no action required
Equipment rinsate blank	Water	VOAs, SVOAs, metals, radionuclides	One sample per day (can prepare and hold pending sample results)	Monitor decontamination effectiveness and sample cross contamination	[b]	Advisory--no action required

[a] U.S. Environmental Protection Agency Functional Guidelines for Data Validation may apply.
[b] For volatile and semivolatile analysis, if blank shows detectable levels of any common laboratory contaminant (e.g., methylene chloride, acetone, 2-butanone, toluene, and/or any phthalate ester), sample must exhibit that contaminant at a level 10 times the quantitation limit to be considered detectable. For all other contaminants, sample must exhibit the contaminant at a level 5 times the quantitation level to be considered detectable.

Table 9-10

Summary of Laboratory Quality Control Procedures[a] by Analytical Method

Parameter	EPA SW-846[b] Analytical Method	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Target compound volatile organics	8240B or 8260A	Instrument performance: mass calibration/ion abundance pattern	Every 12 hours of analysis time	Per method	Repeat until acceptance criteria satisfied
		Initial calibration: instrument sensitivity and linearity of response	Five concentration levels; after each instrument performance, check prior to sample analysis	Relative response factors (RRF) within method limits	Repeat calibration
		Continuing calibration	Every 12 hours of analysis time	Average RRFs <25 percent (%) difference	Repeat calibration
		Internal standards	All calibration standards, samples, and blanks	Extracted ion current profile (EICP); D -50 to +100% Retention time shifts <0.50 minutes	Correct malfunction; reanalyze sample per method criteria
		Method blank	Every 12 hours of analysis time	<5 times quantitation limit for methylene chloride, acetone, 2-butanone; all other compounds < or = to quantitation limit	Determine source of contamination, and document corrective action; reextract and reanalyze samples
		System monitoring compounds	Every method blank, sample, matrix spike, matrix spike duplicate; matrix specific, per method limits	Check instrument and calculations; reanalyze per method criteria	

Refer to footnotes at end of table.

Table 9-10 (Continued)

Summary of Laboratory Quality Control Procedures[a] by Analytical Method

Parameter	EPA SW-846[b] Analytical Method	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Target compound semivolatile organics	8250A or 8270B	Instrument performance: mass calibration/ion abundance pattern	Every 12 hours	Per method	Repeat until acceptance criteria satisfied
		Initial calibration: instrument sensitivity and linearity of response	Five concentration levels. After each performance, check prior to sample analysis	RRFs within method limits	Repeat calibration
		Continuing calibration	Every 12 hours	Average RRFs <25% difference	Repeat calibration
		Internal standards	All calibration standards, samples and blanks	EICP D -50 to +100% Retention time shifts <0.50 minutes	Correct malfunction; reanalyze sample per method criteria
		Method blank	Each group of samples of similar matrix and concentration level (soils)	<5 times quantitation limit for phthalate esters; all other compounds < or = to quantitation limit	Determine source of contamination; document corrective action; reextract and reanalyze samples
		Surrogate compounds	Each sample, blank	Matrix-specific per method limits	Reextract and reanalyze per method criteria

Refer to footnotes at end of table.

Table 9-10 (Continued)

Summary of Laboratory Quality Control Procedures[a] by Analytical Method

Parameter	EPA SW-846[b] Analytical Method	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Metals	6010A	Surrogate compounds Instrument calibration Initial/continuing calibration	Each sample and blank daily, or each setup after instrument calibration, 10% or every 2 hours	60 - 150% recovery 5% of true value 10% of true value	Advisory only--no action Repeat calibration; correct problem; recalibrate and reanalyze previous ten samples
		Initial/continuing calibration blank	Every calibration, 10% or 2 hours	< contract-required detection limits	Correct problem; recalibrate and reanalyze all samples since last blank
		Preparation blank	Each batch of digested samples	< contract-required detection limits	Redigest and reanalyze all associated samples per method criteria
		Interference check sample (ICS)	Each run or twice per 8-hour shift	20% of true value	Correct problem; recalibrate, reanalyze all samples since last ICS
		Duplicate sample analysis	Once per field batch per matrix	0 - 20% relative difference when < five times detection limit; detection limit otherwise	Flag data
		Laboratory control sample (LCS)	Once per field batch or each digest group	80 - 120% recovery (except silver and antimony)	Correct problem; redigest and reanalyze all samples since last LCS

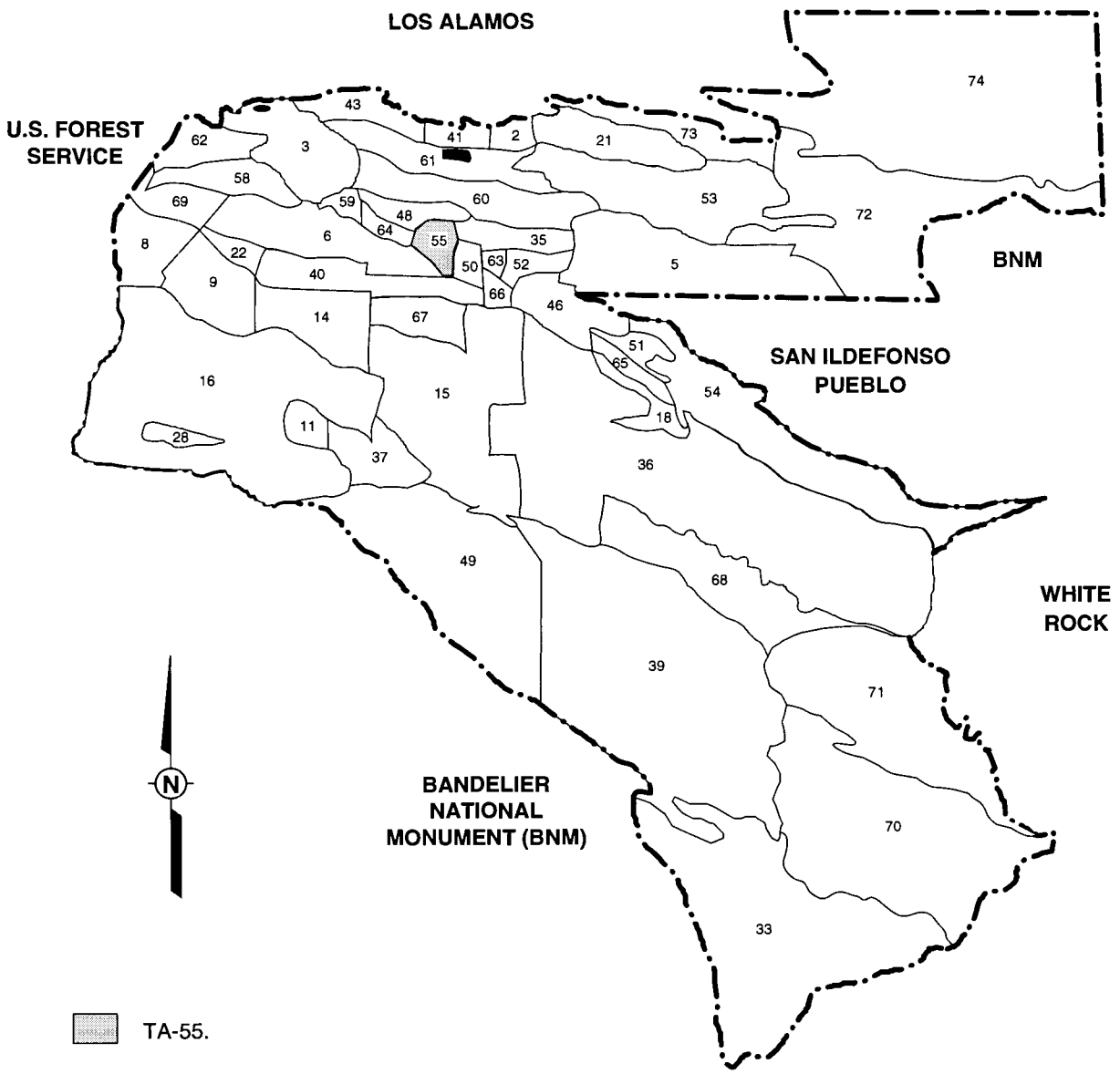
Refer to footnotes at end of table.

Table 9-10 (Continued)

Summary of Laboratory Quality Control Procedures[a] by Analytical Method

Parameter	EPA SW-846[b] Analytical Method	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Metals (cont'd)	6010A	Serial dilution analysis	Once per field batch per matrix	10% original determination	Flag data
		Instrument detection limit	Quarterly	As determined	Not applicable
		Inter-element corrections	Annually	As determined	Not applicable
		Linear range analysis	Quarterly	5% of true value	Reanalyze

[a] Source: U.S. Environmental Protection Agency Contract Laboratory Program Statement of Work for Inorganic and Organic Analysis (EPA, 1990). Not all listed procedures may be applicable to SW-846 protocols.
[b] U.S. Environmental Protection Agency, 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*.



TA-55.

Not Los Alamos National Laboratory property.

Note: Technical Area 57, the Fenton Hill Geothermal Site, is not shown on this figure.

4800 0 4800
Scale in Feet

Modified from Los Alamos National Laboratory, 1994, "Environmental Surveillance at Los Alamos During 1992," LA-12764-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure 9-1
Location of Technical Area (TA) 55

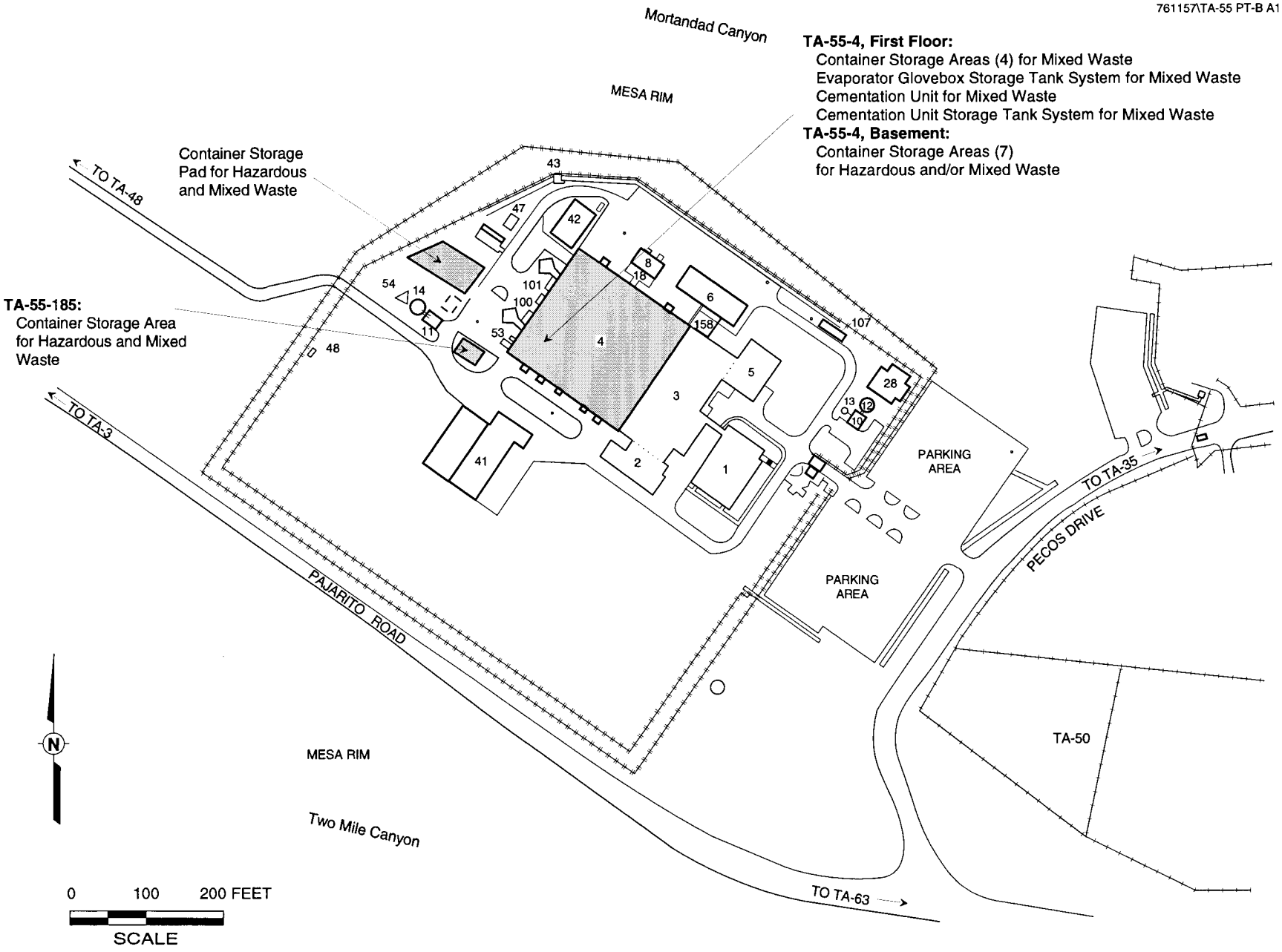


Figure 9-2
Technical Area (TA) 55

10.0 CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS

This section describes the solid waste management units (SWMU) that have been identified in Technical Area (TA) 55 at Los Alamos National Laboratory (LANL) and is presented to satisfy regulatory requirements in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart IX, 270.14(d), revised November 1, 1995. LANL uses the definition of a SWMU presented in "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515" (U.S. Environmental Protection Agency [EPA], 1990; EPA, 1994a), hereinafter referred to as Module VIII. This definition states that SWMUs are "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at or around a facility at which solid wastes have been routinely and systematically released."

10.1 SWMU DESCRIPTIONS

Several types of SWMUs are present within TA-55. These SWMUs include those identified for corrective actions in Module VIII, as modified following a Class III permit modification effective May 19, 1994 (Section 10.1.1); SWMUs identified in Revision 1.0 of LANL's "Solid Waste Management Units Report," (LANL, 1990) hereinafter referred to as the 1990 SWMU Report (Section 10.1.2); and SWMUs that are active hazardous/mixed waste management units, but were not identified in the 1990 SWMU Report (Section 10.1.3). SWMUs identified in Section 10.1.1 that are also included in the 1990 SWMU Report will not be reiterated in Section 10.1.2. TA-55 also contains SWMUs associated with TA-42, which was formerly located within the current TA-55 boundary. From 1951 until 1978, TA-42 was located within a 5,000-square-meter, fenced area just to the northeast of the main cluster of buildings currently located at TA-55. In 1978, all structures, debris, and soil contamination associated with TA-42 were removed and taken to TA-54 during a decontamination and decommissioning (D&D) project (LANL, 1992).

10.1.1 SWMUs Identified for Corrective Actions in Module VIII

The following are descriptions of the SWMUs at TA-55, including those SWMUs associated with the former TA-42, that have been identified for corrective actions in Module VIII. These descriptions were compiled from the "RFI Work Plan for Operable Unit 1129" (LANL, 1992). Brief

unit and waste descriptions are also provided in Table 10-1. Figure 10-1 shows the locations of the SWMUs in TA-55.

10.1.1.1 Incinerator Complex

An incinerator designed to incinerate radionuclide-contaminated waste was located at TA-42. Beginning in 1951, the unit was used to incinerate small quantities of low-level radioactive waste in a cylindrical combustion chamber. Because of operational problems, however, the incinerator was shut down in 1952 (LANL, 1992). Part of the building (TA-42-1) was later used as a storage decontamination area (see below) and the entire structure was removed in 1978. The incinerator is designated as SWMU No. 42-001(a).

Two holding tanks [SWMU Nos. 42-001(b) and 42-001(c)] were associated with the incinerator at TA-42. The tanks each had a 37,000 gallon (gal) capacity and were connected to the incinerator via underground drainlines. The tanks, which were used to store ash generated during the process, were removed during the D&D effort. The drainlines were filled with asphalt but it remains unknown whether they were removed or left in place (LANL, 1992).

10.1.1.2 Decontamination Areas

The main floor area of the incinerator building (TA-42-1) was used from 1956 until 1969 to store and decontaminate laboratory equipment that was contaminated with radionuclides and possibly grease and oils (LANL, 1992). This area is identified as SWMU No. 42-002(a). Items that could not be decontaminated in TA-42-1 were washed off at the end of an asphalt driveway located adjacent to the building. Runoff from the decontamination activities flowed down an embankment on the northwest side of the driveway. Potentially contaminated soils in the area were not removed during the D&D effort (LANL, 1992). The outside decontamination area is identified as SWMU No. 42-002(b).

10.1.1.3 Septic System

A septic system [SWMU No. 42-003] was located adjacent to TA-42-1 and served that building. Installed in 1951, the septic system consisted of a drainline from the building, a 565-gal septic tank, a filter trench, a leach field, and an outfall to Mortandad Canyon (LANL, 1990; LANL, 1992). Liquid wastes containing plutonium, uranium, fission products, and tritium entered the septic system as a result of the decontamination activities previously described. Solvents, acids, and

greases may have also entered the septic system. The septic system and associated contaminated soils were removed in 1978 during the D&D project (LANL, 1992).

10.1.1.4 Sumps and Tanks

The basement of TA-55-4 contains numerous sumps, pumps, and tanks. Six 3- by 3- by 3-feet (ft) deep sumps/pumps contain spills and mop water generated in the building. The liquid may contain mixed waste constituents (LANL, 1990). Four tank pumps, each measuring 8 inches (in.) in diameter and 4 ft long, and four blowdown tanks of the same dimensions receive condensate from cooling coils. The condensate discharged to the units may have contained small amounts of mixed wastes in the past. All liquids collected and contained within these units are transferred via direct pipeline to TA-50 for treatment (LANL, 1990; LANL, 1992). The sumps, pumps, and tanks in the TA-55-4 basement are collectively identified as SWMU No. 55-008.

10.1.1.5 Monitoring Sump

A monitoring sump [SWMU No. 55-009] is located outside at TA-55, northeast of TA-55-6. The sump, which is no longer in service, was used to monitor sanitary waste liquids produced at TA-55 prior to being discharged to sewage treatment lagoons at TA-35. The sump measures approximately 7- by 7- by 5.5-ft deep and is connected to TA-55-4 by a 6-in. vitrified clay pipe measuring approximately 250 ft long. An 8-in. vitrified clay pipe, measuring approximately 4,000 ft long, connects the sump to the lagoons at TA-35. The sump was in service for several years, but no significant levels of radionuclides were detected. This unit was taken out of service and has been abandoned in place (LANL, 1990; LANL, 1992).

10.1.2 SWMUs Identified in the 1990 SWMU Report

The following are descriptions of the SWMUs at TA-55 identified in the 1990 SWMU Report, but not included in Module VIII for corrective actions. These descriptions were compiled from the RFI Work Plan and from the 1990 SWMU Report.

10.1.2.1 Cementation Unit[a]

The cementation unit included in this permit application for treatment of transuranic (TRU) mixed waste is identified in the SWMU Report as SWMU No. 55-001. This unit and its operation are fully described in other sections of this permit application.

The cementation storage tank system included in this permit application for storage of TRU mixed waste is also identified as SWMU No. 55-001. This unit is fully described in other sections of this permit application.

10.1.2.2 Evaporators[a]

Two thermosyphon evaporators [SWMU No. 55-004] are located in Room 401 in TA-55-4 (TA-55-4-401). The evaporator units reduce the volume of nitric acid effluent generated from the nitrate-based aqueous recovery process used to produce relatively pure plutonium oxides. Each evaporator is capable of processing 540 to 700 liters of liquid during a typical run. The resulting acidic liquid distillate is transferred to TA-50 for further treatment. The evaporator bottoms are discharged into the evaporator glovebox storage tank system. The solutions are then sufficiently cooled to allow the salts in the solutions to crystallize and precipitate out. The solutions are subsequently processed through the filtration unit and treated by solidification in the cementation unit.

The evaporator glovebox storage tank system included in this permit application for storage of TRU mixed waste is also identified as SWMU No. 55-004. This unit is fully described in other sections of this permit application.

10.1.2.3 Filtration Unit[a]

A filtration unit [SWMU No. 55-005] is located in TA-55-4-401 and is used in conjunction with the evaporator and the cementation unit. The filtration unit is used to filter out the salts in the evaporator bottoms. Liquids from the filtration unit are transferred into the storage tank systems (i.e., the evaporator glovebox storage tank system and the cementation unit storage tank system).

---

[a] The descriptions for these units were extracted from TA-55 specific Standard Operating Procedures. This information is more definitive than the descriptions contained in the RFI Work Plan or the 1990 SWMU Report.

Solids are redissolved, when possible, and further processed in the evaporator or are sent to the cementation unit for treatment by solidification.

10.1.2.4 Container Storage Areas

Several active container storage areas [SWMU No. 55-002(a)] within TA-55-4 are used to store radioactively-contaminated wastes and are described in the following sentences. A satellite container storage area in TA-55-4-425 is used to store 55-gal drums of radioactively-contaminated vacuum pump oil. TA-55-4-124 houses a glovebox which contains radioactive fuel pellets and a radioactively-contaminated pellet grinder left over from a joint project between LANL and Hanford in 1988. A container storage area located in the basement of TA-55-4 is used to temporarily store low-level waste awaiting radiological survey. The waste consists primarily of rags, plastic, paper, glassware, packaging material, and metal scraps (LANL, 1992).

Waste with a count less than 5 milliroentgens per hour is placed in dempster dumpsters [SWMU No. 55-002(b)] located outside of TA-55-4 and adjacent to TA-55-8. These dumpsters are used solely for storage of packaged, low-level, radioactively-contaminated solid waste (LANL, 1990; LANL, 1992).

An inactive container storage area [SWMU No. 55-012] is located in TA-55-4-503. The area was the former storage location of a 100 milliliter bottle of waste nitric acid containing nonradioactive heavy metals generated during reagent preparation (LANL, 1990; LANL, 1992). The jar was disposed of sometime prior to November 1990.

SWMU No. 55-013(a) is a fume hood located in TA-55-3-186. This fume hood is a satellite accumulation area used to store chemical wastes including acetone, trichloroethylene, tetrahydrofuran, pyridine, toluene, ethanol, chlorotrifluorethylene, diethyl ether, pentane, dichloromethane, solvent-contaminated hydrolysis products of alkali, diatomaceous earth (celite), metals, hydrides, and molecular sieves (LANL, 1990; LANL, 1992). SWMU No. 55-013(b) is a fume hood located in TA-55-4-208. This satellite accumulation area is used to store chemical wastes including tetrahydrofuran, pyridine, and dimethoxyethane (ethylene, hexane, glycol, dimethyl ether) (LANL, 1990; LANL, 1992). Both of these active satellite accumulation areas are regularly inspected.

10.1.2.5 Containment Area

A containment area and an associated storage tank (TA-55-127) are located on the south side of TA-55-4. This area [SWMU No. 55-003] consists of a 6,100 gal nitric acid tank surrounded by secondary containment. The acid, which is virgin material, is used for several dissolution processes during the plutonium recovery process. The secondary containment area consists of 10-in.-thick concrete walls and floor and has sufficient capacity to contain the entire volume of the tank (LANL, 1990; LANL, 1992).

10.1.2.6 Glass Breaker

SWMU No. 55-006 is a glass breaker located in TA-55-4-133. The unit was used to break glassware potentially contaminated with mixed waste, but has not been in service since January 1991. The glass was broken to reduce waste volume. Once broken, the glass was placed in containers that were suitable for disposal (LANL, 1990; LANL, 1992).

10.1.2.7 Thermal Treatment Units

Two thermal treatment units [SWMU No. 55-007] are located in TA-55-4-420. The units were used to incinerate small quantities of rags contaminated with radionuclides. After treatment, ash was sent through a leaching system to recover the radionuclides if the TRU content of the ash was above a certain level. Otherwise the ash was sent to the cementation unit for treatment by solidification. Gases resulting from the thermal treatment process were scrubbed in a sodium hydroxide solution prior to release through the TA-55 glovebox ventilation system, which is equipped with high-efficiency particulate air (HEPA) filters (LANL, 1990; LANL, 1992).

10.1.2.8 Solvent Spill

In 1984 a solvent spill was discovered while drilling boreholes about 6 to 8 ft from the southwest side of TA-55-4. Analysis of core samples taken from the boreholes indicated the presence of methyl ethyl ketone, toluene, and methyl isobutyl ketone, all of which are common solvents. The source of the solvents is believed to be a spill of plasite paint used during the construction of TA-55-4 in the 1970s (LANL, 1990; LANL, 1992). The spill area is designated as SWMU No. 55-010.

10.1.2.9 Drains and Outfalls

A storm drainage system is located at TA-55 and manages storm water collected from around TA-55-4. The storm drains may potentially contain low levels of TRU radionuclides, solvents, and metals. These contaminants may have settled on the TA-55-4 roof and parking area from air emissions and then may have been carried to the drainage system by storm water (LANL, 1990; LANL, 1992). The catch basins, storm drains, and outfalls comprising the drainage system are designated as SWMU No. 55-011(a-e).

10.1.3 Active Hazardous/Mixed Waste Management Units Not Identified in the 1990 SWMU Report

The following sections describe active hazardous/mixed waste management units at TA-55 that were not identified in the 1990 SWMU Report.

10.1.3.1 Container Storage Areas

Most of the active container storage areas included in this permit application have not been designated formally as SWMUs and assigned SWMU numbers. These areas are or may be used for hazardous and/or mixed waste storage and are described in detail in other sections of this permit application.

The basement in TA-55-4 contains seven container storage areas designated as Areas 1 through 7. Area 1 is an L-shaped area located in the southwest section of the basement, and is approximately 61 ft long by 55 ft wide. The area is used to store hazardous waste, TRU mixed waste, and low-level mixed waste.

Area 2 is located in the southeast section of the basement, adjacent to TA-55-4-38A and is approximately 27 ft long by 11 ft wide. The area is used to store hazardous waste, TRU mixed waste, and low-level mixed waste.

Area 3 is located a few feet north of Area 1 in the southwest corner of the basement. The area measures 26 ft long by 10 ft wide and is used to store hazardous waste, TRU mixed waste, and low-level mixed waste.

Area 4 is located in the northwest section of the TA-55-4 basement. This area is 16 ft long by 13 ft wide and is used to store hazardous waste, TRU mixed waste, and low-level mixed waste.

Area 5 is located in the northeast section of the basement adjacent to TA-55-4-8. This container storage area is approximately 45 ft long by 17.5 ft wide and is used to store hazardous waste, TRU mixed waste, and low-level mixed waste.

Area 6 is located along the eastern wall of the TA-55-4 basement. This area is approximately 80 ft long by 50.5 ft wide and is used to store TRU mixed waste.

Area 7 is comprised of two narrow areas in the northern part of the TA-55-4 basement. This area is split with one portion on either side of the basement corridor leading to an outside access ramp. The western portion is approximately 33 ft long by 3 ft wide. The eastern portion is approximately 49 ft long by 2 ft wide. Area 7 may be used to store hazardous waste, TRU mixed waste, and low-level mixed waste.

TA-55-4-401 contains two container storage areas designated as Areas 8 and 9. Area 8 is 6 ft long by 5.5 ft wide and may be used to store TRU mixed waste and low-level mixed waste. Area 9 is 6.25 ft long by 5 ft wide and also may be used to store TRU mixed waste and low-level mixed waste.

A container storage area for TRU mixed waste and low-level mixed waste is located in TA-55-4-433. The area, designated as Area 10, is comprised of two separate sections. One portion of the container storage area is located at the northern end of Room 433. This area is 4 ft long by 3 ft wide. The other portion of the container storage area, located at the southern end of the room, is 10 ft long by 2 ft wide. The areas may be used to store mixed wastes awaiting radiological survey.

TA-55-4-432, designated as Area 11, may be used to store TRU mixed waste. The room measures approximately 20 ft long by 34 ft wide.

A container storage area is located in TA-55-185. The area measures approximately 60 ft long by 18 ft wide and may be used to store hazardous waste, TRU mixed waste, and low-level mixed waste.

An asphalt container storage pad is located on the west side of TA-55-4. This pad has a trapezoidal shape with the four sides measuring 102 ft, 86 ft, 156 ft, and 105 ft. The area is used to store hazardous waste, TRU mixed waste, and low-level mixed waste.

10.1.3.2 Oxygen Sparging Unit

An oxygen sparging unit was formerly located in a glovebox in TA-55-4-429. The unit consisted of a magnesium oxide crucible encased in a stainless steel, ceramic-insulated shell. The unit measured approximately 1.5 ft high by 1 ft in diameter and was used from January 1993 until October 1993 to treat waste pyrochemical salts potentially containing ignitable and/or reactive metals (e.g., potassium, sodium, calcium). The treatment process involved the oxidation of the ignitable/reactive metals to the nonhazardous metal oxide. The oxygen sparging unit, which was not assigned a SWMU number, underwent closure in October 1993 and is pending closure approval.

10.2 RELEASES

SWMU No. 55-010 is a solvent spill that contaminated soil on the southwest side of TA-55-4 with methyl ethyl ketone, methyl isobutyl ketone, and toluene. Analytical results confirmed the presence of plasite paint, an organic solvent-based epoxy paint; thus, it was determined that the contamination was the result of an accidental spill by painting contractors during construction of the Plutonium Facility. The contaminated soil was covered with clean soil and asphalt in 1978 (LANL, 1992).

Because of operational problems associated with the off-gas system, the incinerator [SWMU No. 42-001(a)] is known to have released an undetermined amount of radionuclides and possibly other chemical contaminants (LANL, 1990; LANL, 1992). During D&D activities 600 cubic meters (m^3) of debris and 1,200 m^3 of soil were removed. Following debris and soil removal, 61 soil samples were taken in the area and each contained less than 30 picocuries per gram (pCi/g) of alpha radioactivity (LANL, 1990).

Liquid waste and ash waste were intentionally released from the holding tanks [SWMU No. 42-001(b-c)] into Mortandad Canyon in 1952. The ash waste contained an estimated 100 millicuries of radioactivity. Samples collected from Mortandad Canyon in 1952 confirmed that radioactive contamination had entered the canyon (LANL, 1992).

Wash liquids from the outdoor contamination area [SWMU No. 42-002(b)] were not contained and ran down an embankment adjacent to the asphalt area. Potentially affected soils were not sampled or removed during the D&D effort (LANL, 1990; LANL, 1992).

The septic system [SWMU No. 42-003] released radioactive liquid wastes to an outfall area in Mortandad Canyon. During the 1978 D&D project, approximately 1,200 m^3 of soil were removed from the septic tank outfall area. Analysis of soil samples collected in the outfall area indicated levels of radioactivity ranging from below 25 pCi/g to 400 pCi/g (LANL, 1990; LANL, 1992).

None of the remaining SWMUs at TA-55 have had documented, unintentional releases of hazardous constituents or hazardous wastes to the environment (LANL, 1990).

10.2.1 Characterization of Releases

Potential releases from SWMUs are described in the 1990 SWMU Report and in the "RFI Work Plan for Operable Unit 1129." These descriptions include the material released and the nature of the release. However, because of the nature of the releases, the exact volume released is not known. The timing of the releases can only be estimated by the period of operation and sampling events.

10.2.2 Corrective Actions

Pursuant to 20 NMAC 4.1, Subpart V, 264.101(a), revised November 1, 1995, corrective actions are required only for releases of hazardous waste or hazardous constituents. Because some of the SWMUs in TA-55 have released or are suspected to have released hazardous constituents to the environment, they will be investigated and remediated, as necessary and with EPA and New Mexico Environment Department approval, during LANL Environmental Restoration Project corrective action activities at TA-55. Corrective action at TA-55 will follow the Resource Conservation and Recovery Act Facility Investigation/Corrective Measures Study process. Activities to be conducted include surface and subsurface sampling.

Table 10-1

Solid Waste Management Unit (SWMU) Descriptions[a]

SWMU No.	Unit Type	Unit Description	Waste Description
42-001(a)[b]	Incinerator	Cylindrical combustion chamber formerly housed in Technical Area (TA)-42-1 and used to incinerate radioactively-contaminated waste; decommissioned in 1978.	Radioactively-contaminated wastes.
42-001(b-c)[b]	Holding Tanks	Two 37,000-gallon holding tanks associated with the incinerator; decommissioned in 1978.	Radioactive ash from incinerator.
42-002(a)[b]	Decontamination Area	Main floor area of TA-42-1 which was used from 1956 until 1969 to decontaminate laboratory equipment; decommissioned in 1978.	Radionuclides and possibly grease and oils.
42-002(b)[b]	Decontamination Area	Asphalt driveway formerly located adjacent to TA-42-1 and used to decontaminate large items that could not be decontaminated inside TA-42-1; decommissioned in 1978.	Radionuclides and possibly grease and oils.
42-003[b]	Septic System	Septic system that served TA-42-1; the unit consisted of a drainline from TA-42-1, a 55-gallon septic tank, a filter trench, a leach field, and an outfall; decommissioned in 1978.	Sanitary wastes and liquid wastes containing plutonium, uranium, fission products, tritium, and possibly solvents, acids, and greases.
55-001	Cementation Unit	Cementation unit housed inside a glovebox in TA-55-4-401 and used to solidify transuranic (TRU) waste material in lead-shielded 55-gallon drums.	Mixed waste liquids and solids.
55-001	Storage Tanks	Five storage tanks and ancillary equipment associated with the cementation unit in TA-55-4-401.	Mixed waste liquids.
55-002(a-b)	Container Storage	Rooms, gloveboxes, and dumpsters at TA-55-4 used to store radioactive waste.	Radioactively-contaminated liquids and solids.

Refer to footnotes at end of table.

Table 10-1 (Continued)

Solid Waste Management Unit (SWMU) Descriptions[a]

SWMU No.	Unit Type	Unit Description	Waste Description
55-003	Containment Area	6,100 gallon nitric acid storage tank and associated secondary containment area located on the south side of TA-55-4.	Nitric acid (virgin material).
55-004	Evaporator	Thermosyphon evaporator located in TA-55-4-401 and used to reduce the volume of nitric acid effluent generated from the nitrate-based recovery process.	Mixed waste liquids and solids.
55-004	Storage Tanks	Storage tank and ancillary equipment associated with the evaporator in TA-55-4-401.	Mixed waste liquids.
55-005	Filtration Unit	Used in conjunction with the evaporator to remove nitrate salts from evaporator bottoms.	Radioactively-contaminated liquids and solids.
55-006	Glass Breaker	Unit housed inside a glovebox in TA-55-4-133 and used to break glassware.	Potentially radioactively-contaminated glassware.
55-007	Thermal Treatment	Two thermal treatment units used to incinerate rags.	Potentially radioactively-contaminated rags.
55-008[b]	Sumps and Tanks	Sumps and tanks used to contain and manage spills and mop water generated in TA-55-4.	Small amounts of mixed wastes and potentially radioactively-contaminated liquids.
55-009[b]	Sump	Inactive sump formerly used to monitor sanitary waste liquids produced at TA-55.	Sanitary wastes that may have contained chemicals and solvents.
55-010	Solvent Spill	Solvent-contaminated soil on the southwest side of TA-55-4 resulting from an accidental spill of plasite paint.	Methyl ethyl ketone, toluene, and methyl isobutyl ketone.
55-011(a-e)	Drains and Outfalls	Catch basins, storm drains, and outfalls that make up the storm drainage system at TA-55.	Storm water potentially contaminated with radionuclides, solvents, and/or metals.
55-012	Container Storage	Inactive container storage area, formerly used to store approximately 100 milliliters of waste acid.	Nitric acid contaminated with heavy metals.

Refer to footnotes at end of table.

Table 10-1 (Continued)

Solid Waste Management Unit (SWMU) Descriptions[a]

SWMU No.	Unit Type	Unit Description	Waste Description
55-013(a)	Container Storage	Active satellite accumulation area located inside a fume hood in TA-55-3-186.	Acetone, trichloroethylene, tetrahydrofuran, pyridine, toluene, ethanol, chlorotrifluoroethylene, diethyl ether, pentane, dichloromethane, metals, hydrides, molecular sieves, and solvent-contaminated hydrolysis products of alkali, diatomaceous earth.
55-013(b)	Container Storage	Active satellite accumulation area located inside a fume hood in TA-55-4-208.	Tetrahydrofuran, pyridine, and dimethoxyethane (ethylene, hexane, glycol, and dimethyl ether).
TBD[c]	Container Storage	An approximately 61- by 55-feet area adjacent to Room 42 in the southwest quadrant of the TA-55-4 basement (Area 1).	Hazardous waste, TRU mixed waste, and low-level mixed waste.
TBD	Container Storage	An approximately 27- by 11-feet area adjacent to Room 38A in TA-55-4 basement (Area 2).	Hazardous waste, TRU mixed waste, and low-level mixed waste.
TBD	Container Storage	26- by 10-feet area located in southwest quadrant of TA-55-4 basement (Area 3).	Hazardous waste, TRU mixed waste, and low-level mixed waste.
TBD	Container Storage	16- by 13-feet area located just north of Room 7 in the TA-55-4 basement (Area 4).	Hazardous waste, TRU mixed waste, and low-level mixed waste.
TBD	Container Storage	An approximately 45- by 17.5-feet area adjacent to Room 8 in the TA-55-4 basement (Area 5).	Hazardous waste, TRU mixed waste, and low-level mixed waste.
TBD	Container Storage	An approximately 80- by 50.5-feet area located along the eastern wall of the TA-55-4 basement (Area 6).	TRU mixed waste.

Refer to footnotes at end of table.

Table 10-1 (Continued)

Solid Waste Management Unit (SWMU) Descriptions[a]

SWMU No.	Unit Type	Unit Description	Waste Description
TBD	Container Storage	Two narrow areas located east of Room 4 in the TA-55-4 basement; one area measures approximately 33- by 3-feet and the other measures approximately 49- by 2-feet (Area 7).	Hazardous waste, low-level mixed waste, and TRU mixed waste.
TBD	Container Storage	6- by 5.5-feet area in TA-55-4-401 (Area 8).	TRU mixed waste and low-level mixed waste.
TBD	Container Storage	6.25- by 5-feet area in TA-55-4-401 (Area 9).	TRU mixed waste and low-level mixed waste.
TBD	Container Storage	Two small areas in TA-55-4-433 (Area 10); one area measures 4- by 3-feet and the other measures 10- by 2-feet.	TRU mixed waste and low-level mixed waste.
TBD	Container Storage	Room 432 in TA-55-4 (Area 11).	TRU mixed waste.
TBD	Container Storage	An approximately 60- by 18-feet area in TA-55-185.	Hazardous waste, TRU mixed waste, and low-level mixed waste.
TBD	Container Storage	Trapezoidal-shaped asphalt pad located northwest of TA-55-4; the four sides of the pad measure 102 feet, 86 feet, 156 feet, and 105 feet.	Hazardous waste, TRU mixed waste, and low-level mixed waste.
TBD	Oxygen Sparging Unit	A magnesium oxide crucible encased in a stainless steel, ceramic-insulated shell and measuring 1.5 feet high by 1 foot in diameter.	Waste salts potentially containing ignitable and/or reactive metals.

[a] Information compiled from Los Alamos National Laboratory, 1990, "Solid Waste Management Units Report," Revision 1, LAUR 90-3400, Los Alamos National Laboratory, Los Alamos, New Mexico; U.S. Environmental Protection Agency, 1990, modified 1994, "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515," U.S. Environmental Protection Agency, Region 6, Hazardous Waste Management Division, Dallas, Texas; and Los Alamos National Laboratory, 1992, "RFI Work Plan for Operable Unit 1129," LA-UR-92-800, Los Alamos National Laboratory, Los Alamos, New Mexico.

[b] SWMU is identified for corrective action in U.S. Environmental Protection Agency, 1990, modified 1994, "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515," U.S. Environmental Protection Agency, Region 6, Hazardous Waste Management Division, Dallas, Texas.

[c] TBD = SWMU No. to be determined.

11.0 OTHER FEDERAL LAWS

The following federal laws are required under the New Mexico Administrative Code, Chapter 4, Part 1, Subpart IX, 270.3 and 270.14(b)(20), revised November 1, 1995, to be given consideration when applying for hazardous waste permit. When any of these laws is applicable, its procedures must be followed:

1. *The Wild and Scenic Rivers Act (16 United States Code [USC] 1273 et seq.).* This act provides for a national wild and scenic rivers system and prohibits construction of any waterway that would have a direct adverse effect on the values for which a wild and scenic river was established.

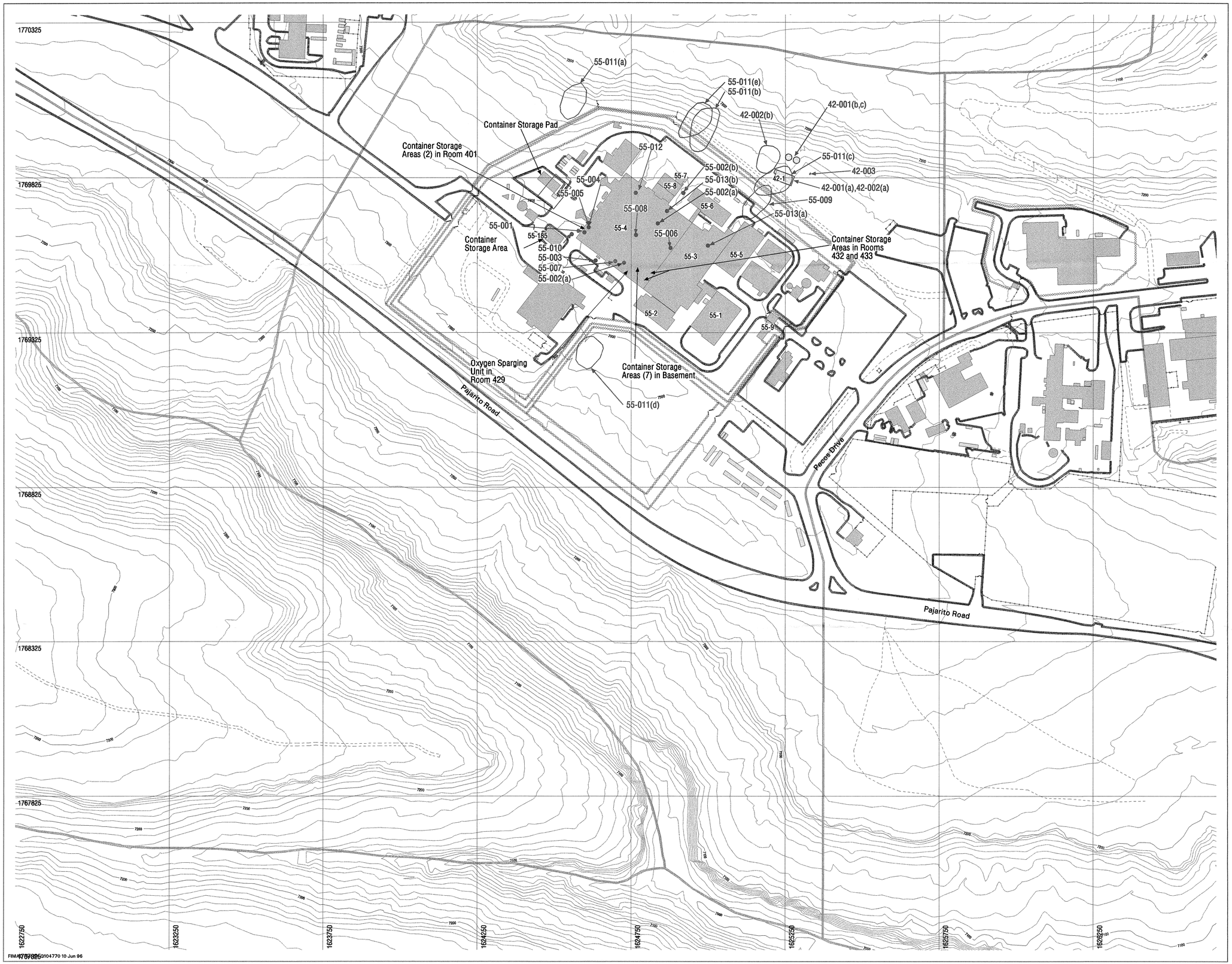
2. *The National Historic Preservation Act of 1966 (16 USC 470 et seq.).* This act establishes a program for the preservation of historic properties throughout the country. The act has provisions that require mitigation of adverse effects to registered properties.

3. *The Endangered Species Act of 1973 (16 USC 1531).* This act provides for the conservation of endangered and threatened species of fish, wildlife, and plants. It prohibits any action that would likely jeopardize the continued existence of any endangered or threatened species or adversely affect its critical habitat.

4. *The Coastal Zone Management Act of 1972 (16 USC 1451 et seq.).* This act establishes national policy for the management, use, protection, and development of land and water resources of the nation's coastal zones. Section 307(c) of the act and implementing regulations prohibit the U.S. Environmental Protection Agency from issuing a permit for activity affecting coastal zone land or water without the certification from the applicant that the activity is in compliance with the state Coastal Zone Management Program.

5. *The Fish and Wildlife Coordination Act of 1934, as amended (16 USC 661 et seq.).* This act promotes the conservation of wildlife, fish, and game, and integrates this conservation with water resource projects. Certain provisions of the act require that permits proposing or authorizing the impoundment, diversion, or other control or modification of any body of water be considered by the appropriate state agency for impacts to wildlife resources.

Because Los Alamos National Laboratory (LANL) has ongoing programs in support of the National Historic Preservation Act, the Endangered Species Act, and the Fish and Wildlife Coordination Act, consideration was given to these federal laws. Provisions in the Wild and Scenic Rivers Act and the Coastal Zone Management Act are not applicable to LANL's activities.



LEGEND

- TA-55
- Boundary, TA
- Contours, 10 foot
- Contours, 100 foot
- Fence, Industrial
- Fence, Security
- Roads, Dirt
- Roads, Paved
- SWMU Location
- SWMU, point location
- Former Structure
- Permanent Structure
- Temporary Structure

(Note to Reviewer: This map describes the locations of all SWMUs at TA-55. SWMUs with numbers are labeled as such. Those units without SWMU numbers have written descriptions.)

Figure 10-1
Solid Waste Management Units (SWMU) in Technical Area (TA) 55

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 500
Feet per inch on map = 150

SCALE 1:1800

0 46 92 138 184

METERS

0 150 300 450 600

FEET

NOTICE: The information on this map is provisional. Feature locations are dependent on scale and symbology and their accuracy may not have been confirmed. Los Alamos National Laboratory boundary is based on legal description established in 1995. Other boundary, structure, and utility data are from Los Alamos National Laboratory Engineering Division and Los Alamos County Utility and Engineering Departments. Contour data are from Los Alamos National Laboratory Environmental Restoration Project aerial survey, September 1991.

4413-P

University of California
Los Alamos National Laboratory
Earth and Environmental Sciences Division

FIMAD Facility for Information Management, Analysis, and Display
FIMAD is the electronic data repository for the Environmental Restoration Project at Los Alamos National Laboratory.

Produced by: Marcia Jones

Date: June 10, 1996 FIMAD Plot ID: G104770

12.0 CERTIFICATION [20 NMAC 4.1, Subpart IX, 270.11(d)]

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

R. Bruce Matthews
Division Director - Nuclear Materials Technology Division
Los Alamos National Laboratory
Operator

6/26/96
Date Signed

Dennis J. Erickson
Division Director - Environment, Safety, and Health Division
Los Alamos National Laboratory
Operator

6/27/96
Date Signed

G. Thomas Todd
Area Manager, Los Alamos Area Office
U.S. Department of Energy
Albuquerque Operations
Owner/Operator

6/27/96
Date Signed

13.0 LIST OF REFERENCES

Abeele, W. V., M. L. Wheeler, and B. W. Burton, 1981, "Geohydrology of Bandelier Tuff," LA-8962-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

Aldrich, M. J., and D. P. Dethier, 1990, "Stratigraphic and Tectonic Evolution of the Northern Española Basin, Rio Grande Rift, New Mexico," *Geological Society of America Bulletin*, Vol. 102, No. 12, pp. 1695–1705.

Aldrich, M. J., Jr., 1986, "Tectonics of the Jemez Lineament in the Jemez Mountains and Rio Grande Rift," *Journal of Geophysical Research*, Vol. 91, pp. 1753–1762.

Bailey, R. A., R. L. Smith, and C. S. Ross, 1969, "Volcanic Rocks in the Jemez Mountains, New Mexico," in Contributions to Stratigraphy, U.S. Geological Survey Bulletin 1274-P, Washington, D.C., 29 pp.

Baldridge, W. S., P. E. Damon, M. Shafiqullah, and R. J. Bridwell, 1980, "Evolution of the Central Rio Grande Rift, New Mexico: New Potassium-Argon Ages," in *Earth and Planetary Science Letters*, Vol. 51, pp. 309–321.

Biehler, S., J. Ferguson, W. S. Baldridge, G. R. Jiracek, J. L. Aldern, M. Martinez, R. Fernandez, J. Romo, B. Gilpin, L. W. Braile, D. R. Hersey, B. P. Luyendyk, and C. L. Aiken, 1991, "A Geophysical Model of the Española Basin, Rio Grande Rift, New Mexico," in *Geophysics*, Vol. 56, No. 3, pp. 340–343.

Conover, C. S., C. V. Theis, and R. L. Griggs, 1963, "Geology and Hydrology of Valle Grande and Valle Toledo, Sandoval County, New Mexico," U.S. Geological Survey Water Supply Paper 1619-Y, Washington, D.C.

Cooper, J. B., W. D. Purtymun, and E. C. John, 1965, "Records of Water Supply Wells Guaje Canyon 6, Pajarito Mesa 1, and Pajarito Mesa 2, Los Alamos, New Mexico, Basic Data Report," U.S. Geological Survey, Albuquerque, New Mexico.

Crowe, B. M., G. W. Linn, G. Heiken, and M. L. Bevier, 1978, "Stratigraphy of the Bandelier Tuff in the Pajarito Plateau, Applications to Waste Management," LA-7225-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

Cushman, R. L., 1965, "An Evaluation of Aquifer and Well Characteristics of Municipal Well Fields in Los Alamos and Guaje Canyons near Los Alamos, New Mexico," U.S. Geological Survey Water Supply Paper 1809-D, Washington, D.C.

Dethier, D. P., C. D. Harrington, and M. J. Aldrich, 1988, "Late Cenozoic Rates of Erosion in the Western Española Basin, New Mexico: Evidence from Geologic Dating of Erosion Surfaces," *Geological Society of America Bulletin*, Vol. 100, pp. 928–937.

DOE, see U.S. Department of Energy.

Dransfield, B. J., and J. N. Gardner, 1985, "Subsurface Geology of the Pajarito Plateau, Española Basin, New Mexico," LA-10455-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

EPA, see U.S. Environmental Protection Agency.

Gallaher, B., Los Alamos National Laboratory, Water Quality and Hydrology Group, February 1, 1995, Memorandum ESH-18/WQ&H-95-0044.

Galusha, T., and J. C. Blick, 1971, "Stratigraphy of the Santa Fe Group, New Mexico," *Bulletin of the American Museum of Natural History*, Vol. 144, Article 1, Lund Humphries, Great Britain, pp. 1–128.

Gardner, J. N., W. S. Baldridge, R. Gribble, K. Manley, K. Tanaka, J. W. Geissman, M. Gonzalez, and G. Baron, 1990, "Results from Seismic Hazards Trench #1 (SHT-1) Los Alamos Seismic Hazards Investigations," EES1-SH90-19, Los Alamos National Laboratory, Los Alamos, New Mexico.

Gardner, J. N., and L. House, 1987, "Seismic Hazards Investigations at Los Alamos National Laboratory, 1984 to 1985," LA-11072-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

Gardner, J. N., F. Goff, S. Garcia, and R. C. Hagan, 1986, "Stratigraphic Relations and Lithologic Variations in the Jemez Volcanic Field, New Mexico," *Journal of Geophysical Research*, Vol. 91, pp. 1763–1778.

Gardner, J. N., and F. Goff, 1984, "Potassium-Argon Dates from the Jemez Volcanic Field: Implications for Tectonic Activity in the North-Central Rio Grande Rift," in New Mexico Geological Society Guidebook, *35th Field Conference, Rio Grande Rift, Northern New Mexico*, University of New Mexico, Albuquerque, New Mexico.

Goff, F., 1991, "Isotopic Results on Eight White Rock Canyon Springs," Los Alamos National Laboratory Memorandum EES-1, Geology/Geochemistry, from Fraser Goff to Alan Stoker, Los Alamos, New Mexico.

Goff, F., J. N. Gardner, and G. Valentine, 1990, "Geology of St. Peter's Dome Area, Jemez Mountains, New Mexico," Geologic Map 69, New Mexico Bureau of Mines & Mineral Resources, New Mexico Institute of Mining & Technology, Socorro, New Mexico.

Goff, F., J. N. Gardner, W. S. Baldridge, J. B. Hulen, D. L. Nielson, D. Vaniman, G. Heiken, M. A. Dungan, and D. Broxton, 1989, "Volcanic and Hydrothermal Evolution of Valles Caldera and Jemez Volcanic Field," in Field Excursions to Volcanic Terranes in the Western United States, Volume I: Southern Rocky Mountain Region, Memoir 46, C. E. Chapin and J. Zidek (Eds.), New Mexico Bureau of Mines & Mineral Resources, Socorro, New Mexico, pp. 381–434.

Griggs, R. L., and J. D. Hem, 1964, "Geology and Ground-Water Resources of the Los Alamos Area, New Mexico," U.S. Geological Survey Water Supply Paper 1753, Albuquerque, New Mexico.

Heiken, G., F. Goff, J. Stix, S. Tamanyu, M. Shafiqullah, S. Garcia, and R. C. Hagan, 1986, "Intracaldera Volcanic Activity, Toledo Caldera and Embayment, Jemez Mountains, New Mexico," *Journal of Geophysical Research*, Vol. 91, pp. 1799–1815.

Ingersoll, R. V., W. Cavazza, W. S. Baldridge, and M. Shafiqullah, 1990, "Cenozoic Sedimentation and Paleotectonics of North-Central New Mexico: Implications for Initiation and Evolution of the Rio Grande Rift," in *Geological Society of America Bulletin*, Vol. 102, pp. 1280–1296.

IT Corporation (IT), 1987, "Hydrogeologic Assessment of Technical Area 54, Areas G and L, Los Alamos National Laboratory," Docket No. NMHWA 001007, IT Corporation, Albuquerque, New Mexico.

Kearl, P. M., J. J. Dexter, and M. Kautsky, 1986, "Vadose Zone Characterization of Technical Area 54, Waste Disposal Areas G and L, Los Alamos National Laboratory, New Mexico, Report 3: Preliminary Assessment of the Hydrogeologic System," Report GJ-44, Bendix Field Engineering Corporation, Grand Junction, Colorado.

Kelley, V. C., 1978, "Geology of Española Basin, New Mexico," Geologic Map 48, New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico.

LANL, see Los Alamos National Laboratory.

Los Alamos County, 1992, "Traffic Counts," Los Alamos County Public Works Department, Traffic Engineering Group.

Los Alamos County, 1991, "Traffic Count Diagram," Los Alamos County Public Works Department, Traffic Engineering Group.

Los Alamos National Laboratory (LANL), 1996, "Technical Area 55 Part A Permit Application," Revision 1.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

Los Alamos National Laboratory (LANL), 1995a, "Los Alamos National Laboratory RCRA Waste Analysis Plan," Rev. 0.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

Los Alamos National Laboratory (LANL), 1995b, "Report for the Characterization Review of Low-Level Mixed Waste, Final Draft," Los Alamos National Laboratory, Los Alamos, New Mexico.

Los Alamos National Laboratory (LANL), 1995c, "Groundwater Protection Management Program Plan," Los Alamos National Laboratory, Los Alamos, New Mexico.

Los Alamos National Laboratory (LANL), 1995d, "Emergency Management Plan," Los Alamos National Laboratory, Emergency Management and Response Office, Los Alamos, New Mexico.

Los Alamos National Laboratory (LANL), 1994a, "RCRA Part A Permit Application for Mixed Waste," Revision 2.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

Los Alamos National Laboratory (LANL), 1994b, "Environmental Surveillance at Los Alamos During 1992," LA-12764-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Los Alamos National Laboratory (LANL), 1993a, "RCRA Part B Permit Application: Technical Area 54, Area G, Pads 1, 2, and 4; Storage Domes A-D; Chemical Plating Waste Treatment Skid and Treated Liquid Storage Tanks, Technical Area 63, Hazardous Waste Treatment Facility," Los Alamos National Laboratory, Los Alamos, New Mexico.

Los Alamos National Laboratory (LANL), 1993b, "Installation Work Plan for Environmental Restoration," Rev. 3, Los Alamos National Laboratory, Los Alamos, New Mexico.

Los Alamos National Laboratory (LANL), 1992, "RFI Work Plan for Operable Unit 1129," LA-UR-92-800, Los Alamos National Laboratory, Los Alamos, New Mexico.

Los Alamos National Laboratory (LANL), 1991a, "Hazardous Waste Permit Application, Part A, for Mixed Waste," Los Alamos National Laboratory, Los Alamos, New Mexico.

Los Alamos National Laboratory (LANL), 1991b, "Los Alamos Climatology Summary," Los Alamos National Laboratory, Los Alamos, New Mexico.

Los Alamos National Laboratory (LANL), 1990, "Solid Waste Management Units Report," Revision 1, LAUR 90-3400, Los Alamos National Laboratory, Los Alamos, New Mexico.

May, S. J., 1984, "Miocene Stratigraphic Relations and Problems Between the Abiquiu, Los Pinos, and Tesuque Formations Near Ojo Caliente, Northern Española Basin," in New Mexico Geological Society Guidebook, Santa Fe, New Mexico.

McLin, S. G., 1992, "Determination of 100-Year Floodplain Elevations at Los Alamos National Laboratory," LA-12195-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

New Mexico Environmental Improvement Board (NMEIB), 1994, "New Mexico Administrative Code Title 20," Chapter 4, Part 1, NMEID, Santa Fe, New Mexico.

New Mexico Environmental Improvement Division, 1989, "Hazardous Waste Facility Permit," NM 0890010515-1, issued to Los Alamos National Laboratory, Los Alamos, New Mexico.

Nyhan, J. W., L. W. Hacker, T. E. Calhoun, and D. L. Young, 1978, "Soil Survey of Los Alamos County, New Mexico," LA-6779-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

Pan Am World Services, Inc., 1986, "Asphalt Road Maintenance Report," Los Alamos National Laboratory, Los Alamos, New Mexico.

Purtymun, W. D., 1984, "Hydrologic Characteristics of the Main Aquifer in the Los Alamos Area: Development of Ground Water Supplies," LA-9957-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

Purtymun, W. D., M. N. Maes, and R. Peters, 1984, "Distribution of Moisture, Tritium, and Plutonium in the Alluvium Aquifer and Underlying Tuff in Mortandad Canyon," LA-10100-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Purtymun, W. D., W. R. Hansen, and R. J. Peters, 1983, "Radiochemical Quality of Water in the Shallow Aquifer in Mortandad Canyon 1967–1978," LA-9675-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

Purtymun, W. D., R. J. Peters, and J. W. Owens, 1980, "Geohydrology of White Rock Canyon of the Rio Grande from Otowi to Frijoles Canyon," LA-8635-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

Purtymun, W. D., J. R. Buchholz, and T. E. Hakonsen, 1977, "Chemical Quality of Effluents and Their Influence on Water Quality in a Shallow Aquifer," *Journal of Environmental Quality*, Vol. 6, No. 1, pp. 29–32.

Purtymun, W. D., 1975, "Geohydrology of the Pajarito Plateau with Reference to Quality of Water, 1949–1972," LA-5744, Los Alamos National Laboratory, Los Alamos, New Mexico.

Purtymun, W. D., and W. R. Kennedy, 1971, "Geology and Hydrology of Mesita del Buey," LA-4660, Los Alamos National Laboratory, Los Alamos, New Mexico.

Self, S., D. E. Kircher, and J. A. Wolff, 1988, "The El Cajete Series, Valles Caldera, New Mexico," in *Journal of Geophysical Research*, Vol. 93, pp. 6113–6127.

Smith, R. L., R. A. Bailey, and C. S. Ross, 1970, "Geologic Map of the Jemez Mountains, New Mexico," U.S. Geological Survey Miscellaneous Investigations Series, Map I-571, Washington, D.C.

Smith, R. L., and R. A. Bailey, 1966, "The Bandelier Tuff - A Study of Ash-Flow Eruption Cycles from Zoned Magma Chambers," *Bulletin Volcanologique*, Vol. 29, pp. 83–104.

Spell, T. L., T. M. Harrison, and J. A. Wolf, 1990, "$^{40}Ar/^{39}Ar$ Dating of the Bandelier Tuff and San Diego Canyon Ignimbrites, Jemez Mountains, New Mexico: Temporal Constraints on Magmatic Evolution," *Journal of Volcanology and Geothermal Research*, Vol. 43, pp. 175–193.

Turbeville, B. N., D. B. Waresback, and S. Self, 1989, "Lava-Dome Growth and Explosive Volcanism in the Jemez Mountains, New Mexico: Evidence from the Plio-Pleistocene Puye Alluvial Fan," *Journal of Volcanology and Geothermal Research*, Vol. 36, pp. 267–291.

U.S. Department of Energy (DOE), 1995a, "DOE Waste Treatability Group Guidance," *DOE/LLW-217*, Rev. 0, January 1995, Idaho National Engineering Laboratory, Lockheed Idaho Technologies Company, Idaho Falls, Idaho.

U.S. Department of Energy (DOE), 1995b, "TRU Waste Characterization Quality Assurance Program Plan," *CAO-94-1010*, Rev. 0, Draft, Carlsbad Area Office, Carlsbad, New Mexico.

U.S. Department of Energy (DOE), 1994, "TRUPACT-II Content Codes (TRUCON)," *DOE/WIPP89-004*, Rev. 8, U.S. Department of Energy, Washington, D.C.

U.S. Department of Energy (DOE), 1991, "Waste Acceptance Criteria for the Waste Isolation Pilot Plant," *WIPP-DOE-069*, Revision 4, Carlsbad, New Mexico, Waste Isolation Pilot Plant, U.S. Department of Energy.

U.S. Department of Energy (DOE), 1988, "Radioactive Waste Management," *DOE Order 5820.2A*, U.S. Department of Energy, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1994a, "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515," effective date May 19, 1994, U.S. Environmental Protection Agency, Region 6, Hazardous Waste Management Division, Dallas, Texas.

U.S. Environmental Protection Agency (EPA), 1994b, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes - A Guidance Manual," OSWER 9938.4-03, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1994c, "Test Methods for Evaluating Solid Waste," Physical/Chemical Methods, *EPA-SW-846*, Third Edition, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1992, "Characterizing Heterogeneous Wastes: Methods and Recommendations," U.S. Environmental Protection Agency, Environmental Systems Monitoring Laboratory, Office of Research and Development, Las Vegas, Nevada.

U.S. Environmental Protection Agency (EPA), 1990, "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA ID NM0890010515," U.S. Environmental Protection Agency, Region 6, Hazardous Waste Management Division, Dallas, Texas.

Vaniman, D., and K. Wohletz, 1990, "Results of Geological Mapping/Fracture Studies: TA-55 Area," Los Alamos National Laboratory Memorandum EES1-SH90-17, Los Alamos, New Mexico.

Vernon, J. H., and Robert E. Riecker, 1989, "Significant Cenozoic Faulting, East Margin of the Española Basin, Rio Grande Rift, New Mexico," in *Geology*, Vol. 17, pp. 230–233.

Wachs, D., C. D. Harrington, J. N. Gardner, and L. W. Maassen, 1988, "Evidence of Young Fault Movements on the Pajarito Fault System in the Area of Los Alamos, New Mexico," LA-1156-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

Waresback, D. B., and B. N. Turbeville, 1990, "Evolution of a Plio-Pleistocene Volcanogenic-Alluvial Fan: The Puye Formation, Jemez Mountains, New Mexico," in *Geological Society of America Bulletin*, Vol. 102, pp. 298–314.

Weir, J. E., Jr., and W. D. Purtymun, 1962, "Geology and Hydrology of Technical Area 49, Frijoles Mesa, Los Alamos County, New Mexico," U.S. Geological Survey Administrative Release, Albuquerque, New Mexico.

Woodward-Clyde Federal Services, 1995, "Evaluation of the Potential for Surface Faulting at TA-63," prepared for Los Alamos National Laboratory, Los Alamos, New Mexico.

APPENDIX A

Determination of 100-Year Floodplain Elevations at Los Alamos National Laboratory

LA-12195-MS
UC-903
Issued: August 1992

Determination of 100-Year Floodplain Elevations at Los Alamos National Laboratory

Stephen G. McLin

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Table of Contents

ABSTRACT . . . 1

I. INTRODUCTION . . . 2

II. COMPUTATION METHODOLOGY . . . 4

III. HEC-1 FLOOD HYDROGRAPH PACKAGE . . . 5

- A. General Model Description . . . 5
- B. Design Storm Events for Los Alamos . . . 6
- C. SCS Unit Hydrograph . . . 10
- D. Model Input Parameters . . . 15
- E. Peak Hydrographs for Major Watersheds . . . 21
- F. Comparison with USGS Flood-Flow Frequencies . . . 22
- G. Comparison with Other Flood-Flow Frequencies . . . 25

IV. HEC-2 WATER-SURFACE PROFILES . . . 25

- A. General Model Description . . . 25
- B. Stream Channel Geometries . . . 31
- C. Channel Friction Losses . . . 33
- D. Starting Water-Surface Elevations . . . 34
- E. Computed Water-Surface Profiles . . . 35

V. FINAL FLOODPLAIN DEFINITIONS . . . 35

VI. CONCLUSIONS . . . 36

VII. ACKNOWLEDGMENTS . . . 37

VIII. REFERENCES . . . 37

APPENDIX A. AUTOGISS-MOSS SYSTEM . . . 41

- i. Extraction of MOSS Topographic Data . . . 41
- ii. Insertion of Floodplain Boundaries . . . 44

APPENDIX B. TABULATED HEC-1 INPUT PARAMETERS . . . 47

APPENDIX C. FLOOD-FLOW FREQUENCIES . . . 63

DISK 1. HEC-1 WATERSHED INPUT DATA FILES

- i. Los Alamos Canyon Watershed (WSLA.DAT)
- ii. Sandia Canyon Watershed (SAND.DAT)
- iii. Mortandad Canyon Watershed (MORT.DAT)
- iv. Pajarito Canyon Watershed (BIRD.DAT)
- v. Water Canyon Watershed (WATR.DAT)
- vi. Ancho Canyon Watershed (ANCH.DAT)
- vii. Chaquehui Canyon Watershed (CHAQ.DAT)
- viii. Frijoles Canyon Watershed (BEAN.DAT)

DISK 2. HEC-2 INPUT DATA FILES

i. Barrancas Canyon (BARRM.HEC and BARRT.HEC)

ii. Bayo Canyon (BAYO.HEC and BAYT.HEC)

iii. Pueblo Canyon (PUEB.HEC)

iv. Los Alamos Canyon (LAWS.HEC)

v. Sandia Canyon (SANDA.HEC)

vi. Mortandad Canyon (MORT.HEC)

vii. Canada del Buey Canyon (CANDA.HEC)

viii. Pajarito Canyon (PAJAO.HEC)

ix. Three-Mile Canyon (PAJ3M.HEC)

x. Two-Mile Canyon (PAJ2N.HEC, PAJ2M.HEC, and PAJAS.HEC)

xi. Valle Canyon (VALLE.HEC)

xii. Water Canyon (WATER.HEC)

xiii. Potrillo Canyon (POTR.HEC)

xiv. Fence Canyon (FENCE.HEC)

xv. Ancho Canyon (ANCHE.HEC, ANCHM.HEC, and ANCHW.HEC)

xvi. Chaquehui Canyon (CHAQU.HEC)

DETERMINATION OF 100-YEAR FLOODPLAIN ELEVATIONS AT LOS ALAMOS NATIONAL LABORATORY

by

Stephen G. McLin

ABSTRACT

Under existing permit requirements, the US Environmental Protection Agency stipulates that facilities regulated by the Resource Conservation and Recovery Act must delineate all 100-yr floodplain elevations within their boundaries. At Los Alamos these floodplains are located within ungaged watersheds that drain Pajarito Plateau. This report documents the floodplain computational mapping procedure and, along with supporting maps, is intended to satisfy this permit requirement.

The floodplain mapping procedure outlined here uses topographic data from AUTOGIS Mapping Overlay Statistical System (AUTOGIS-MOSS), a graphical information system database. About 65% of the Laboratory has 2-ft topographic contour interval coverage, while 35% has 10-ft coverage. Targeted stream channel segments are initially specified in the MOSS system, and topographic profiles of stream channel cross sections at user-designated intervals are extracted automatically. Each 2-D profile is stored as a 3-D MOSS line feature using New Mexico state plane coordinates. This procedure is initiated at a convenient downstream location within each watershed and is continued upstream to a selected termination point. These 3-D line features are then exported in a format that satisfies the US Army Corps of Engineers' (COE's) Water-Surface Profiles (HEC-2) input data requirements.

The COE's computer-based Flood Hydrograph Package (HEC-1) and HEC-2 were used on a PC-type microcomputer to perform floodplain hydrology simulations. HEC-1 generates storm hydrographs at selected channel locations within each ungaged watershed. This information, along with the stream channel geometry extracted from the MOSS system, is then used by HEC-2 to define each floodplain. The approach used here employs a 100-yr, 6-h design storm event for Los Alamos, but alternative floodplain elevations produced by different storm events are easily computed.

The HEC-2-computed water-surface elevations for each channel section, along with the left and right channel stations where this water surface intersects the ground, are read back into the MOSS system. This information is then transformed within MOSS to determine local geographically referenced coordinates that uniquely define the 100-yr floodpool. Finally, these paired coordinates are linked together as MOSS-area features to identify each watershed floodplain. In this particular application, 11 separate watersheds traverse LANL lands: individual channels range up to 9 mi in length. The 100-yr floodplain was defined on each channel segment at 250-ft intervals, and detailed 1:4800-scale maps were generated.

I. INTRODUCTION

The US Environmental Protection Agency (EPA) stipulates that all regulated hazardous waste treatment, storage, and disposal facilities must apply for a Resource Conservation and Recovery Act (RCRA) operating permit. Under EPA authority, the New Mexico Environment Department issued the US Department of Energy (DOE) and Los Alamos National Laboratory (LANL) a RCRA hazardous waste facility operating permit in November 1989. The EPA issued DOE and LANL the Hazardous and Solid Waste Amendments (HSWA) portion of that permit in March 1990. As a condition to the HSWA portion of the permit, LANL was required to define all 100-yr floodplain elevations within the facility boundary [40 CFR 270.14(b)(11)(iii)]. These floodplain elevations must be consistent with National Flood Insurance Program maps produced for the Federal Insurance Administration (FIA), or must use an equivalent method of mapping. Before this HSWA permit condition was mandated, these floodplain boundary locations had never been completely mapped within the LANL complex. This report describes a methodology that is recognized by the EPA and others (i.e., FIA, US Army Corps of Engineers (COE), US Bureau of Reclamation, and US Soil Conservation Service) as being an approved technique for defining floodplain elevations in ungaged watersheds.

Actual floodplain-modeling efforts used the COE Hydrologic Engineering Center (HEC) computer-based Flood Hydrograph model (HEC-1) and the Water-Surface Profiles model (HEC-2). Both the HEC-1 and HEC-2 computer programs are classified as single-event simulation models, as opposed to continuous-simulation streamflow models like the Stanford or Kentucky Watershed Models. Continuous-simulation models require extensive system observation, which is not available at LANL. Event-simulation models, on the other hand, allow greater flexibility in using distributed parameters and short time increments. They also require considerably less field observation to support input data requirements. In addition, the HEC-1 and HEC-2 event-simulation models are recognized by the EPA and COE as state-of-the-art simulation models for ungaged watershed applications.

HEC-1 is used to simulate either real or hypothetical storm hydrographs in ungaged or gaged watersheds in response to user-specified rainfall hyetographs. As used here, HEC-1 employs a traditional 100-yr, 6-h design storm event for Los Alamos, although any alternative return-period event can easily be incorporated. A representative 100-yr, 6-h design storm event is recommended by the COE for defining 100-yr floodplains in northern New Mexico (M. Magnuson, US Army COE, Albuquerque, personal communication, 1989). Predicted HEC-1 hydrograph peaks at various stream channel locations, along with stream channel geometry and watershed basin characteristics, are used by HEC-2 to compute 100-yr floodplain elevations.

Topographic profiles of stream channel cross sections at various locations were obtained from LANL's AUTOGIS computer-based Mapping Overlay Statistical System (AUTOGIS-MOSS), a graphic information system database copyrighted by Autometric, Inc. About 65% of LANL has 2-ft topographic-contour interval coverage, while 35% has 10-ft coverage. Targeted stream channel segments were initially specified in the MOSS system, and topographic profiles of cross sections at user-designated intervals along segments were extracted automatically. Each 2-D topographic profile was stored as a 3-D MOSS line feature using New Mexico state plane coordinates. This procedure was initiated at the intersection of the eastern DOE-LANL facility boundary and each watershed stream channel and was continued upstream to the western facility boundary. These 3-D line features were then exported in a format satisfying HEC-2 model input data requirements. Appendix A describes how to use the AUTOGIS-MOSS data extraction programs developed for this project; actual source code listings (LA-CC 91-3) are contained in Disk No. 1 attached to this report.

HEC-2 is used to compute floodplain elevations that are associated with user-specified hydrograph peaks. Floodplain elevations for 11 separate watersheds that included all major tributaries were defined at 250-ft intervals along stream channels within the DOE-LANL boundary. These watersheds are depicted in Fig. 1; they were subdivided into 52 separate subbasins. Peak floods were also defined with HEC-1 for two additional watersheds having a total of eight separate subbasins; however, these later watersheds do not cross the DOE-LANL facility boundary. The HEC-1

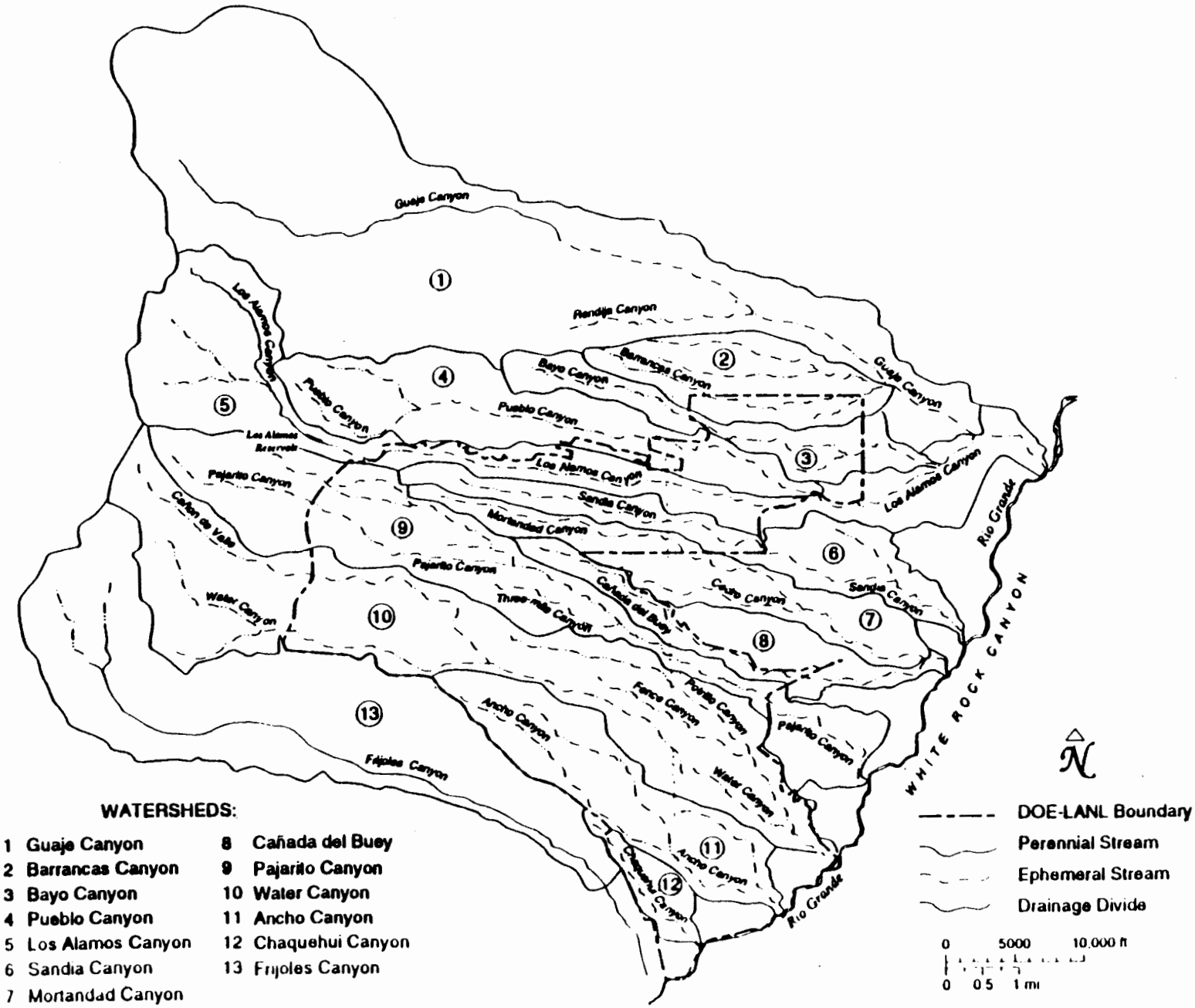


Fig. 1. Major watersheds at Los Alamos (see Table 1).

and HEC-2 input data files used to generate these hydrograph peaks and floodplain elevations are contained on disks numbered 1 and 2 attached to this report. Parameter estimation procedures and construction of input data files, including the AUTOGIS-MOSS data extraction technique used to define topographical profiles of stream channel cross sections, are described in the sections below. Once all floodplains had been defined by HEC-2, then this information was read back into the MOSS system. These data were then transformed within MOSS to determine New Mexico state plane geographically referenced coordinates that uniquely define the 100-yr floodpool at each stream cross section. Finally 1:4800-scale maps depicting the DOE-LANL boundary and all 100-yr floodplains were prepared. This packet of maps is maintained on file in LANL's Facilities Engineering Planning Group office (ENG-2 File Number R-7160) and in the Geology and Geochemistry Group office (EES-1). This report documents the identification of these floodplain elevations and, along with the above-referenced maps, is intended to satisfy the RCRA/HSWA permit requirement that all 100-yr floodplains within the DOE-LANL facility be mapped.

II. COMPUTATIONAL METHODOLOGY

Predicting peak discharge rates and synthesizing complete discharge hydrographs for use in defining floodplain areas within ungaged watersheds are two challenging tasks in engineering hydrology. Most designs involve hydrologic analyses based upon a critical flood that imitates some hypothetical future storm event. Ideally these analyses are based on long-term rainfall-runoff observations. At LANL sufficient stream flow records are not available to support these analyses, although an extensive rain gage network with a lengthy precipitation record lends support (Bowen 1990). Hence, one may be tempted to employ some regional analysis technique, or use empirical-correlative methods. However these approaches may not accurately simulate the rainfall-runoff process. An example illustrates this point.

The US Geological Survey (USGS) has produced probabilistic techniques to estimate peak discharges in New Mexico's streams (Waltemeyer 1986; Thomas and Gold 1982; Scott 1971; and Borland 1970). These USGS studies define the regional magnitude and flood frequency within New Mexico stream channels using multiple regression techniques for the 2-, 5-, 10-, 25-, 50-, and 100-yr storm events. The empirical equations used are valid for specific watersheds under a wide range of climatic basin conditions that are considerably different from those at Los Alamos. Furthermore, these USGS studies yield significant errors in applications for which gaging records are available for direct comparison. Finally, these techniques were not intended to satisfy the RCRA/HSWA permit condition requiring floodplain definition. A direct comparison between the USGS and HEC-1 hydrograph peaks is presented later in this report.

Other analytical tools are also available to perform floodplain analyses; Viessman, et al. (1977) have summarized many of these approaches. However, the LANL site is contained within a system of ungaged, interconnected, watersheds with ephemeral stream drainage. Hence, most of these alternative approaches would not produce acceptable results. The reason for this centers around the general shape of watersheds within the LANL complex. These watersheds are elongated in the east/west direction along Pajarito Plateau, but they are extremely narrow in the north/south direction. This atypical watershed shape, coupled with variability in surficial soil type and vegetation cover, yields fairly typical rainfall-runoff time-of-concentration values for each subbasin within an individual watershed. Here, time of concentration is defined as the flow time from the most remote point in a drainage subbasin area to its outlet point. However, as one moves downstream these subbasin time-of-concentration values and unusual watershed configurations combine to yield hydrograph peaks that are atypically amplified. Hence, one tends to actually observe longer-duration runoff events with lower corresponding hydrograph peaks than some simple models would predict.

When one considers the particular application at LANL, the deterministic approach using unit hydrograph theory commonly employed by the US Army COE, the US Soil Conservation Service (SCS), and US Bureau of Reclamation is clearly appropriate. This approach is incorporated into the HEC-1 model and generates stream hydrographs at specific channel locations. An entire watershed is represented by an interconnected group of subbasins. Each subbasin generates an individual unit

hydrograph that simulates important hydrologic rainfall-runoff relationships, which are reflected by average subbasin characteristics. Individual subbasin hydrographs are then hydraulically routed downstream and combined with other stream-connected, subbasin hydrographs. These HEC-1 peak hydrograph values are subsequently read into the HEC-2 model as a function of channel distance. HEC-2 then simulates the 100-yr water-surface elevation using a steady, gradually varied flow approximation. An iterative, standard-step method was used to compute this water-surface elevation as a function of channel distance.

Several key HEC-1 parameters represent average nonlinear temporal and spatial processes within each subbasin; they include antecedent moisture conditions, soil types, and land cover. HEC-1 also requires that a design rainfall amount and temporal distribution be specified as input data. Hence, the unit hydrograph approach is quite flexible. In addition, the HEC-1 and HEC-2 models also require basic watershed topographic and geometric characteristics, topographic profiles of stream cross sections, and bed-roughness factors as a function of channel length. All of this information for LANL watersheds was available from the MOSS mapping system or was readily obtained during short field investigations.

III. HEC-1 FLOOD HYDROGRAPH PACKAGE

A. General Model Description

HEC-1 is the most widely accepted method for systematically computing runoff hydrographs in complex watersheds. It is a general-purpose model consisting of a calling program and six subroutines. Two of the subroutines determine the optimal unit hydrograph, channel loss rate, and streamflow-routing parameters. Other subroutines perform snowmelt-runoff, unit hydrograph, hydrograph-routing, and combination computations and hydrograph-balancing operations. HEC-1 is capable of simulating a single-storm rainfall-runoff process or computing multiple floods for the same watershed during planning studies. It can be used to forecast both pre- and post-construction flooding impacts associated with development activities. Output from the model includes design storm hydrographs at specified channel locations within the watershed. HEC-1 output is then used by the HEC-2 model as input data.

Table 1 summarizes major watersheds draining the DOE-LANL facility complex. Figure 1 shows approximate watershed locations; detailed maps are referenced later in this report. Because watershed basins within the facility complex are ungaged, the SCS synthetic unit hydrograph technique was used to characterize the relationship between rainfall-runoff and flood peak discharges. Although HEC-1 can use either the Clark, Snyder, or SCS synthetic unit hydrograph approach, the latter was selected for reasons listed below. Furthermore, the SCS rainfall-abstraction rate was also used, as this paper will describe later. Finally, by using a variety of techniques, including modified Puls, Muskingum, kinematic wave, working R&D, and level-pool reservoir routing, HEC-1 can route computed flood flows through downstream subbasins. The Muskingum method was selected for channel routing because channel losses and flood wave attenuations in individual watersheds have not been fully characterized. Hence, these losses were assumed to be zero, even though they are known to be relatively high in certain stream channel segments. It should be emphasized that a relatively conservative design philosophy was followed here; whenever specific observational data were not available, an approach that would tend to yield larger peak hydrographs at a particular channel location was taken. It should also be noted that the HEC-1 model is extremely flexible; however, only those particular features that were used in this study are explained in detail. The interested reader is referred to the HEC-1 user's manual (US Army COE 1990) for additional model descriptions and to Viessman et al. (1977) for general hydrologic principles. Finally, it should be noted that the June 1988 FORTRAN version of HEC-1, published as PROHEC1 (March 1990 release) by Dodson & Associates, Inc., of Houston, Texas, was used in this study.

Table 1. Watersheds draining the eastern DOE-LANL boundary. See Figure 1 for approximate locations.

MAJOR WATERSHED NAME	TECH AREAS WITHIN WATERSHED
1. GUAJE CANYON WATERSHED	Outside DOE-LANL Boundary, Guaje municipal well field.
2. BARRANCAS CANYON WATERSHED	None.
3. BAYO CANYON WATERSHED	None.
4. PUEBLO CANYON WATERSHED	Historic LANL Sites, O-1 water well, and airport.
5. LOS ALAMOS CANYON WATERSHED a. Canada Bonito Tributary b. Quemazon Canyon Tributary	Historic LANL Sites, 3, 43, 41, 2, 21, 53, airport, O-4 water well, and Los Alamos municipal well field.
6. SANDIA CANYON WATERSHED	3, 53, municipal landfill, PM-1 and PM-3 water wells.
7. MORTANDAD CANYON WATERSHED a. Ten Site Canyon Tributary	3, 48, 55, 42, 50, 35, 52, and 5.
8. CANADA DEL BUEY WATERSHED	52, 5, 46, 51, 54, and PM-4 and PM-5 water wells.
9. PAJARITO CANYON WATERSHED a. Two-Mile Canyon Tributary b. Three-Mile Canyon Tributary	3, 58, 6, 8, 9, 22, 59, 69, 14, 15, 51, 18, 54, and PM-2 water supply well.
10. WATER CANYON WATERSHED a. Ski Lodge Canyon Tributary b. Canon de Valle Tributary c. Potrillo Canyon Tributary d. Fence Canyon Tributary	16, 9, 14, 11, 37, 28, 49, and 15. 15 and 36.
11. ANCHO CANYON WATERSHED a. Unnamed Tributary at State Road 4 b. Unnamed Tributary near Rio Grande	49, 33, and 39.
12. CHAQUEHUI CANYON WATERSHED	33.
13. FRIJOLES CANYON WATERSHED	Outside DOE-LANL Boundary

B. Design Storm Events for Los Alamos

Obviously, a particular storm hydrograph for a given watershed is intimately related to the spatial and temporal storm distribution pattern generating that hydrograph. Hence, in this report we describe the 100-yr, 6-h design storm event that produces the 100-year floodplain for Los Alamos The reader should note that other 100-yr storm durations (for example, the 100-yr, 24-h event) may produce different 100-yr floodplain definitions. Each of these aspects is described below.

Establishing a design storm event requires several important steps. These include specification of (1) storm frequency or return period; (2) storm duration, total rainfall depth, and watershed area adjustment; and (3) storm temporal distribution and duration of rainfall excess. The EPA stipulates that RCRA-permitted facilities must use the 100-yr storm to define all floodplains [40 CFR 270.14(b)(11)(iii)]. The US Army COE recommends that a 6-h storm event be used in 100-yr HEC-1 flood simulations for northern New Mexico. In addition, rainfall depths have been tabulated for Los Alamos County (Bowen 1989). Owing to the small size of individual subbasin watersheds within the Laboratory complex (typically less than 5 sq mi), no areal adjustment was made for these rainfall depths. Hence factors (1) and (2) above are fixed by institutional constraints and system observations. The recommended design rationale for factor (3) is described below.

A representative rainfall hyetograph that is based on either the worst-possible storm distribution pattern or on recorded storm distribution patterns must be selected. This hyetograph will significantly affect the shape and peak value of the resulting runoff hydrograph for a given watershed. Precipitation depths have been measured daily in Los Alamos since 1911 (Bowen 1990). Individual storm patterns have been recorded in 15-min intervals since 1979. These data were used to develop intensity/duration/frequency (IDF) relationships for Los Alamos. These IDF curves were then used to establish individual 6-h design storm distributions for the 2-, 5-, 10-, 25-, 50-, and 100-yr events. A comparison with the SCS 6-h design storm distribution (SCS, 1968) shows that the SCS curve produces a slightly more uniform rainfall distribution and somewhat lower corresponding hydrograph peaks.

Since standard IDF curves had not been developed previously for Los Alamos, they were constructed for this study using precipitation data from Bowen (1990, p. 156). Intensity is the time rate of precipitation, expressed in inches per hour (in./h). Here, average intensity is given by the expression

$$i = P/T = c/(T^e + f), \qquad \text{(III-1)}$$

where i is average intensity (in./h) over time T; P is the precipitation depth (in.) listed in Bowen (1990); T is rainfall duration (min); and c, e, and f are coefficients that vary with location and return period (Tr). Plots of i versus T are shown in Fig. 2; for Los Alamos, these IDF curves have the following coefficients:

Tr (yr)	c	e	f
2	88.441	1.011	21.953
5	85.513	0.962	10.752
10	80.908	0.931	6.123
25	82.730	0.912	3.281
50	81.414	0.893	1.580
100	85.050	0.888	0.617

Once these IDF curves had been constructed, a hyetograph of a 6-h design storm was developed for each return-period event using the alternating-block method (Chow et al. 1988, pp. 454–466). Results for the 2- and 100-yr storm events are shown in Fig. 3. Figure 4 shows the cumulative 100-yr, 6-h design storm for Los Alamos and the SCS 6-h design storm for comparison. The Los Alamos cumulative 6-h design storm patterns for the 2-, 5-, 10-, 25-, 50-, and 100-yr events are listed in Table 2; note that these distributions are in dimensionless form. These hyetographs were used throughout this study in all HEC-1 simulations.

It should be noted that each of the Los Alamos storm distributions listed in Table 2 contains all of the shorter-duration events with the same recurrence interval. For example, the 100-yr, 6-h design storm contains the 100-yr, 15-min storm in its central 15-min interval. Likewise, the 100-yr, 30-min storm is contained within the central 30-min interval of the 100-yr, 6-h design distribution. Similar comments apply to the 2-, 5-, 10-, 25-, and 50-yr design storm events listed in Table 2.

While many theoretical storm distributions are available for midwestern and eastern watersheds, it was felt that none of these would adequately reflect conditions at Los Alamos. In other words, these

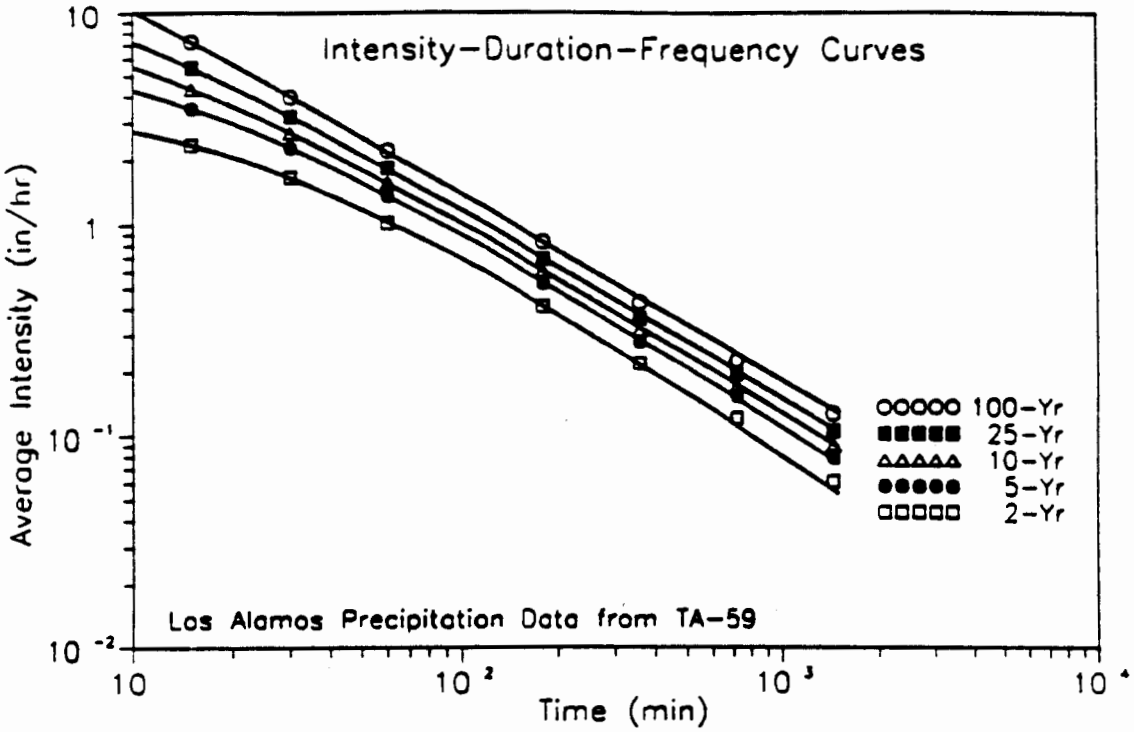


Fig. 2. Intensity-duration-frequency curves for Los Alamos County.

midwestern and eastern storm patterns tend to yield smaller peak hydrographs than those obtained from Los Alamos storm patterns. Note that one may also use instantaneous rainfall increments (Hoggan, 1989, p. 239; US Army COE, 1959; USBR, 1977, pp. 86–89) in HEC-1 simulations; however, this option was not used here. Instead, cumulative storm distribution patterns were used in all HEC-1 simulations; furthermore, they were adjusted for total rainfall depths in individual subbasin watersheds. It can be inferred from Fig. 3 that all of the 6-h design storm distribution patterns used in this study have a midpoint peak intensity near 3 h. Figure 3 also implies that gradually increasing and decreasing intensities precede and follow these peak values. This general worst-possible design storm pattern essentially satisfies abstractions with low rainfall intensity early in the storm. As a result, this design pattern yields higher hydrographs in response to higher rainfall intensities at later times. It should be added that observed New Mexico summer thunderstorms typically result from intense prefrontal squall lines moving south to north. While an observed 100-yr 6-h storm has never been recorded at Los Alamos, its characteristic distribution would probably show the highest rainfall intensities in the first hour and gradually decreasing rainfall intensities over the next 5 h. Furthermore, observed thunderstorms are exceptionally localized events and rarely cover an entire watershed. However, each subbasin's design storm was assumed to occur simultaneously with all other subbasin events in HEC-1 simulations. Hence, the Los Alamos design storm distribution patterns are conservative and tend to yield larger hydrograph peaks than would likely be obtained from observed hyetographs. Finally, it should be noted that observed rainfall data were obtained from Bowen (1989, Table 9.1) and are summarized here in Table 3. Linear interpolation was used to adjust these precipitation depth values for elevation differences between rain gages at Technical Areas 54 and 59 (TA-54 and TA-59) and individual elevations of subbasin centroids (Tables 4 and 5). Centroid elevations were obtained from 7.5-min-series USGS topographic maps. Precipitation depths listed in these tables were assumed to be uniformly distributed over their

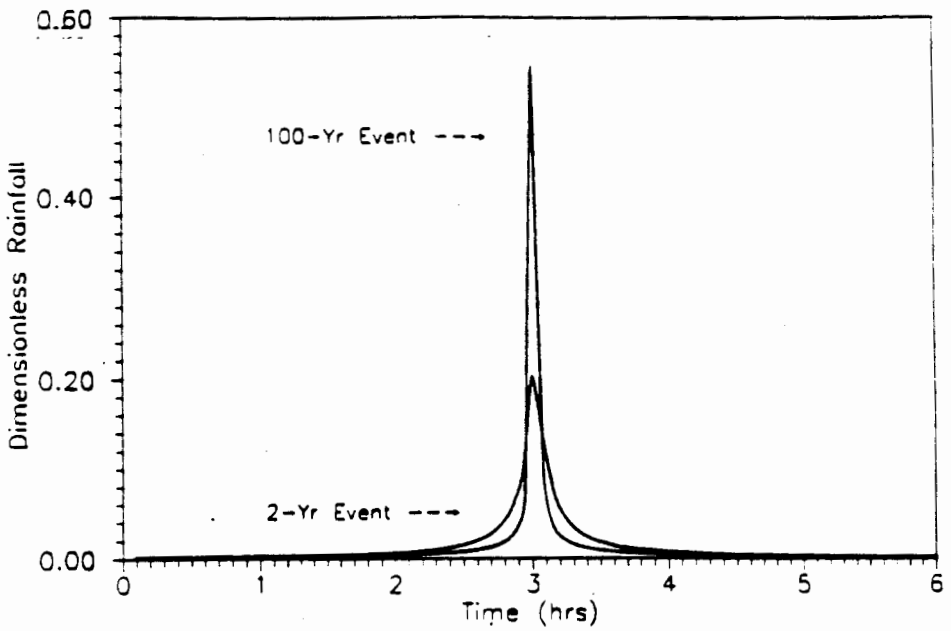


Fig. 3. Six-hour design storms for Los Alamos County.

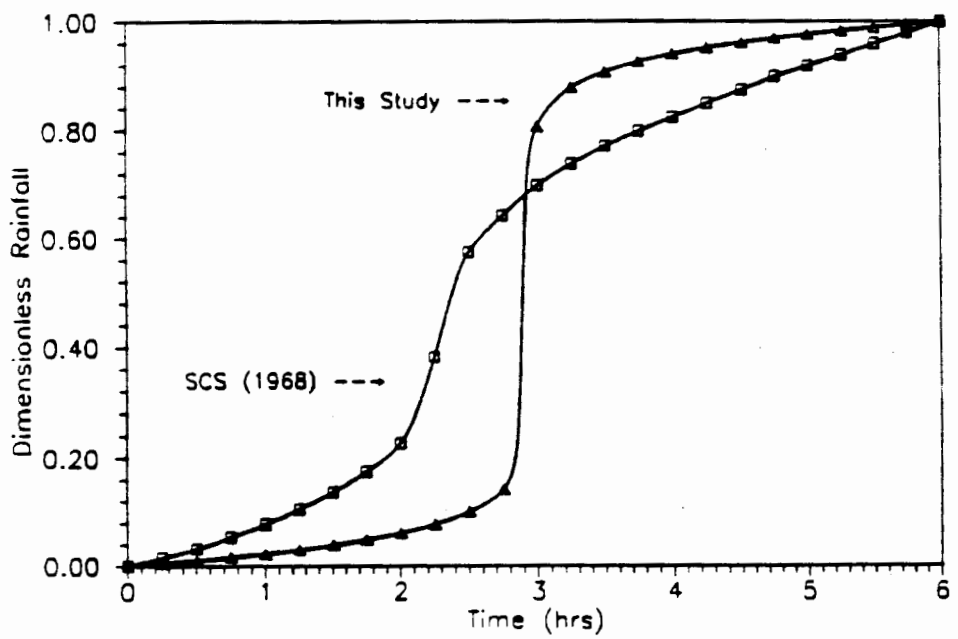


Fig. 4. Cumulative 100-yr. 6-h design storm distributions.

Table 2. Individual 6-hour design storm distributions for Los Alamos County. See Figures 1 through 3.

Time (min)	Time (hr)	Cumulative Storm Distribution (dimensionless) 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
0	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	0.25	0.0021	0.0033	0.0041	0.0045	0.0051	0.0051
30	0.50	0.0046	0.0071	0.0087	0.0095	0.0106	0.0106
45	0.75	0.0078	0.0114	0.0139	0.0151	0.0167	0.0167
60	1.00	0.0118	0.0165	0.0199	0.0213	0.0235	0.0234
75	1.25	0.0169	0.0227	0.0268	0.0285	0.0312	0.0310
90	1.50	0.0238	0.0303	0.0351	0.0369	0.0401	0.0397
105	1.75	0.0334	0.0402	0.0454	0.0471	0.0507	0.0499
120	2.00	0.0476	0.0537	0.0588	0.0599	0.0637	0.0624
135	2.25	0.0704	0.0739	0.0778	0.0774	0.0808	0.0784
150	2.50	0.1125	0.1087	0.1088	0.1045	0.1060	0.1012
165	2.75	0.2121	0.1894	0.1770	0.1608	0.1542	0.1424
180	3.00	0.6644	0.7017	0.7289	0.7617	0.7833	0.8081
195	3.25	0.8493	0.8598	0.8637	0.8718	0.8726	0.8797
210	3.50	0.9113	0.9100	0.9070	0.9087	0.9057	0.9090
225	3.75	0.9416	0.9358	0.9307	0.9300	0.9260	0.9278
240	4.00	0.9594	0.9521	0.9465	0.9448	0.9408	0.9418
255	4.25	0.9709	0.9636	0.9581	0.9562	0.9525	0.9530
270	4.50	0.9790	0.9722	0.9673	0.9654	0.9622	0.9624
285	4.75	0.9849	0.9790	0.9749	0.9731	0.9704	0.9705
300	5.00	0.9894	0.9846	0.9813	0.9798	0.9776	0.9777
315	5.25	0.9930	0.9893	0.9868	0.9857	0.9841	0.9840
330	5.50	0.9958	0.9934	0.9917	0.9909	0.9899	0.9898
345	5.75	0.9981	0.9969	0.9961	0.9957	0.9951	0.9951
360	6.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

respective subbasins in all HEC-1 simulations. These depths were also assumed to have the temporal distributions listed in Table 2 using 15-min rainfall increments.

C. SCS Unit Hydrograph

Obviously, not all rainfall from a storm contributes to direct runoff, because some is lost during the overland flow process. Four theoretical rainfall-abstraction calculation techniques are incorporated in HEC-1; these include the initial and uniform, the exponential, the SCS, and the Holtan techniques. However, the SCS calculation method is the only one which provides reasonably good estimates when geographic watershed characteristics are used to estimate time-of-concentration or basin lag time values. Here, basin lag time is defined as the time between the centroid of excess rainfall and the resulting stream hydrograph peak. The SCS technique uses an SCS curve number (CN) to relate accumulated rainfall excess or runoff to accumulated rainfall with an empirical CN value. In equation form we have

$$R = (P-I)^2/(P-I+S),\ S = 1000/CN - 10,\ \text{and}\ I = 0.2S, \qquad \text{(III-2)}$$

where

Table 3. Precipitation depths for various return periods and storm durations at Los Alamos (TA-59) and White Rock (TA-54)

Los Alamos - TA-59: Elevation = 7379 ft above MSL.

	Precipitation Depth (inches)					
Tr (yrs)	1 hr	3 hr	6 hr	12 hr	24 hr	Annual
2	1.03	1.24	1.34	1.47	1.45	18.10
5	1.38	1.60	1.71	1.84	1.90	22.90
10	1.59	1.83	1.94	2.07	2.18	25.80
25	1.86	2.10	2.21	2.35	2.54	29.00
50	2.06	2.32	2.42	2.55	2.80	31.70
100	2.25	2.52	2.61	2.74	3.06	34.00
500	2.70	3.01	3.08	3.19	3.66	39.87

White Rock - TA-54: Elevation = 6690 ft above MSL.

	Precipitation Depth (inches)					
Tr (yrs)	1 hr	3 hr	6 hr	12 hr	24 hr	Annual
2	0.69	0.81	0.89	1.06	1.18	13.10
5	0.96	1.08	1.17	1.36	1.55	16.40
10	1.15	1.27	1.36	1.55	1.78	18.40
25	1.38	1.50	1.59	1.78	2.08	21.00
50	1.56	1.68	1.77	1.95	2.31	22.90
100	1.75	1.86	1.94	2.11	2.52	24.40
500	2.18	2.28	2.39	2.49	3.03	28.41

R = runoff (in.),
P = rainfall (in.),
I = infiltration abstraction (in.),
S = potential maximum retention after rainfall begins (in.), and
CN = SCS curve number (% of runoff).

The CN is a function of land use, vegetation cover, soil classification, hydrologic conditions, and antecedent moisture and runoff conditions. Variations in infiltration rates of different soil types are incorporated in the CN through the classification of soils into four hydrologic soil groups possessing high (Group A), moderate (Group B), low (Group C), and very low (Group D) infiltration capacities. Group A soils have a water transmission rate >0.30 in./h; Group B soils have a transmission rate of 0.15–0.30 in./h; Group C soils have a rate of 0.05–0.15 in./h; and Group D soils have a rate <0.05 in./h. These soil types have been previously mapped in Los Alamos County (Nyhan et al. 1978) and were used here. In addition, CN values have been tabulated in Hoggan (1989, pp. 33–36). Antecedent moisture conditions (AMC) that are typically used for design applications are called AMC-II (average AMC). Techniques for converting CN values under AMC-II to CN values under AMC-I (very dry soil, but above the average plant-wilting point) and AMC-III (nearly saturated soil—heavy rainfall or light ranifall with low temperatures has occurred within the previous five days) are available (Viessman et al. 1977, Tables 12-15, p. 622). However, no such adjustments

Table 4. Tabulated 2-year and 100-year, 6-hour precipitation totals for individual watershed sub-basins.

Watershed Name	Sub-Basin Centroid Elevation (ft MSL)	Precipitation (in) 2-year	100-year
Guaje			
1. Above BM-7172[1]	8100	1.69	3.29
2. Above BM-6253	6700	0.96	2.09
3. Rendija at BM-6253	7105	1.17	2.44
4. Above BM-5897 at Barrancas	6400	0.88	1.83
5. Above LA Canyon Confluence	5920	0.55	1.44
Barrancas			
1. Townsite Tributary at El 6000	6580	0.89	1.99
2. Southern Tributary at El 6000	6200	0.69	1.66
3. Northern 2 Tributaries El 5940	6600	0.90	2.00
4. Above BM-5897 at Guaje	6140	0.66	1.61
Baye			
1. Townsite Tributary at El 6615	7220	1.23	2.53
2. Main Channel at El 6080	6900	0.85	1.92
3. Southern Tributary at Totavi	6100	0.64	1.57
Pueblo			
1. Trib Confluence at El 7220	8400	1.84	3.34
2. Above County Line at El 6526	7300	1.27	2.68
3. NM-4 Y & LA Confluence	6480	0.84	1.90
Los Alamos			
1. Above Reservoir at El 7657	9200	2.26	4.23
2. Above Bridge at El 7126	7700	1.48	2.94
3. NM-4 Y & Pueblo Canyon	7050	1.14	2.39
4. Above Totavi at Baye Confluence	6000	0.59	1.49
5. Above Guaje Confluence	5740	0.45	1.29
6. Above Rio Grande Confluence	5600	0.38	1.18
Sandia			
1. Above NM-4 at El 6460	6900	1.06	2.26
2. Main Channel at El 6090	6400	0.88	1.83
3. Tsankawi Drainage at El 6090	6300	0.75	1.75
4. Above Rio Grande Confluence	5800	0.48	1.32
Mortandad			
1. Ten-Site Conflu at El 7060	7200	1.31	2.67
2. Above 1st Sed Trap at El 6783	7045	1.14	2.38
3. At East DOE Boundary Line	6730	0.97	2.11
4. Above NM-4 at El 6455 & Cedro	6640	0.82	2.04
5. Cedro Canyon at Mortandad	6650	0.93	2.05
6. Canada del Buey Confluence	6340	0.77	1.78
Canada del Buey			
1. Above NM-4 at White Rock[1]	6865	1.84	2.23
2. Above Rio Grande Confluence	6500	0.85	1.92
Pajarito			
1. Above NM-503 at W. DOE Line	8720	2.81	3.82
2. Above 2-mi Canyon Confluence	7500	1.37	2.77
3. 2-mi Canyon at Pajarito	7500	1.37	2.77
4. Above 3-mi Canyon Confluence	6850	1.03	2.22
5. 3-mi Canyon at Pajarito	7030	1.13	2.37
6. Above NM-4 & White Rock	6610	0.91	2.01
7. Above Rio Grande Confluence	6330	0.76	1.77
Potrillo			
1. Above Fence Confluence	6750	0.90	2.13
2. Fence Canyon at Potrillo	6700	0.96	2.09
3. Above Water Canyon Confluence	6400	0.80	1.83
Water			
1. Above NM-503 at West DOE Line	8400	1.84	3.34
2. Above Valle Canyon Confluence	7400	1.32	2.69
3. Above NM-4 at El 6410	6600	0.90	2.00
4. Above Potrillo C. Confluence	6500	0.85	1.92
5. Above Rio Grande Confluence	5700	0.43	1.23
Valle			
1. Above NM-503 at W. DOE Line	8680	1.99	3.78
2. Above TA-16 Area P Landfill	7510	1.38	2.78
3. Above Water Canyon Confluence	7300	1.27	2.68
Ancho			
1. West Fork and NM-4 at El 6246	6900	1.06	2.26
2. East Fork and NM-4 at El 6246	6800	1.01	2.17
3. Lower East Fork at El 5358	6400	0.80	1.83
4. Main Channel at El 5358	6300	0.75	1.75
5. Above Rio Grande Confluence	5750	0.46	1.28
Chaquehui			
1. Above Rio Grande Confluence	6450	0.82	1.87
Frijoles			
1. Main Channel at El 7200	8900	2.10	3.97
2. Below Burn Mesa at El 6670	7300	1.27	2.68
3. Above USGS Gage Station	7000	1.11	2.35

[1]Location of sub-basin outflow point in main stream channel; see watershed boundary and USGS 7.5 minute topographic maps.

Table 5. Tabulated 5, 10, 25, and 50-year, 6-hour precipitation totals for individual watershed sub-basins.

Watershed Name	6-hr Precipitation Totals (in) 5-yr	10-yr	25-yr	50-yr
Guaje				
1. Above BM-7172[1]	2.16	2.44	2.77	3.03
2. Above BM-6253	1.27	1.47	1.72	1.91
3. Rendija at BM-6253	1.53	1.75	2.02	2.23
4. Above BM-5897 at Barrancas	1.07	1.26	1.49	1.67
5. Above LA Canyon Confluence	0.77	0.92	1.13	1.29
Barrancas				
1. Townsite Tributary at El 6000	1.19	1.38	1.63	1.81
2. Southern Tributary at El 6000	0.95	1.12	1.34	1.51
3. Northern 2 Tributaries El 5940	1.20	1.40	1.64	1.83
4. Above BM-5897 at Guaje	0.91	1.08	1.29	1.46
Bayo				
1. Townsite Tributary at El 6615	1.60	1.83	2.11	2.32
2. Main Channel at El 6080	1.14	1.33	1.57	1.75
3. Southern Tributary at Totavi	0.88	1.05	1.26	1.43
Pueblo				
1. Trib Confluence at El 7220	2.35	2.65	3.00	3.27
2. Above County Line at El 6526	1.65	1.88	2.17	2.39
3. KW-4 Y & LA Confluence	1.13	1.31	1.55	1.73
Los Alamos				
1. Above Reservoir at El 7657	2.86	3.21	3.60	3.90
2. Above Bridge at El 7126	1.90	2.16	2.47	2.71
3. KW-4 Y & Pueblo Canyon	1.49	1.71	1.98	2.19
4. Above Totavi at Bayo Confluence	0.82	0.98	1.19	1.35
5. Above Guaje Confluence	0.65	0.80	0.99	1.14
6. Above Rio Grande Confluence	0.56	0.70	0.89	1.03
Sandia				
1. Above KW-4 at El 6460	1.39	1.61	1.87	2.07
2. Main Channel at El 6090	1.07	1.26	1.49	1.67
3. Tsanzawi Drainage at El 6090	1.01	1.19	1.42	1.59
4. Above Rio Grande Confluence	0.69	0.84	1.04	1.19
Mortandad				
1. Ten-Site Conflu at El 7060	1.70	1.94	2.23	2.45
2. Above 1st Sed Trap at El 6783	1.49	1.71	1.98	2.18
3. At East DOE Boundary Line	1.30	1.49	1.74	1.93
4. Above KW-4 at El 6455 & Cedro	1.23	1.43	1.67	1.86
5. Cedro Canyon at Mortandad	1.23	1.43	1.68	1.87
6. Canada del Buey Confluence	1.04	1.22	1.45	1.62
Canada del Buey				
1. Above KW-4 at White Rock[1]	1.37	1.58	1.84	2.04
2. Above Rio Grande Confluence	1.14	1.33	1.57	1.75
Pajarito				
1. Above KW-503 at W. DOE Line	2.56	2.87	3.24	3.52
2. Above 2-mi Canyon Confluence	1.78	2.02	2.32	2.55
3. 2-mi Canyon at Pajarito	1.78	2.02	2.32	2.55
4. Above 3-mi Canyon Confluence	1.36	1.57	1.83	2.03
5. 3-mi Canyon at Pajarito	1.48	1.70	1.97	2.17
6. Above KW-4 & White Rock	1.21	1.40	1.65	1.84
7. Above Rio Grande Confluence	1.03	1.21	1.44	1.61
Potrillo				
1. Above Fence Confluence	1.30	1.50	1.76	1.95
2. Fence Canyon at Potrillo	1.27	1.47	1.72	1.91
3. Above Water Canyon Confluence	1.07	1.26	1.49	1.67
Water				
1. Above KW-503 at West DOE Line	2.35	2.65	3.00	3.27
2. Above Valle Canyon Confluence	1.71	1.95	2.25	2.47
3. Above KW-4 at El 6410	1.20	1.40	1.64	1.83
4. Above Potrillo C. Confluence	1.14	1.33	1.57	1.75
5. Above Rio Grande Confluence	0.63	0.77	0.96	1.11
Valle				
1. Above KW-503 at W. DOE Line	2.53	2.85	3.21	3.49
2. Above TA-16 Area P Landfill	1.78	2.03	2.33	2.55
3. Above Water Canyon Confluence	1.65	1.88	2.17	2.39
Ancho				
1. West Fork and KW-4 at El 6246	1.39	1.61	1.87	2.07
2. East Fork and KW-4 at El 6246	1.33	1.54	1.79	1.99
3. Lower East Fork at El 5558	1.07	1.26	1.49	1.67
4. Main Channel at El 5558	1.01	1.19	1.42	1.59
5. Above Rio Grande Confluence	0.66	0.81	1.00	1.15
Chaquehui				
1. Above Rio Grande Confluence	1.11	1.29	1.53	1.71
Frijoles				
1. Main Channel at El 7200	2.67	3.00	3.38	3.66
2. Below Burn Mesa at El 6670	1.65	1.88	2.17	2.39
3. Above USGS Gage Station	1.46	1.68	1.94	2.15

[1]Location of sub-basin outflow point in main stream channel; see watershed boundary and USGS 7.5 minute topographic maps.

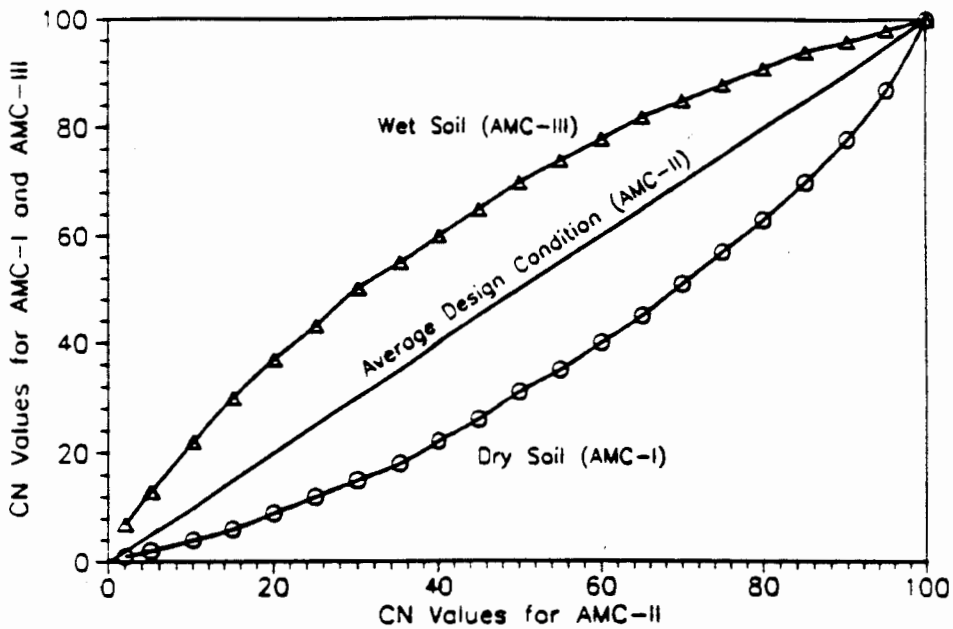


Fig. 5. Variations of SCS curve numbers for different moisture conditions.

were made in this study. Figure 5 shows the relationship of CN values under AMC-I and AMC-III conditions as a function of CN values under AMC-II conditions. Once rainfall excess has been determined, a unit hydrograph can be computed for each subbasin.

The SCS synthetic unit hydrograph procedure is based on a dimensionless unit hydrograph developed from an analysis of numerous unit hydrographs from small geographically diverse, rural watersheds. This dimensionless unit hydrograph represents the ratio of discharge to peak discharge versus the ratio of time to lag time. This lag time is a fundamental watershed characteristic and directly depends upon overland flow path length and mean flow velocity. As such, lag time is influenced by drainage basin area, main channel slope and geometry, land cover, and temporal and spatial storm patterns. In concept, the lag time incorporates the effect of basin size and much of the effect of basin shape. The advantage of the SCS approach is that it only requires the determination of time-to-peak (t_p) and peak discharge (Q_p), which are given by (Viessman et al. 1977, pp. 138–139)

$$t_p = D/2 + t_l \text{ and } Q_p = 454\ A/t_p, \qquad \text{(III-3)}$$

where

t_p	=	time from rainfall beginning to peak discharge (h),
D	=	rainfall duration (h),
t_l	=	basin lag time from centroid of rainfall excess to peak discharge (h),
Q_p	=	peak discharge (cfs),
A	=	watershed drainage area (sq mi).

The basin lag time (t_l) in Equation (III-3) can be expressed as

$$t_l = [L^{0.8}\ (S + 1)^{0.7}]/[1900\ Y^{0.5}], \qquad \text{(III-4)}$$

where l is the water course length (ft) going upstream to the watershed divide, Y is the average watershed slope (%) along the flow path, and all other terms are as previously defined.

Figure 6 uses Equation (III-4) and the tabulated data contained in Appendix B to depict basin lag time as a function of subbasin drainage area for Los Alamos. According to Graf (1988, p. 90), these lag times are comparable to those from northeastern US watersheds. However, he does not indicate how his values were determined. In Fig. 7 Los Alamos watershed data are used to show SCS basin lag times from Equation (III-4) as a function of Snyder basin lag times. Data used to compute these Snyder lag times are summarized in Table 6. The upper curve in Fig. 7 was obtained from a relationship derived by the US Army COE for mountainous watersheds near Los Angeles, California (Linsley et al. 1982, pp. 223-225). This relationship is given by

$$t_{sl} = C_t[(L \cdot Lc)/(s^{0.5})]^n, \qquad \text{(III-5)}$$

where

t_{sl}	=	Snyder lag time (h) for mountainous watersheds,
C_t	=	coefficient accounting for slope and storage effects,
L	=	channel length (mi) from basin outlet to divide,
Lc	=	channel length (mi) from basin outlet to centroid,
s	=	weighted channel slope (ft/ft), and
n	=	an empirical coefficient.

For mountainous watersheds near Los Angeles, California, Linsley reports values for C_t and n of 1.2 and 0.38, respectively. The lower curve in Fig. 7 represents Snyder lag times based on the US Army COE's studies from the Rio Puerco, in New Mexico, and from El Paso, Texas. For this second curve, the standard Snyder lag time equation was used. This expression is given by

$$t_{sl} = C_t(L \cdot Lc)^{0.30}, \qquad \text{(III-6)}$$

where all terms are as previously defined. Values for C_t were obtained from a logarithmic plot of C_t verses s (M. Magnuson, personal communication 1989). Figure 7 clearly shows that the SCS basin lag times used in this study are bracketed by extremes produced with the Snyder technique.

As mentioned above, the SCS runoff CN relates accumulated rainfall excess or runoff to accumulated rainfall. In addition to ease of use, Equation (III-4) has the advantage that the impacts of development within a watershed can be evaluated because changes in CN over time are easily estimated. As previously mentioned, tables exist that list CN values for a variety of conditions, ranging from urban to semiarid (Hoggan 1989, pp. 33-36). These same impacts cannot be estimated with the Snyder or Clark methods. In fact, if one originally employed either the Snyder or the Clark unit hydrograph method and land use patterns changed over time, there would be no systematic methodology for evaluating corresponding changes in the hydrograph peak, unless the SCS technique was subsequently used.

The US Army COE in Albuquerque has developed Snyder's synthetic unit hydrograph method for applications in north central New Mexico (M. Magnuson, personal communication, 1989). Regardless, it was felt that the Snyder's coefficients representing basin slopes and storage were generally not applicable to Pajarito Plateau. It can be inferred from Fig. 7 that either smaller or larger hydrograph peaks can be obtained from HEC-1 simulations if the Snyder unit hydrograph approach is used instead of the SCS technique. The potential for generating larger hydrograph peaks is obviously of interest. However, as discussed in Subsection E, use of this alternative approach in Los Alamos County cannot be justified.

D. Model Input Parameters

Because all watersheds within the DOE-LANL complex are similar, individual HEC-1 input data files have a similar structure (see Disk No. 1). This generic file structure is illustrated in Table 7. Individual watershed boundary location maps were constructed from 7.5-min USGS topographic

Table 6. Parameters used to compute Snyder basin lag times using equations (III-5 and 6). See Figure 6 and text for definitions.

Watershed Sub-Basin	Area (sq mi)	L (mi)	Lc (mi)	E-85 (ft)	E-10 (ft)	Slope (%)	Ct
Quaje[1]							
1	11.30	6.44	2.41	8840	7300	6.84[2]	0.54
2	3.25	4.55	3.69	7020	6340	3.78	0.62
3	9.59	8.71	4.83	7860	6400	4.23	0.60
4	2.13	2.41	1.61	6160	5900	2.80	0.68
5	1.45	1.70	0.99	5845	5675	2.52	0.66
Barrancas							
1	1.79	4.83	2.37	6880	6120	3.97	0.61
2	0.33	1.37	0.52	6385	6020	6.71	0.52
3	2.52	4.36	2.41	6840	6020	4.75	0.58
4	0 21	C.62	0.47	5960	5880	3.28	0.69
Bayo							
1	1.57	3.17	1.66	7150	6670	3.82	0.46
2	1.15	2 89	1.28	6560	6150	3.38	0.49
3	1.19	2.41	1.23	6220	5820	4.18	0.50
Pueblo							
1	2.24	2.84	1.56	7820	7260	4.90	0.57
2	4.61	4.55	3.17	7130	6652	2.66	0.72
3	1.55	2.65	1.56	6420	6295	1.19	0.94
Los Alamos							
1	6.33	3.79	2.18	8900	7740	7.73	0.50
2	0.74	1.89	0.95	7520	7160	4.80	0.58
3	3.31	6.63	3.50	6980	6350	2.40	0.74
4	1.96	2.23	0.99	6170	5775	4.48	0.59
5	0.77	0.95	0.52	5740	5670	1.87	0.77
6	0.67	1.47	0.99	5630	5500	2.24	0.73
Sandia							
1	2.65	6.96	3.22	7250	6530	2.61	0.72
2	0.85	2.23	1.18	6420	6260	2.04	0.76
3	1.32	1.89	1.18	6360	6160	2.67	0.72
4	0.75	1.70	1.04	5780	5510	4.00	0.61
Mortandad							
1	0.55	1.70	0.76	7360	7115	3.63	0.63
2	0.81	1.99	1.04	7020	6600	2.79	0.68
3	0.36	1.14	0.57	6765	6670	2.11	0.73
4	1.61	2.32	1.89	6630	6470	1.74	0.79
5	0.86	3.03	1.85	6760	6480	2.33	0.76
6	1.72	2.56	1.33	6425	5720	6.96	0.52
Canada del Buey[1]							
1	2.10	5.59	2.94	6980	6400	2.26[2]	0.74
2	2.42	2.79	2.79	6360	5310	7.60	0.50
Pajarito							
1	1.99	3.27	1.61	9915	7950	15.19	0.42
2	2.57	3.46	2.60	7570	6900	4.31	0.60
3	3.28	5.35	2.56	8440	6990	6.84	0.52
4	0.67	2.08	1.04	6910	6745	2.00	0.76
5	1.70	3.69	1.70	7280	6752	3.61	0.68
6	1.15	2.84	1.42	6700	6530	1.51	0.83
7	2.24	2.94	1.47	6460	5540	7.91	0.50
Potrillo							
1	2.78	5.40	2.79	7020	6460	2.62	0.70
2	1.03	3.41	2.04	6860	6490	2.74	0.69
3	0.96	1.85	0.90	6410	5800	7.25	0.51
Water							
1	4.07	3.41	1.75	9100	7605	11.87	0.46
2	2.63	3.36	1.75	7400	6800	3.91	0.61
3	1.42	3.60	1.85	6755	6450	2.11	0.73
4	1.97	2.60	1.28	6340	5800	4.40	0.59
5	0.32	0.95	0.57	5770	5400	9.87	0.47
Valle							
1	2.33	4.26	2.46	9480	7840	9.72	0.47
2	0.78	1.42	0.90	7600	7320	4.90	0.57
3	1.17	2.37	1.61	7225	6800	3.60	0.63
Ancho							
1	2.19	4.80	2.60	7060	6275	4.06	0.50
2	2.40	4.17	2.08	6860	6290	3.45	0.52
3	1.11	2.46	1.33	6450	5810	6.56	0.44
4	1.04	1.89	0.95	6210	5670	7.20	0.51
5	0.19	0.47	0.47	5530	5410	6.40	0.54
Chaquehui							
1	1.50	3.13	1.56	6540	5650	7.19	0.51
Frijoles							
1	4.97	3.83	1.89	9500	7860	16.83	0.46
2	4.92	4.62	2.46	7560	6780	4.26	0.60
3	8.13	4.55	4.17	6520	6090	2.39	0.72

[1]See Table 4 for locations of sub-basin outflow points.
[2]Weighted sub-basin slope = (E85 - E10)*100/(0.75*L).

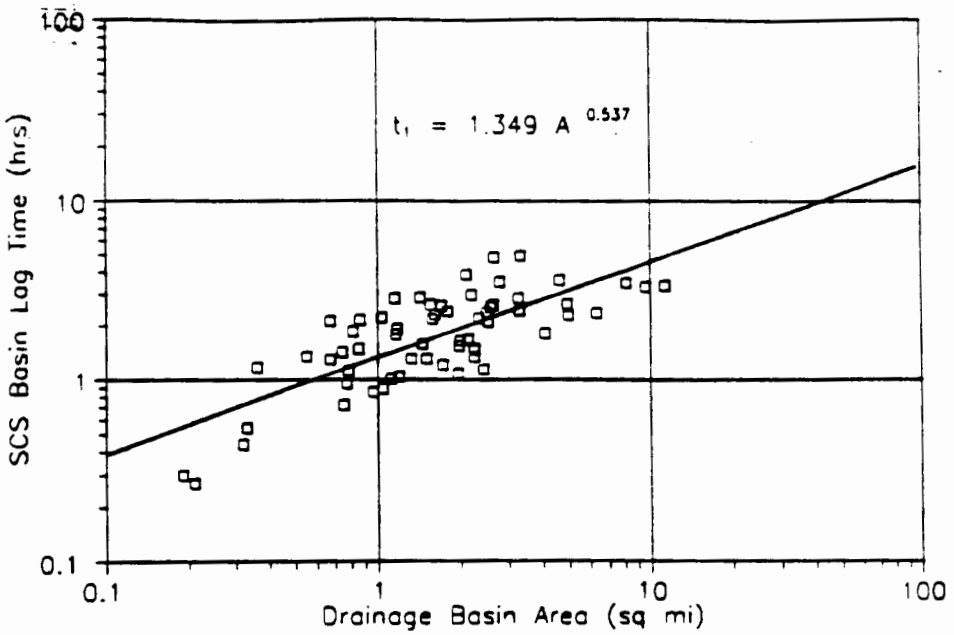


Fig. 6. Drainage basin area vs SCS basin lag time at Los Alamos.

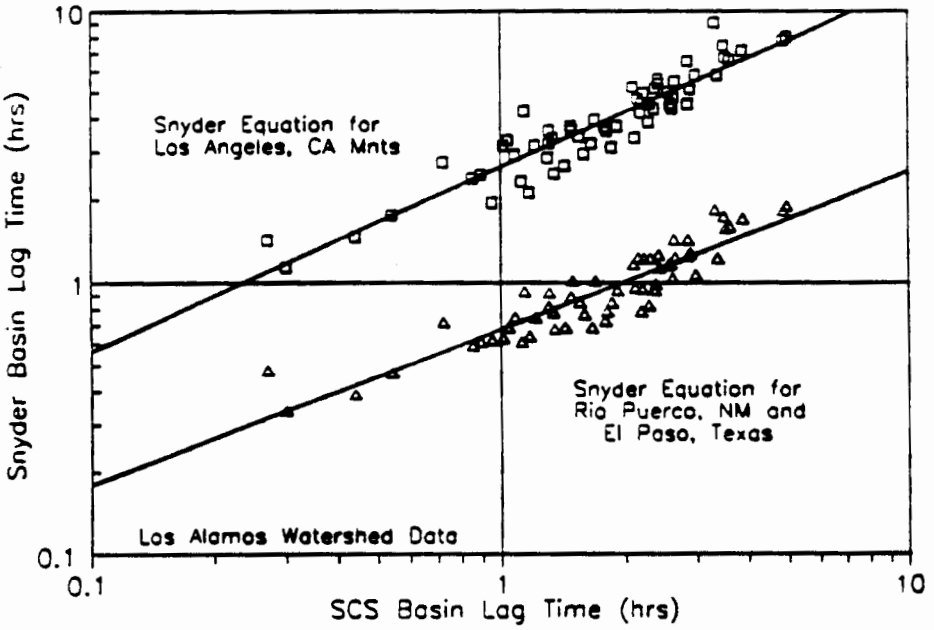


Fig. 7. SCS basin lag time vs Snyder lag times at Los Alamos.

Table 7. Typical HEC-1 input file identification scheme. See HEC-1 user manual for complete listing of other options.

Data Category	Record Identification	Data Description
Job Initialization	ID	Job Identification
	IT	Job Time Control
	IO	General Output Control
	IN	Input Data Time Control
Precipitation Data	PC[1]	Cumulative Prec Time Series
	PG[2]	Storm Gage Total Precipitation
	PR	Recording Gage to be Weighted
	PW	Precipitation Gage Weight Factor
	PT	Total Storm Gages to be Weighted
Job Step Control	KK	Stream Station Identifier
	KM	Alphanumeric Comment Message
	KO	Output Control for this Station
Basin Data	BA[3]	Basin Area
Loss Rate Data	LS[3]	SCS Curve Number Loss Technique
Unitgraph Data	UD[3]	SCS Dimensionless Unitgraph
Routing Data	RL	Channel Loss Rates
	RM[3]	Muskingum Routing Parameters
Hydrograph Transformations	HC	Combine Hydrographs
End of Job	ZZ	Required to End Job

[1]See Table 2 for design storm distribution.

[2]See Tables 4 and 5 for individual sub-basin values.

[3]See individual watershed sub-basin values in Appendix A.

maps; they are located with the floodplain boundary maps in the Facilities Engineering Planning Group Office (Comer and McLin 1991). Equations to compute individual input file parameters were listed in the previous section. Results of these calculations are listed in Appendix B. Tabulated watershed characteristics include subbasin area, subbasin main channel length to water divide or upstream subbasin boundary, elevation change over channel length, average subbasin CN value, and computed SCS basin lag time from Equation (III-4). All watersheds were outlined on the USGS topographic maps, and individual subbasin areas were measured with a planimeter. Measurements obtained from four repeated area calculations for each subbasin yielded variances that deviated <1% from average values. Selected watershed areas are listed in Table 8, and all subbasin area mean values are given in Appendix B and Disk No. 1. Channel lengths and elevation changes were also taken directly from topographic maps with similar measurement repeatability. It should also be mentioned that predicted HEC-1 hydrographs are relatively insensitive to minor measurement

Table 8a. Hydrograph peaks (cfs) corresponding to individual 6-hour Los Alamos design storm events at east DOE-LANL boundary. See Table 9 for description of exact locations. See Table 2 for cumulative storm distribution patterns.

Watershed Name	Basin Area	Recurrence Interval Hydrograph Peaks (cfs) 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Guaje[1]	26.27[2]	20	137	265	472	666	888
Barrancas	2.12	1	12	25	47	67	90
Bayo	3.92	2	21	43	79	111	147
Pueblo	8.40	8	65	121	211	292	383
Los Alamos	10.38	19	115	204	332	447	589
Los Alamos	20.74	24	166	300	502	686	902
Sandia	2.65	1	10	21	38	54	71
Mortandad	1.72	1	6	11	19	27	35
Canada del Buey	2.10	1	11	21	38	54	72
Pajarito	11.36	5	71	143	263	372	498
2-Mile	3.28	1	19	40	77	111	149
3-Mile	1.70	1	12	24	43	60	80
Fence	1.03	1	8	16	29	41	55
Potrillo	2.78	1	14	28	53	75	99
Potrillo	4.77	2	15	30	56	81	108
Canon de Valle	4.28	2	21	41	75	104	141
Water	12.40	4	68	139	255	361	485
Ancho	4.67	2	27	57	105	150	198
Chaquehui	1.50	1	13	27	53	78	103
Frijoles[1]	18.02	33	160	284	479	654	853

[1]Watershed boundary is outside DOE-LANL complex.
[2]Drainage basin area in square miles.

Table 8b. Total 24-hr runoff volumes (ac-ft) corresponding to individual 6-hour Los Alamos design storm events at east DOE-LANL boundary. See Table 9 for description of exact locations. See Table 2 for cumulative storm distribution patterns.

Watershed Name	Basin Area	Recurrence Interval 24-hr Runoff (ac-ft) 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Guaje[1]	26.27[2]	8	67	133	236	333	442
Barrancas	2.12	<1	4	8	18	24	32
Bayo	3.92	<1	8	16	30	44	58
Pueblo	8.40	4	26	48	85	119	155
Los Alamos	10.38	8	48	83	137	184	240
Los Alamos	20.74	12	75	141	236	325	424
Sandia	2.65	<1	6	12	22	32	42
Mortandad	1.72	<1	1	2	4	6	9
Canada del Buey	2.10	<1	6	10	18	24	30
Pajarito	11.36	2	26	54	99	141	186
2-Mile	3.28	<1	6	14	26	38	50
3-Mile	1.70	<1	4	8	16	22	28
Fence	1.03	<1	2	4	10	12	16
Potrillo	2.78	<1	6	12	24	34	44
Potrillo	4.77	<1	8	18	32	46	60
Canon de Valle	4.28	<1	6	10	18	26	38
Water	12.40	2	24	48	87	125	169
Ancho	4.67	<1	10	20	38	54	71
Chaquehui	1.50	<1	2	6	12	16	22
Frijoles[1]	18.02	12	65	119	200	276	359

[1]Watershed boundary is outside DOE-LANL complex.
[2]Drainage basin area in square miles.

errors in subbasin area, main channel length, and elevation differences as implied by Equation (III-4). In addition, Manning's equation was used to compute Muskingum routing parameters from average channel flow velocities (Appendix B). Finally, it should be pointed out that all watershed parameters are listed in the HEC-1 input data files on Disk No. 1 and are not discussed in detail here.

Note that Guaje and Frijoles Canyons have been included in Tables 4 and 5, Appendix B, and on Disk-No. 1 even though these watershed stream channels do not cross the DOE-LANL complex. Guaje Canyon was included because the Guaje municipal well field is located there; Frijoles Canyon was included because a USGS gaging station is located at the Bandelier National Park Headquarters. Also note that the tabulated watershed characteristics are listed according to subbasins within a given watershed. Each subbasin boundary division was selected according to several factors. These included (1) tributary inflow, (2) significant change in CN value, (3) an important geographic feature or manmade boundary marker, or (4) another unspecified feature for which a hydrograph peak value was required in HEC-2 simulations. Finally, it should be noted that these subbasins extend from the topographic peaks that define watershed boundaries located to the west of the DOE-LANL complex to the Rio Grande drainage confluence located to the east. Hence, hydrograph peak values were obtained for numerous points along individual watercourses within the DOE-LANL complex, for individual stream channels as they exit the DOE-LANL complex, and for confluent channels merging with the Rio Grande. Only 100-yr floodplains within the DOE-LANL complex were computed, however, because the AUTOGIS-MOSS topographic data do not extend beyond this boundary.

E. Peak Hydrographs for Major Watersheds

Once all subbasin characteristic parameters (Appendix B) and HEC-1 input data files (Disk No. 1) had been prepared, individual watershed hydrographs could be generated. Before this was done, however, a parameter sensitivity analysis was made. With the approach that was used here, all model parameters, except for composite subbasin CNs, are constrained to a very narrow range of observed values. These CN values could be estimated from county soil maps (Nyhan et al. 1978) and standard tables (Hoggan 1989). In actual practice, an individual, composite, subbasin CN value was computed as an area-weighted average according to mapped soil and vegetation types and variable CN values. However, it is reasonable to expect that composite CN values can vary by as much as 10% above or below their originally estimated values. Hence, in order to reduce the uncertainty in these estimated CN values, hydrograph peaks produced by the 2-yr, 6-h design storm event for LANL were examined for all subbasin watersheds. The logic for this design procedure is straightforward: from physical observation, one can quickly develop a general appreciation for flood magnitudes associated with individual 2-yr storm events within Los Alamos County. These qualitative observations suggest that 2-yr flood peaks in Los Alamos County vary between zero and a few hundred gallons per minute. This same appreciation cannot be easily developed for 100-yr magnitude events. Following this logic, all HEC-1 simulations should accurately reflect 2-yr events if one is to have confidence in larger recurrence-interval floods. Note that once all subbasin characteristic parameters have been determined for a given HEC-1 watershed, changing the subbasin rainfall totals (i.e., the PG data card shown in Table 7 for each HEC-1 input data file) and the design storm distribution patterns (i.e., the PC cards shown in Table 7) generates different recurrence interval hydrographs. Results obtained from this design methodology are outlined below.

Each HEC-1 watershed simulation was made for the 2-yr, 6-h LANL design storm event, as described above. If a given subbasin yielded a hydrograph peak that was unreasonably high or low, then the composite CN value was adjusted either downward or upward, respectively, and a new simulation was made. Note that a change in CN value implies a corresponding change in basin lag time, as suggested by Equation (III-4). This iterative process was repeated several times for each watershed. Individual composite CN values were typically adjusted <3% until the 2-yr hydrograph peak was greater than zero but less than about 2 cfs for an average-sized subbasin. Approximately half of all subbasins required a composite CN value adjustment; these adjustments were nearly

equally divided between increases and decreases in CN values. Once these CN values were fixed, the 2-, 5-, 10-, 25-, 50-, and 100-yr hydrographs were computed using the 6-h rainfall totals listed in Tables 4 and 5 and the design storm distribution patterns listed in Table 2. Resulting hydrograph peaks and 24-h runoff volumes for all watersheds crossing the eastern DOE-LANL boundary are given in Tables 8 and 9. Table 10 lists hydrograph peaks and 24-h runoff volumes for confluent stream channels at the Rio Grande. One should use care in referring to these tables. For example, the Los Alamos Canyon watershed is listed in both tables. In Table 8, the second Los Alamos hydrograph peak includes Pueblo Canyon flows because these streams are confluent above the eastern DOE-LANL boundary. In Table 10, the Los Alamos values include flows from Guaje, Rendija, Barrancas, Bayo, Pueblo, and Los Alamos Canyons because all of these streams are confluent above the Rio Grande. Similar comments apply to other listed watersheds. It should also be mentioned that these combined hydrograph peaks cannot simply be arithmetically added together. Instead they must be hydraulically routed downstream and then combined. In other words, each stream hydrograph abscissa must be aligned to account for flood wave travel time. This procedure is automatically performed in the HEC-1 hydrograph-combining subroutine. Finally, it should be pointed out that all stream channels were assumed to have zero baseflow because all streams within the DOE-LANL boundary are normally ephemeral.

F. Comparison with USGS Flood-Flow Frequencies

The USGS has developed regression equations (Waltemeyer 1986) for estimating flood discharges for the 2-, 5-, 10-, 25-, 50-, and 100-yr recurrence intervals from ungaged watersheds in New Mexico. A comparison between hydrograph peaks produced by the HEC-1 and USGS techniques was made in order to illustrate their differences. Generally, one might expect both methods to yield 100-yr peak flows of similar magnitude for Pajarito Plateau watersheds. However, the USGS approach consistently yields higher peak flows than does the HEC-1 technique employed above. At lower recurrence intervals, these differences become more pronounced. For 2-yr floods, the USGS procedure yields hydrograph peaks that are typically one or more orders of magnitude larger than HEC-1 peaks using equivalent subbasin watershed parameters. The reason for these differences is centered on the storm pattern incorporated into each technique and the fact that the HEC-1 model theoretically simulates the rainfall-runoff process more realistically.

Los Alamos County is located within the Central Mountain-Valley Region, according to Waltemeyer (1986, pp. 3 and 47). His regression equation for hydrograph peaks is given by

$$Q_n = (aA^b)(Ec/1000)^c(I^d), \qquad \text{(III-7)}$$

where

Q_n	=	hydrograph peak (cfs) for yearly recurrence interval n,
A	=	watershed area (sq mi),
Ec	=	average channel elevation at points that are 10% and 85% of the stream length upstream from the hydrograph peak (ft), and
I	=	rainfall total (in.) for the 10-yr, 24-h storm.

In Equation (III-7), parameters a, b, c, and d are the regression coefficients. For Los Alamos, these parameters are listed below.

Table 9. Channel locations of hydrograph peaks listed in Table 8; also see USGS 7.5 minute topographic maps.

Watershed Name	Stream-channel locations of hydrograph peaks
Guaje[1]	Above Barrancas Canyon confluence.
Barrancas	Tributary confluence below east DOE-LANL boundary.
Bayo	Tributary confluence above east DOE-LANL boundary.
Pueblo	Above Los Alamos Canyon confluence at HW-4.
Los Alamos	Above Pueblo Canyon confluence at HW-4.
Los Alamos	Above Bayo Canyon confluence at Totavi.
Sandia	At DOE-LANL eastern boundary.
Mortandad	At DOE-LANL eastern boundary.
Canada del Buey	At DOE-LANL eastern boundary.
Pajarito	At DOE-LANL eastern boundary.
2-Mile	Above Pajarito Canyon confluence.
3-Mile	Above Pajarito Canyon confluence.
Fence	Above Potrillo Canyon confluence at gravel pit.
Potrillo	Above Fence Canyon confluence.
Potrillo	Above Water Canyon confluence.
Canon de Valle	Above Water Canyon confluence.
Water	Stream crossing at HW-4.
Ancho	Stream confluence below HW-4.
Chaquehui	At DOE-LANL eastern boundary.
Frijoles[1]	At USGS gaging station above Rio Grande.

[1]Watershed boundary is outside DOE-LANL complex.

Table 10a Hydrograph peaks (cfs) corresponding to individual 6-hour Los Alamos design storm events at the Rio Grande confluence. See Table 2 for cumulative storm distribution patterns.

Watershed Name	Basin[1] Area	Recurrence Interval Hydrograph Peaks (cfs) 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Los Alamos	58.67	39	302	573	997	1392	1845
Sandia	5.57	2	23	50	96	137	182
Canada del Buey	10.43	33	74	127	220	300	395
Pajarito	13.60	24	71	142	260	369	495
Water	19.46	5	80	165	305	434	580
Ancho	7.01	2	32	67	124	179	236
Chaquehui	1.50	1	13	27	53	78	103
Frijoles[2]	18.02	33	160	284	479	654	853

[1]Drainage basin area in square miles.

[2]At USGS gaging station above Rio Grande confluence.

Table 10b Total 24-hr runoff volumes (ac-ft) corresponding to individual 6-hour Los Alamos design storm events at the Rio Grande confluence. See Table 2 for cumulative storm distribution patterns.

Watershed Name	Basin[1] Area	Recurrence Interval 24-hr Runoff (ac-ft) 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Los Alamos	58.67	22	161	309	543	764	1010
Sandia	5.57	<1	10	24	44	61	81
Canada del Buey	10.43	6	24	44	75	103	135
Pajarito	13.60	6	36	67	121	169	222
Water	19.46	2	36	71	135	190	258
Ancho	7.01	1	14	30	54	77	103
Chaquehui	1.50	<1	2	6	12	16	22
Frijoles[2]	18.02	12	65	119	200	276	359

[1]Drainage basin area in square miles.

[2]At USGS gaging station above Rio Grande confluence.

Q_n	a	b	c	d
2	55200	0.17	−1.05	1.79
5	170000	0.41	−1.13	1.67
10	289000	0.42	−1.11	1.59
25	497000	0.40	−1.13	1.51
50	685000	0.39	−1.11	1.15
100	896000	0.38	−1.09	1.40

All other parameters for Equation (III-7) are listed in Table 11 for watersheds draining the eastern DOE-LANL facility boundary. Note that Waltemeyer (1986, p. 6) indicates that I is the maximum precipitation intensity for the 10-yr, 24-h storm event. He indicates that these I-values can be obtained from precipitation-frequency maps for New Mexico (Miller et al. 1973). However, these maps give precipitation totals rather than intensity, which is given in inches per hour. Thus, the 10-yr, 24-h precipitation total is listed in Table 11. Comparison of 2- and 100-yr hydrograph peaks, as a function of drainage basin area are shown in Figs. 8 and 9. The USGS and HEC-1 methods were used for Los Alamos County. Obviously, for Pajarito Plateau watersheds the USGS approach consistently yields larger hydrograph peaks than does the HEC-1 model. The 2-yr floods obtained from the USGS method are especially interesting because they are so large. In fact, it is this obvious discrepancy that prompted the use of the HEC-1 approach in the first place. Any long-term county resident will readily agree that the predicted 2-yr USGS hydrograph peak flows grossly disagree with his or her personal experience. By logical extension, one must also question the 100-yr flood peaks. For this reason the USGS approach was rejected for use on Pajarito Plateau watersheds. One should not infer that other New Mexico watersheds outside Los Alamos County cannot be accurately represented with the USGS technique, however.

Figures 8–10 depict the HEC-1 hydrograph peaks at the eastern DOE-LANL boundary and at the Rio Grande. These peaks are also listed in Tables 8–10. These and other peak values were used as input data in HEC-2 simulations for final definition of all 100-yr floodplains. Figure 11 shows 100-yr peak flows along the Los Alamos Canyon watershed and includes data from Los Alamos, Guaje, Rendija, Barrancas, Bayo, and Pueblo canyons.

G. Comparison with Other Flood-Flow Frequencies

Lane et al. (1985, pp. 30–37) have generated synthetic streamflow and sediment transport data for Los Alamos Canyon above the Rio Grande confluence. Many of these data were previously unpublished but have recently been reported by Graf (1991, Appendix B4). These data are summarized in Table 12. Weibull plotting positions were used to conduct a log-Pearson Type-III analysis (WRC 1967, WRC 1981, US Army COE 1982) for these data. Figure 12 clearly shows that Lane's synthetic streamflow data are statistically identical to HEC-1 hydrograph peaks obtained in this study for Los Alamos Canyon at the Rio Grande.

IV. HEC-2 WATER-SURFACE PROFILES

A. General Model Description

The HEC-2 model is similar in concept to the HEC-1 model in that it contains a calling program and multiple subroutines. The HEC-2 calculates and plots water-surface profiles for subcritical, critical, and supercritical gradually varied steady flows in channels of any cross-sectional configuration. The principal uses of the model are for floodplain definition; for evaluation of the hydraulic effects of bridges, culverts, and weirs; and for calculating stream profiles for various frequency floods for both

Table 11. Watershed parameters for estimating hydrograph peaks at east DOE-LANL boundary using equation (III-7). See Table 9 for basin locations. See text for discussion.

Watershed Name	Basin Area	E85 (ft)	E10 (ft)	Ec (ft)	I (in)
Guaje[1]	26.27[2]	8480	6060	7270	2.12
Barrancas	2.12	6880	6120	6500	1.67
Bayo	3.92	7035	6220	6628	1.74
Pueblo	8.40	7900	6395	7148	2.05
Los Alamos	10.38	8235	6415	7325	2.15
Sandia	2.65	7250	6530	6890	1.86
Mortandad	1.72	7235	6710	6973	1.94
Canada del Buey	2.10	6980	6480	6730	1.80
Pajarito	11.36	8560	6590	7575	2.29
Potrillo	4.77	6470	6050	6260	1.53
Canon de Valle	4.28	9100	7000	8050	2.57
Water	19.46	8155	5960	7058	1.99
Ancho	7.01	6960	5685	6323	1.57
Chaquehui	1.50	6540	5640	6090	1.43
Frijoles[1]	18.02	8790	6185	7488	2.24

[1]Watershed boundary is outside DOE-LANL complex.

[2]Drainage basin area in square miles.

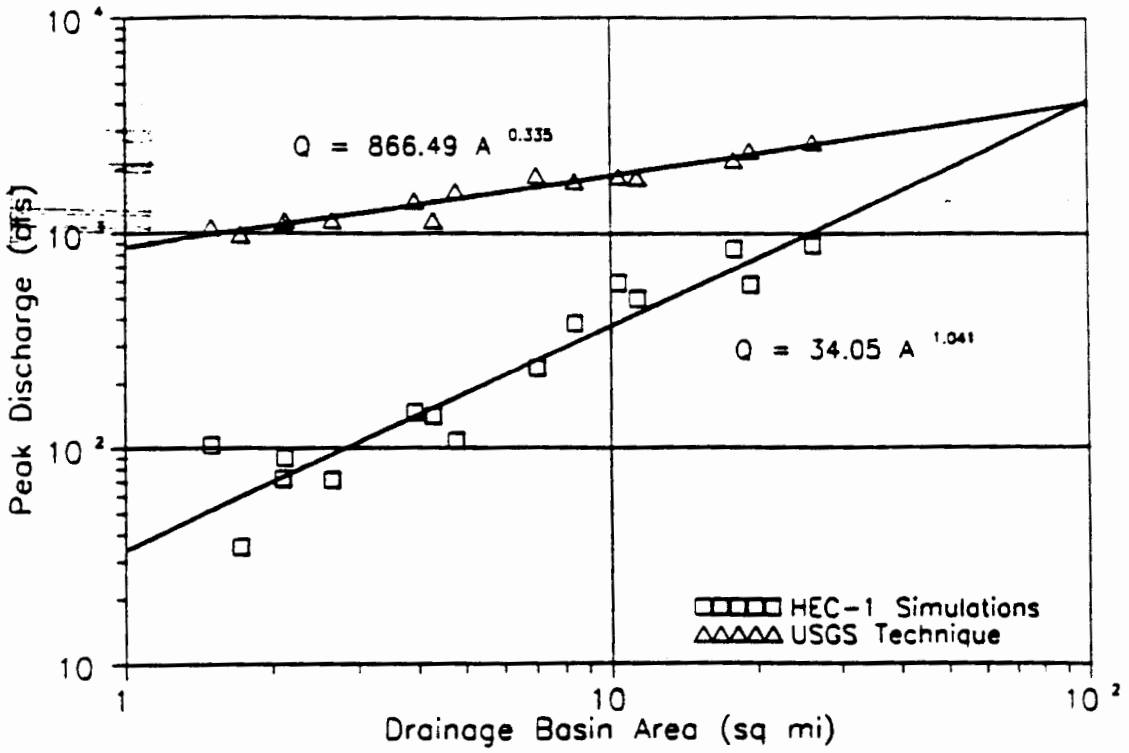


Fig. 8. Comparison of HEC-1 and USGS 100-yr peak discharges at eastern DOE-LANL boundary.

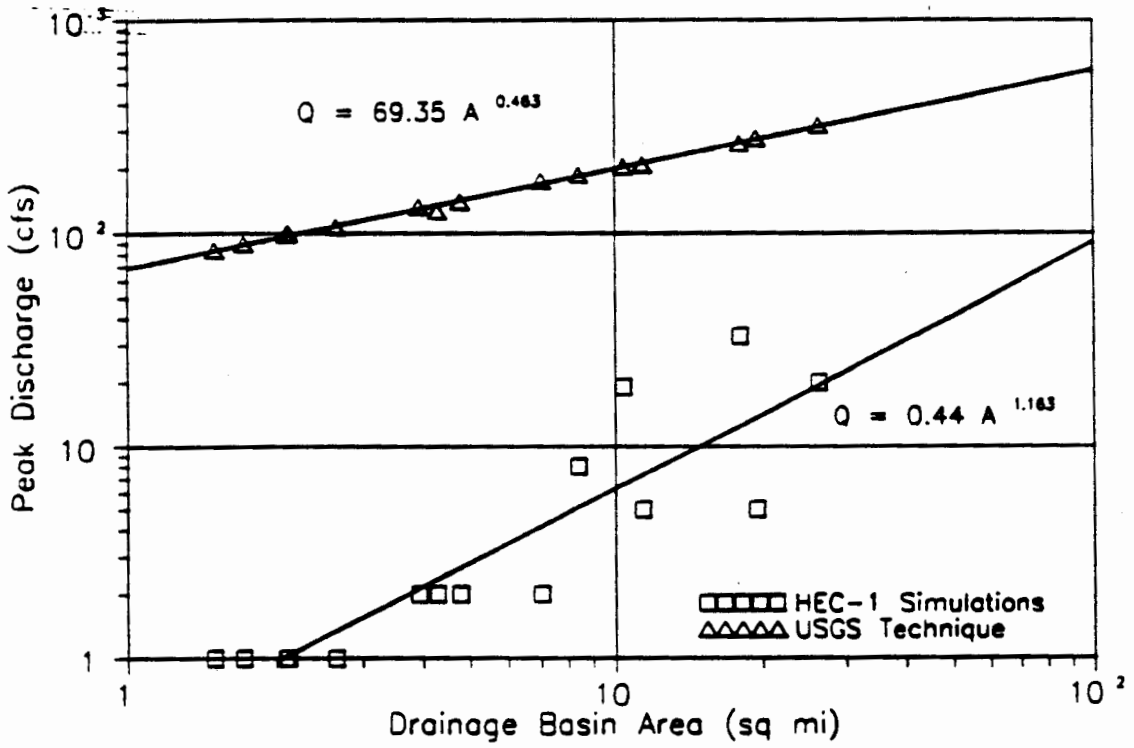


Fig. 9. Comparison of HEC-1 and USGS 2-yr peak discharges at eastern DOE-LANL boundary.

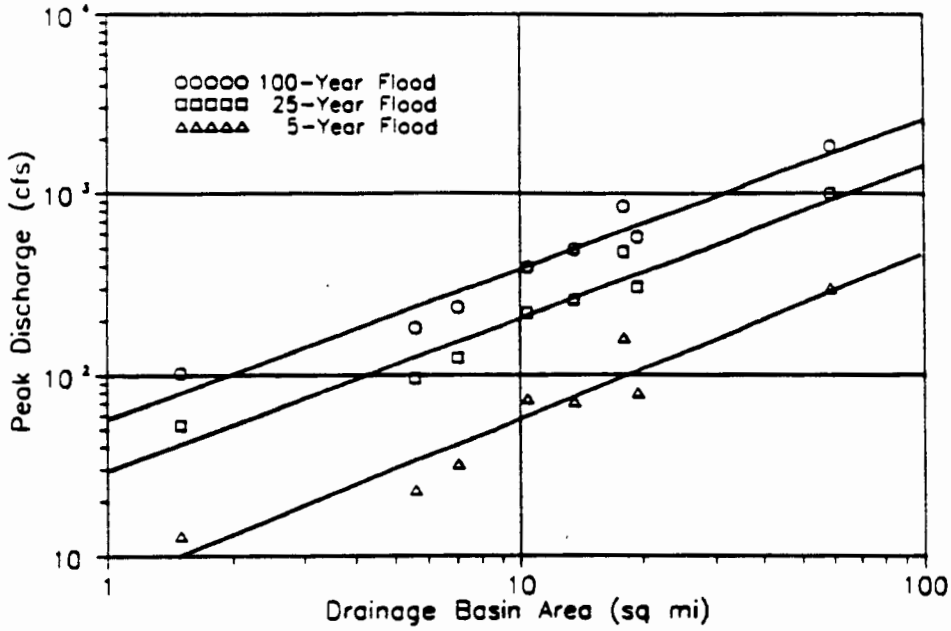


Fig. 10. Drainage basin area vs peak discharge at Rio Grande for Pajarito Plateau streams.

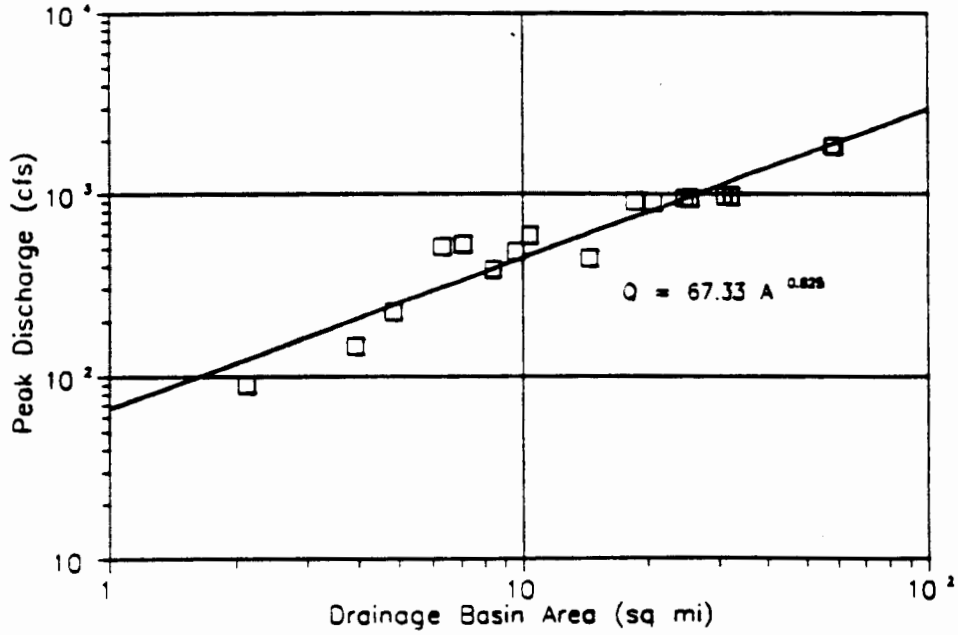


Fig. 11. Drainage basin area vs 100-yr peak discharge for Los Alamos Canyon.

Table 12. Synthetic streamflow data for Los Alamos Canyon at the Rio Grande confluence, as reported in Graf (1991, Appendix B4).

Year	Peak Flood (cfs)	Sediment Yield (tons)
1943	66	466
1944	631	8393
1945	0	61
1946	80	611
1947	2	65
1948	0	61
1949	0	61
1950	20	77
1951	687	9814
1952	386	6316
1953	4	12
1954	129	1006
1955	283	2783
1956	0	0
1957	649	16470
1958	203	2062
1959	59	532
1960	0	154
1961	53	443
1962	1	138
1963	283	2772
1964	0	0
1965	233	3163
1966	32	165
1967	361	4197
1968	924	14120
1969	149	2899
1970	0	0
1971	42	247
1972	0	0
1973	349	3955
1974	20	129
1975	6	99
1976	20	77
1977	4	8
1978	293	3198
1979	312	426
1980	0	183

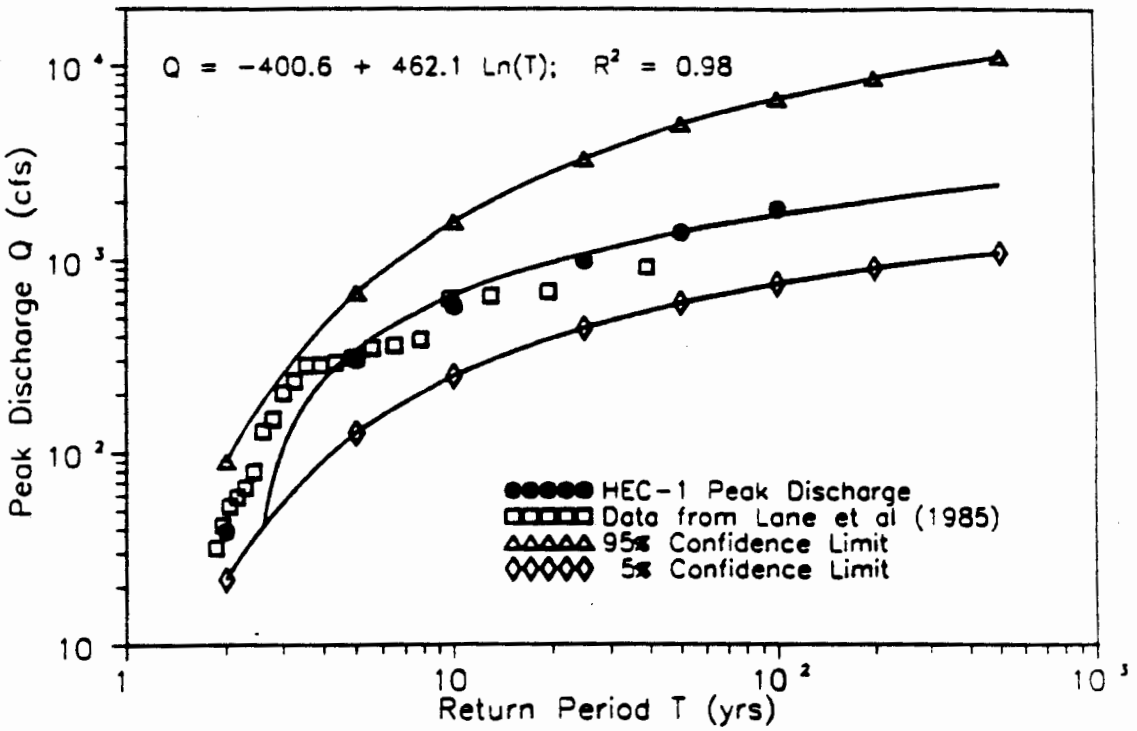


Fig. 12. Log-Pearson Type III analysis of synthetic and HEC-1 flood flows for Los Alamos Canyon at the Rio Grande.

natural and modified channel conditions. Water-surface profile analyses are commonly used to determine flood protection levee heights and flood hazard zones for insurance purposes. The HEC-1 and HEC-2 models are typically used in conjunction with one another for complex floodplain-assessment studies.

The HEC-2 program uses the standard-step numerical method that is based on energy losses to compute water-surface elevation changes between adjacent stream channel cross sections. These computed water-surface elevations correspond to hydrograph peak discharges obtained from HEC-1 simulations. Because energy, or friction, losses are intimately tied to Manning's equation for open channel flow, stream cross sections are required at locations where changes in discharge, slope, shape, and channel roughness occur. Here Manning's equation for English units is given by

$$Q = (1.49/n)AR^{2/3}S^{1/2} \text{ and } R = A/P, \qquad \text{(IV-1)}$$

where

Q	=	discharge (cfs),
A	=	area perpendicular to flow (ft^2),
R	=	hydraulic radius (ft),
P	=	wetted perimeter (ft),
S	=	energy slope (ft/ft), and
n	=	boundary surface roughness coefficient (dimensionless).

Water-surface profile calculations in HEC-2 begin at the downstream cross section for subcritical flow conditions and at the upstream cross section for supercritical flow. The same data rearranged

into a different order are used to make separate model simulations for each of these flow conditions. Model calculations sequentially progress either upstream (subcritical) or downstream (supercritical) from cross section to cross section. At bridge crossings and culverts, where flow hydraulics are more complex, momentum and other equations may be used to compute water-surface elevation changes. This model also takes into account losses resulting from contraction and expansion and from eddies, bends, and tributary junctions when adjustments are made to friction loss coefficients.

The HEC-2 computational methodology is based on the following flow conditions: (1) gradually varied steady flow, (2) one-dimensional flow with horizontal-velocity distribution corrections, (3) small channel slopes not exceeding ~10%, (4) a constant average friction slope between adjacent cross sections, and (5) rigid stream channel cross-sectional boundaries. Some hydraulic flow conditions that violate one or more of the above include (1) rapid downstream flood wave propagation resulting from dam breaching; (2) significant backwater effects caused by downstream boundary conditions such as tidal flows or tributary inflow effects; and (3) wide, flat floodplains that cause hydraulic flow disparities between the main channel and overbank areas.

It is not uncommon for many channel segments to have mixed flow regimes that are characterized by subcritical and supercritical flows that occur simultaneously in different parts of a single cross section or in adjacent cross sections. In these situations, the HEC-2 model must be run for both subcritical and supercritical flow conditions to determine the complete water-surface profile. However, most natural stream channels, including most mountain stream channels, exhibit subcritical flow conditions over the major part of their watercourses. The HEC-2 model is undoubtedly the most widely used technique for defining complex water-surface profiles. Many of the HEC-2 modeling capabilities are not described in detail here. Instead, the interested reader is referred to the HEC-2 user's manual (US Army COE 1982) for a complete description. Finally, it should be noted that the September 1988 FORTRAN version of the HEC-2 model, published as PROHEC2 (March 1990 release with modification 03) by Dodson & Associates, Inc., of Houston, Texas, was used in this study.

B. Stream Channel Geometries

In the HEC-2 model, flow-regime boundary geometry is defined by cross sections and the reach distances between adjacent cross sections. These cross sections, which characterize the flow capacity in the stream channel and overbank areas, are located at user-specified intervals along the stream channel. The model's accuracy can be increased if the distance between adjacent cross sections is reduced to allow more accurate computation of energy losses. Criteria for locating stream cross sections are given by Hoggan (1989, p. 335). According to him, reach lengths should not exceed 0.5 mi for wide floodplains having slopes <2 ft/mi, 1800 ft for slopes <3 ft/mi and 1200 ft for slopes >3 ft/mi. Obviously, there is a tradeoff between stream channel surveying costs and model accuracy requirements. Throughout this study, a constant reach distance of 250 ft was used to describe the geometries of all stream channel cross sections contained within the DOE-LANL complex. This implies literally hundreds of cross sections. However, costly field surveys were kept to a minimum because the majority of this topographic detail was automatically extracted from LANL's AUTOGIS-MOSS graphic information package.

There are actually three separate reach lengths required for each stream's cross section in HEC-2: one for the channel and one for each of the overbanks. HEC-2 uses a discharge-weighted, average reach length between adjacent cross sections and multiplies this distance by the average conveyance in energy loss calculations. Individual channel thalweg lengths were fixed at 250-ft intervals within MOSS. Actual stream channel locations were digitized from USGS 7.5 min base maps and read into MOSS. Cross-sections were uniquely located by MOSS using topographic profiles and geographically referenced coordinates. Because of thalweg meandering, it was assumed that both of the overbank reach lengths between all cross sections of stream channels within the DOE-LANL complex were fixed at 300 ft.

Once individual cross sections had been located within MOSS, a perpendicular topographic profile could be defined for the stream channel. Topographic data for cross sections were extracted from

Table 13. Typical HEC-2 input file identification scheme. See HEC-2 user manual for complete listing of all options.

Data Category	Record Identification	Data Description
Job Initialization	T1	Job ID Title Card (required)
	T2	Job ID Title Card (required)
	T3	Job ID Title Card (required)
	C	Comment Card for Documentation
Job Output Print Control	J1	Start Conditions and Options
	J2	Print Control and Options
	J3	Special Summary Printout Options
	J5	Special Summary Printout Options
	J6	Specify Friction Loss Equations
Job Control and Input Data Cards	QT	Peak Discharge Table from HEC-1
	NC	Manning cross-section n values
	NH	Horizontal Distance n values
	NV	Vertical Distance n values
	X1	Cross-Section ID and Data
	X3	Ineffective Flow Areas
	GR	Elevation and Station Data
	SB	Special Bridge Data Card
	BT	Bridge Geometry Data
	EJ	End of Run in Multiple Run Job
End of Job	ER	Required to End Job

MOSS and the cross sections were sequentially grouped. These groupings were then formatted within MOSS into an ASCII file, consistent with HEC-2 input data requirements, and exported to 5.25-in. magnetic disks for subsequent use. The actual input data file structure for all watersheds is very similar (see Disk No. 2). Table 13 illustrates a generic file structure for a typical subcritical flow simulation. All X1, X3, and GR data cards were generated in this fashion for each HEC-2 watershed simulation. These data files still required additional input parameters, as described below. Separate file configurations for both supercritical and subcritical conditions were generated for each stream channel, but only the latter configurations are given on Disk No. 2.

In spite of this procedure, the MOSS 2- and 10-ft topographic contour data were insufficient to hydraulically define main channel flows in HEC-2. Hence, an idealization of the main stream channel configuration was subsequently inserted into each profile as described below. These trapezoid-shaped channel inserts had a maximum top width of 4 ft, a maximum bottom width of 2 ft, and a fixed depth of 0.3 ft. Channel capacities for this idealized configuration do not exceed 1% of the specified 100-yr peak discharge for any section. Typically, this main channel insert is located near each profile midpoint and accounts for hydraulic variations in Manning's n-values between the main channel and overbank areas. In addition, this insert shape is characteristic of main channel geometries throughout Pajarito Plateau watersheds. Inclusion of these channel inserts proved satisfactory, and they were included in all subsequent HEC-2 simulations.

C. Channel Friction Losses

In HEC-2, the well-known Bernoulli equation is used to determine depths of flow between adjacent stream channel cross sections.

$$WL_2 + a_2V_2^2/2g = WL_1 + a_1V_1^2/2g + h_e$$

$$h_e = LS_f + C(a_2V_2^2/2g - a_1V_1^2/2g) \qquad \text{(IV-2)}$$

where

WL_1 and WL_2	=	upstream and downstream water elevations(ft),
V_1 and V_2	=	upstream and downstream mean velocities (ft/s),
a_1 and a_2	=	upstream and downstream velocity coefficients,
g	=	acceleration due to gravity (ft/sec^2),
h_e	=	energy head loss (ft),
L	=	discharge-weighted reach length (ft),
S_f	=	reach friction slope (dimensionless),
C	=	expansion or contraction loss coefficient, and
Q	=	peak discharge (Q = VA) at a section (cfs).

In general, the coefficient a in Equation (IV-2) is determined from the relationship

$$a = [(QV^2)_1 + (QV^2)_2 + \ldots + (QV^2)_k]/(QV^2)_{ave}. \qquad \text{(IV-3)}$$

where Q is discharge and V is velocity. The terms in the numerator represent complex velocity distribution effects in k localized subareas within a particular cross section, and the terms in the denominator represent average flow conditions in the entire cross section. Manning's Equation (IV-1) is initially used to determine how much of the cross-section's flow is in the channel and how much is in the overbank areas. Values for subarea conveyance (i.e., all terms in Manning's equation except the friction slope term) are therefore known if the friction (or energy) slope is assumed to be constant throughout a given cross section. The particular flow distribution between subareas at a given cross section is determined by multiplying the subarea conveyance and the square root of the friction slope. Localized mean velocities are determined by dividing subarea discharges by cross-section flow areas. Friction slope is approximated by the stream channel bottom slope because the water surface is assumed to parallel it in uniform flow. Hence, all of the terms in Equations (IV-2) and (IV-3) are known, except for a starting water-surface elevation at either the downstream (subcritical) or upstream (supercritical) end of the watercourse, expansion or contraction coefficients, Manning's roughness factor n, and stream discharge. All of these parameters are specified as input data. Therefore, iteration by the standard-step method is used to solve Equations (IV-2) and (IV-3) for WL at all remaining cross sections.

The iteration process mentioned above is terminated when successive, unknown water-surface elevation values at a given cross section converge to within 0.01 ft. Once this elevation has been determined, additional checks are performed to see if this value is above the critical depth for a subcritical simulation or below the critical depth for a supercritical run. If these checks indicate otherwise, then the critical depth is assumed to exist at that section, and a message is printed by the program. The simulation then continues with the next unknown water surface elevation at an adjacent cross section until the last profile is reached. It should be emphasized that the computed depths are constrained to be equal to or greater than the critical depth for subcritical simulations and equal to or less than the critical depth for supercritical runs. Hence, one must run separate simulations for subcritical and supercritical flows. On occasion, changes in velocity heads between adjacent cross sections are too great for the HEC-2 model to accurately determine the energy gradient. For these situations, the HEC-2 model will automatically insert up to three interpolated cross sections between two adjacent user-specified cross sections so that the velocity head difference does not exceed a user-specified amount, typically 0.5 ft. By comparing velocity

heads at successive cross sections the program also determines whether or not the flow is contracting or expanding. The program then applies the appropriate coefficient based on this determination.

It should be noted that only the subcritical flow depths at individual cross sections were used to map 100-yr floodplains in this study. While computed water surface elevations at individual cross sections occasionally corresponded to the critical depth at that section, supercritical depths were not subsequently calculated. The reason for this is straightforward: if a critical depth were found at a given section during a subcritical run, we would know that the actual flow depth must be equal to or less than the critical depth. Thus, the actual floodplain width will be equal to or less than the computed width at that cross-section. In other words, using a computed floodplain width from a subcritical flow simulation that corresponds to the critical depth is conservative, and the mapped floodplain is depicted as being wider than it would actually be. While this procedure is conservative if we are defining floodplain widths, it should not be used for any design calculations that utilize flow velocities (i.e., embankment stability or sediment transport calculations). The reason for this statement is that supercritical flow velocities are equal to or larger than the computed critical flow velocities.

Finally, it should be mentioned that friction losses can be simulated four different ways in the HEC-2 model. The actual technique employed can be user specified or automatically selected by the HEC-2 model according to certain selection criteria. These criteria are based on flow conditions (i.e., either subcritical or supercritical) and a comparison of friction slope changes between cross sections. All of these loss equations produce similar results when short reach lengths are used. Because relatively short reach lengths were used in this study, the automatic selection option was used here. In addition, a constant Manning's n-value of 0.09 was used in all stream channels, and an n-value of 0.12 was used for all overbank areas. The first value (Hoggan 1989, pp. 327-330) corresponds to a tabulated n-value for natural mountainous channels with deep pools, large boulders, and heavy timber stands. The second value corresponds to floodplains with heavy timber stands that have flood stages below branches, little undergrowth, and downed trees. All of these conditions are typical throughout the LANL complex. If localized conditions indicated a change was warranted, individual cross sections were occasionally given different n-values from those listed above. However, standard tabulated n-values were still employed. Perhaps it should also be noted that the effects of channel improvements were also simulated in Los Alamos Canyon near TA-41 and TA-2. These improvements are not discussed in detail here. Instead the interested reader is directed to the input data file for this site. Standard expansion/contraction coefficients of 0.2 and 0.4 were also used throughout this study for all watersheds.

D. Starting Water-Surface Elevations

The starting water-surface elevation must be specified for all HEC-2 simulations. This single parameter is the most difficult starting condition to determine. Typically, one of three techniques is used to establish this value. These techniques are (1) obtaining a known water-surface elevation from a channel rating curve or from direct field observations, (2) estimating a normal flow depth from slope/area computations, and (3) assuming the critical depth. In this study, a combination of the second and third techniques was used, as explained below.

Initially, the critical depth at the down stream cross section was assumed for all HEC-2 subcritical watershed simulations. These initial simulations yielded a preliminary estimate for the energy grade line passing through the first three cross sections located immediately adjacent to the starting cross-section. Hence, refined estimates for the starting water-surface elevation and the slope of the energy grade line at the downstream cross-section were obtained through linear interpolation. These values were specified on the J1 data card in the HEC-2 input data file, as seen in Table 13. A second simulation was then performed. The program computed a discharge for uniform flow conditions and compared it to the user-specified discharge. If there was a significant difference in these two discharge values, the program adjusted the starting water-surface elevation and computed a new normal discharge. This procedure was repeated until the normal discharge agreed to within 1% of the user-specified discharge. The final computed water-surface elevation was then taken as the

starting elevation. It should be noted that this elevation was still constrained to be equal to or greater than the critical depth for subcritical flow simulations and equal to or less than critical depth for supercritical runs. Once this starting depth was fixed, the remaining cross section's flow depths were computed as previously described. This technique worked for most stream channels. Occasionally, however, it was not successful and the critical depth was finally assumed to be the starting water-surface elevation for that watershed.

The above procedure implies that natural channels meet uniform flow conditions, that the energy grade is approximately equal to the average channel-bed slope, and that water surface-elevations can be obtained from a normal-depth calculation. These assumptions are probably conservative in most natural channels. This procedure will even accommodate situations where floodplain topography is relatively uneven. It should be pointed out, however, that floodplains at the eastern boundary of the DOE-LANL complex are relatively broad and flat. Hence the above procedure proved more than adequate.

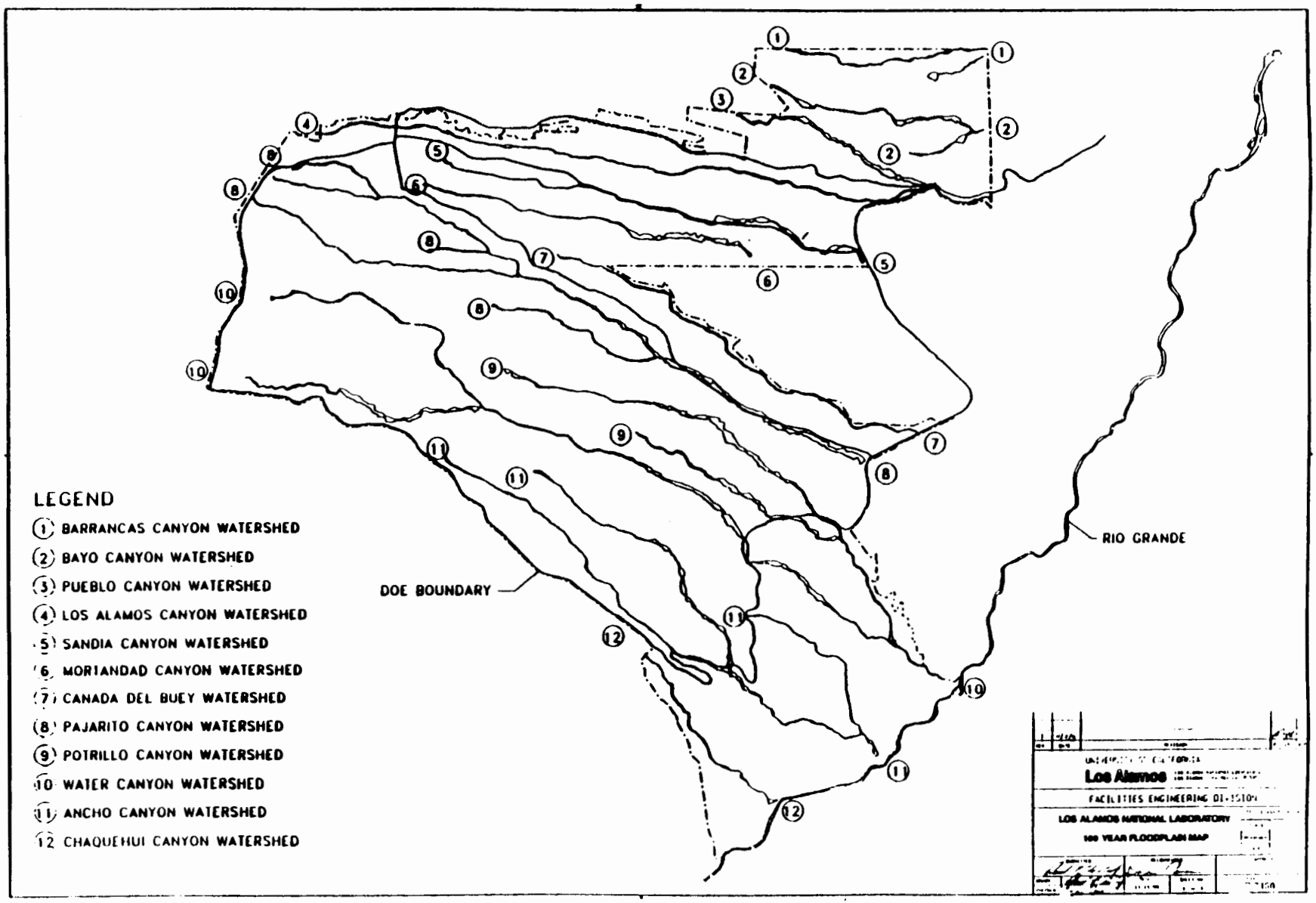
E. Computed Water-Surface Profiles

The above procedures were used to map all 100-yr floodplain boundaries within the DOE-LANL complex. The HEC-2-computed water-surface elevation at each channel section, along with the left and right channel stations where this water surface intersects the ground, were then read back into the MOSS system. This information was then transformed within MOSS to determine New Mexico state plane geographically referenced coordinates that uniquely define the 100-yr floodpool at each cross section. These paired coordinates were linked together as MOSS area features to identify each watershed floodplain. In this particular application, 11 separate elongated watersheds traverse LANL lands, with individual channels ranging up to 9 mi in length. The 100-yr floodplain was defined on each channel segment at 250 ft intervals. Figure 13 shows these preliminary floodplain boundaries. Detailed, 1:4800-scale maps with 10-ft topographic contours and floodplains were then generated by MOSS. Floodplain boundaries were defined by connecting 100-yr floodpool elevations located at channel cross sections with straight lines. These lines were then hand smoothed, using elevation contours and floodplain widths for control. This procedure was followed because occasional small stream bends that are located between cross sections periodically meander outside the original straight-line floodplain boundaries. Finally these smoothed boundaries were digitized within the MOSS system to define floodplains within the DOE-LANL facility. These floodplain boundary maps are intended to supplement this report and are maintained on file in LANL's ENG-2 group office.

Using the information provided in the appendixes of this report, the interested reader can replicate these floodplain maps. In addition, other important hydraulic data may be generated for individual watershed cross sections. This additional information is not included here because it is quite extensive. Using the HEC-1 and HEC-2 input data files listed on Disks 1 and 2, however, the reader can simply run individual watershed simulations and generate the data as required. When the HEC-2 model is used, approximately 40 different variables may be printed for each crosssection. Standard model output includes an input data file listing, detailed output for each section, summary tables, and line printer profile plots. This output can be directed to the computer screen for review, or it may be saved to an output file for later use. The user can tailor the majority of this output for specific needs. The HEC-2 input data files listed on Disk No. 2 of this report have been customized for limited output. The interested reader should be aware that these input data files may be modified to generate as much or a little information as he or she desires.

V. FINAL FLOODPLAIN DEFINITIONS

The procedure described in Appendix A initially defined floodplains in the MOSS system using the MOSS polygon feature to connect 100-yr floodpool elevations with straight lines. Ten-ft topographic contours were overlaid onto these floodplain boundaries and 25 maps were plotted at a scale


LEGEND
1 BARRANCAS CANYON WATERSHED
2 BAYO CANYON WATERSHED
3 PUEBLO CANYON WATERSHED
4 LOS ALAMOS CANYON WATERSHED
5 SANDIA CANYON WATERSHED
6 MORTANDAD CANYON WATERSHED
7 CANADA DEL BUEY WATERSHED
8 PAJARITO CANYON WATERSHED
9 POTRILLO CANYON WATERSHED
10 WATER CANYON WATERSHED
11 ANCHO CANYON WATERSHED
12 CHAQUEHUI CANYON WATERSHED
DOE BOUNDARY
RIO GRANDE
Los Alamos
FACILITIES ENGINEERING DIVISION
LOS ALAMOS NATIONAL LABORATORY
100 YEAR FLOODPLAIN MAP

of 1:4800. These maps provide coverage of the entire DOE-LANL complex. However, meandering stream channels occasionally crossed these straight-line floodplain boundaries at locations midway between HEC-2-defined stream cross sections. In order to correct this apparent inconsistency, the following additional mapping procedure was employed. For control, topographic contours and HEC-2 floodplain elevations and widths were used to hand smooth all straight-line floodplain boundaries between individual stream cross sections. It should be emphasized that original HEC-2 floodplain elevations and widths were not altered during this process. These new floodplain curvilinear boundaries were finally digitized and remain in MOSS system files (ENG-2 File Number R-7160).

VI. CONCLUSIONS

The following general conclusions can be stated:

1. The HEC procedures described here are recognized by the EPA, the COE, and others as being a state-of-the-art technique for mapping 100-yr floodplain boundaries in ungaged watersheds. This report documents this mapping procedure and, along with the floodplain boundary maps (ENG-2 File Number R-7160), is intended to satisfy the RCRA/HSWA permit condition requiring complete floodplain definitions within the DOE-LANL facility boundary.

2. The 100-yr floodplain boundary maps referenced herein are only intended to satisfy the RCRA/HSWA permit condition. Other applications of these maps at specific locations within the LANL complex may warrant additional site-specific field investigations and modified HEC-1 and HEC-2 simulations. For example, individual road culverts were often omitted in HEC-2 simulations. Furthermore, only MOSS 10-ft-contour-interval data were available for a large percentage of the DOE-LANL complex. These areas tended to be located within the canyons on the eastern facility boundary but are certainly not confined to these perimeter regions. Hence, additional floodplain mapping efforts would be desirable for specific waste disposal site investigations or any safety-related site evaluations.

3. LANL's AUTOGIS-MOSS graphic information system was used in this study to define all HEC-2 stream channel profiles at 250-ft intervals. These data were automatically extracted from the MOSS system in an ASCII format compatible with HEC-2 input data requirements. Approximately 65% of the DOE-LANL facility has 2-ft-topographic contour interval data, and 35% has 10-ft contour interval data. Once the HEC-2 model had been used to define floodplain boundaries for all major watershed channels, this information was read back into the MOSS system. Floodplains were initially defined by connecting 100-yr floodpool elevations with straight lines. These boundaries were then hand smoothed using topographic contours and floodplain widths and elevations for control. All original HEC-2 floodplain widths and elevations at stream cross sections were retained during this procedure. These new floodplain line boundaries were finally digitized and remain in MOSS system files.

4. Continuous rainfall-runoff simulation models calibrated to specific gaged watersheds may represent an improvement over the HEC-1 and HEC-2 modeling procedures employed in this study. However, extensions of these research models to ungaged watersheds have not been adequately documented in the literature. Criticism of the event-simulation approach centers on the design assumption that rainfall of a given frequency results in runoff of the same frequency. However, this issue was not addressed in this work. Until the dynamic nature of the rainfall-runoff process is better understood, HEC-1 and HEC-2 represent the best available technology for the definition of floodplains in ungaged watersheds.

5. The SCS curve number method was used in this study to predict runoff. The relative merits of this empirical approach versus physically based representations have been extensively debated in the literature. However, Loague and Freeze (1985) have shown that physically based models

generally do not predict runoff any better than relatively simple approaches. Furthermore, the SCS method has the advantage that future changes in watershed land-use patterns can be easily simulated.

6. The procedure outlined here is flexible in that other return-period intervals for the floodplain could also be computed. For example, other storm durations and return-period intervals could be used to define other floodplain boundaries. In addition, the Nuclear Regulatory Commission does not use a return-period definition for their floodplain elevation studies. Instead, they typically specify that the probable maximum flood (PMF) be used to define the floodplain. With minor changes, the input data files contained in this report could also be used to define the PMF floodplain boundary.

7. Flood flow studies described here can provide information for sediment transport simulations that use the HEC-6 model (US Army COE, 1977). For example, once floodplain elevations have been specified for a given canyon, one can associate a peak hydrograph with that floodplain definition. One could extend this hydrograph peak association to include a mean channel stream velocity for each individual canyon location. These mean velocities would obviously have future implications for sediment transport potential.

VII. ACKNOWLEDGMENTS

This study could not have been completed without the assistance of several key individuals. George Fuller, MOSS systems programer with Autometric, Inc., Lakewood, Colorado, developed the software to extract topographic data from LANL's AUTOGIS-MOSS graphical information system and to insert floodplain elevations back into this system. George Tauxe, Associate Professor, School of Civil Engineering and Environmental Science, University of Oklahoma, Norman, Oklahoma, participated in invaluable discussions concerning HEC-1 and HEC-2 input file structure and parameter evaluation techniques. Brian Comer, Section Leader with ENG-2 at LANL, provided MOSS system support and plotted all floodplain maps. Finally, Molly Magnuson, hydrologist with the US Army COE in Albuquerque, New Mexico, provided valuable information on various topics including the application of Snyder's unit hydrograph theory to New Mexico streams. These individuals' contributions to this effort are greatly appreciated.

VIII. REFERENCES

Borland, J.P., "A Proposed Stream Flow-data Program for New Mexico," US Geological Survey, Albuquerque office, open file report (September 1970) p. 71.

Bowen, B. M., "Los Alamos Climatology," Los Alamos National Laboratory report LA-11735-MS (May 1990).

Chow, V.T., D.R. Maidment, and L.W. Mays, *Applied Hydrology* (McGraw-Hill, New York, 1988) p. 572.

Comer, B.E., and S.G. McLin, *100-Year Floodplain Maps*, Los Alamos National Laboratory's Facilities Engineering Planning Group Office (ENG-2 File Number R-7160, 1991).

Graf, W.L., *Fluvial Processes in Dryland Rivers*, (Springer-Verlag, New York, 1988) p. 90.

Graf, W.L., "Geomorphology of Plutonium in the Northern Rio Grande System," Geography Dept., Arizona State Univ., Tempe, AZ.

Hoggan, D.H., *Computer-Assisted Floodplain Hydrology and Hydraulics* (McGraw-Hill Publishing Co., New York, 1989)

Lane, L.J., W.D. Purtymun, and N.M. Becker, "New Estimating Procedures for Surface Runoff, Sediment Yield, and Contaminant Transport in Los Alamos County, New Mexico," Los Alamos National Laboratory report LA-10335-MS (April 1985)

Loague, K.M., and R.A. Freeze, "A Comparison of Rainfall-Runoff Modeling Techniques for Small Upland Catchments", *Water Resources Research, Washington, DC*, **21** (2) p. 229–248 (1985).

Linsley, R.K., M.A. Kohler, and J.L.H. Paulhus, *Hydrology for Engineers* (McGraw-Hill, New York, 1982).

Miller, J.F., R.H. Frederick, and R.J. Tracy, *Precipitation-Frequency Atlas of the Western United States*, Vol. IV (US Government Printing Office, Washington, DC, 1973).

Nyhan, J.W., L.W. Hacker, T.E. Calhoun, and D.L. Young, "Soil Survey of Los Alamos County, New Mexico," Los Alamos Scientific Laboratory report LA-6779-MS (June 1978).

Scott, A.G., "Preliminary Flood-Frequency Relations and Summary of Maximum Discharges in New Mexico: A Progress Report," US Geological Survey, Albuquerque, open-file report (June 1971).

US Soil Conversation Service, Hydrology Supplement A to Section 4, *Engineering Handbook*, (US Government Printing Office, Washington, DC, 1968).

Thomas, R.P., and R.L. Gold, "Techniques for Estimating Flood Discharges for Unregulated Streams in New Mexico," US Geological Survey, Water Resources Investigations report 82-24 (1982).

US Army Corps of Engineers, *Flood Hydrograph Analysis and Computation*, Pub. No. EM-1110-2-1405 (US Government Printing Office, Washington, DC, 1959).

US Army Corps of Engineers, *HEC-6 Scour and Deposition in Rivers and Reservoirs*, Users Manual for Computer Program 723-G2-L2470 (The Hydrologic Engineering Center, Davis California, 1977).

US Army Corps of Engineers, *HEC-1 Flood Hydrograph Package*, Users Manual for Computer Program 723-X6-L2010 (The Hydrologic Engineering Center, Davis, California, 1990).

US Army Corps of Engineers, *HEC-2 Water Surface Profiles*, Users Manual for Computer Program 723-X6-L202A (The Hydrologic Engineering Center, Davis, California, 1982).

US Army Corps of Engineers, *Flood Flow Frequency Analysis*, Users Manual for Computer Program 723-X6-L7550 (The Hydrologic Engineering Center, Davis, California, 1982).

US Bureau of Reclamation, *Design of Small Dams*, (US Government Printing Office, Washington, DC, 1977).

Waltemeyer, S.D., "Techniques for Estimating Flood-Flow Frequency for Unregulated Streams in New Mexico," US Geological Survey, Water Resources Investigations report 86-4104 (1986).

Water Resources Council, *A Uniform Technique for Determining Flood Flow Frequencies*, Bulletin No. 15 (Water Resources Council, Washington, DC, 1967).

Water Resources Council, *Guidelines for Determining Flood Flow Frequency*, Bulletin No. 17B (Water Resources Council, Washington, DC, 1981).

Viessman, W., J.W. Knapp, G.L. Lewis, and T.E. Harbaugh, *Introduction to Hydrology*, 2nd ed. (Harper and Row Publishers, New York, 1977).

APPENDIX A
AUTOGIS-MOSS SYSTEM

I. Extraction of MOSS Topographic Data

This section documents the procedure used to automatically extract topographic data from LANL's graphic information system for use in HEC-2 simulations. Readers who are not familiar with the procedure can skip to the next section without loss in continuity. The MOSS source codes used to extract this topographic data are given on Disk No. 1 in this report.

In order to transport MOSS topographic data to an HEC-2 input data file, a series of user-activated steps was performed on existing and derived MOSS data sets. This procedure is briefly described below. The source programs to extract this information were developed by Autometric, Inc., under contract to LANL, and are maintained on the AUTOGIS-MOSS system by ENG-2. Section III of this appendix contains a complete source listing of these programs. Note that these programs require other MOSS utility features, which are described in the MOSS users manual. The sample MOSS session listed below details all necessary interactive user responses in a typical MOSS data-extraction process. Note that MOSS computer terminal user responses are in bold letters.

MOSS data extraction requirements for HEC-2 utilization include topographic contour files and stream channel location files. The contour files already existed in the LANL's MOSS system and were originally obtained from aerial photography transformations. The stream channel location files were created for this floodplain study by digitizing major stream channel locations from USGS 7.5-min topographic maps and geographically referencing them to known bench marks. These location files, which indicate the stream center line and have the drainage basin name as their subject, were entered into MOSS in a line format. The MOSS file name containing these stream channel location files is DRAINS. The MOSS topographic data are also in a line format and have numerical subjects that equal their represented elevations. These topographic data are actually included on a series of MOSS contour maps having either 2- or 10-ft contour intervals. However, in order to obtain complete topographic coverage for a given watershed, use of both the 2- and 10-ft-contour-interval maps was required. This resulted in a total number of contour maps that exceeded the maximum allowable active IDs within MOSS. Hence, the 2- and 10-ft-contour-interval maps of the entire LANL complex were merged into a series of single maps each containing both 2- and 10-ft-contour-interval data. The resultant MOSS master project file, LANLM, contains these merged contour maps. This master project file, which represents the resultant file from the MOSS utility entiled MAPIDX, also contains the maps, DRAINS and LANLINDEX, as described below. Using the stream location file, DRAINS, and the contour map index, LANLINDEX, it is a straightforward process to identify those merged MOSS contour maps that may be required for a given watershed application.

For each watershed draining the LANL complex, a file was constructed that defined the map names containing the topographic data This file was then used with the MOSS SELECT command using the FROM option. For more information concerning the SELECT FROM command, see the MOSS user's manual or use the MOSS HELP SELECT command. A list of the SELECT FROM files used in this study includes

FORALAMOS	FORANCHO	FORBAYO	FORCANADA	FORCHAQUE
FORINDEX	FORMORTAN	FORPAJAR0	FORPAJAR1	FORPAJAR2
FORPOTRIL	FORPUBELO	FORSANDIA	FORWATER	

The file, USESPLAT, was also used with the SELECT FROM command, as illustrated by the following example:

```
SELECT FROM FORALAMOS USESPLAT
```

The content of USESPLAT is the single ASCII character "*", which is the MOSS wild card character that matches any character string, and is similar to the AOS/VS "+" template.

There is also a set of files that were used in conjunction with the special FORINDEX file. This file contains all the contour map minimum-bounding rectangles from the map index for each watershed. A list of the SELECT FROM FORINDEX files includes

FALAX	FANCX	FBAYX	FCANX	FCHAX
FMORX	FPAJX0	FPAJX1	FPAJX2	FPOTX
FPUEX	FSANX	FWATX		

These files replace the USESPLAT file mentioned above, as illustrated by the following example:

SELECT FROM FORINDEX FALAX

The result of the SELECT FROM command produces from 1 to 38 active data sets from the merged contour maps, as detailed below. For a given watershed, the stream location file will be a single active ID within MOSS, while the corresponding contour data files will be several active IDs. It is possible that more than one ID will represent the stream location data and also that only one active ID will represent the topographic data. Derived data sets include extracted topographic profiles at stream cross sections and the imported maps produced from these profiles.

Once the stream location and contour data sets have been selected and placed into the active table as IDs, then the MOSS window must be set to include all of these data sets. The first stage of the data-extraction process (AHEC2) can now begin. The MOSS source code for the program AHEC2 is contained on Disk No. 1 in this report. The output from AHEC2 is imported into MOSS and visually checked. Once verified, the second stage of the data-extraction process (EXHEC2) can be initiated. The MOSS source code for the program EXHEC2 is also contained on Disk No. 1. The following abbreviated MOSS dialog provides an example of program execution. It is procedurally correct and represents either MOSS commands or programmatic dialog.

FREE ALL - Start with a clean active table

The selection of contour maps required for a given data-extraction application is best determined through the use of the utility procedure MAPIDX. This procedure will make an index map based on the minimum-bounding rectangular coverages of the contour maps. After plotting the stream location data and the index map, the user must select each contour map that contains topographic data of interest. Results of this utility execution were saved in the file named LANLINDEX. In this example, two files are used to select the contour data. The first file is called FORALAMOS and contains a list of the contour maps that could possibly contain topographic data on Los Alamos that may be of interest. The second file is called USESPLAT and contains the single wild-card character "*" to match all strings. For more information about these two files, see the MOSS users manual under SELECT FROM.

SELect DRAINAGE SUbject *ALAMOS* — Select stream location files for this run.

SELect FROM FORALAMOS USESPLAT — Select all contour maps around the Los Alamos Canyon drainage basin.

WIndow ALL — Set window to entire geographic region

AHEC2 — Invoke the AHEC2 program

At this point, the automated topographic data-extraction and file generator program, AHEC2, will prompt the user to give definable parameters before execution. In this example, there is one active ID for the stream location data, and there are 38 IDs for the contour data. The default vertical height and horizontal distance values are displayed by MOSS in square brackets. These default values are selected by hitting NEWLINE or CARRIAGE RETURN; alternate values may also be entered by the user. Here the vertical height refers to the maximum elevation difference

between the stream channel's highest and lowest elevation points within the profile. Horizontal distance refers to the distance along the profile located perpendicular to either side of the stream channel. The extracted topographic data will be constrained to these limits

Enter active IDs to use for DRAINAGES. 1

Enter active IDs to use for CONTOURS. 2 TH 39

Enter vertical HEIGHT from bottom of DRAINAGE [25] Carriage Return — 25 ft of vertical relief will be included in the stream channel profile.

Enter horizontal DISTANCE between PROFILES [250]. Carriage Return — the total profile width will be 250 ft on either side of the stream channel, giving a total profile distance of 500 ft.

The program could spend time determining which way is downhill or uphill. However, it is much simpler for the user to point with the graphics cursor to indicate drainage direction. After entering these points, the program will pause until the user enters an additional CARRIAGE RETURN, indicating that everything is correct and ready to proceed.

Point to DOWNHILL end of DRAINAGE — use graphics cursor. Point to UPHILL end of DRAINAGE — use graphics cursor. HIT NEWLINE TO CONTINUE.

Two MOSS IMPORT files are now generated. The first is a 2-D file containing profile lines at 250-ft intervals along the stream location file, and the second is a corresponding 3-D file containing data about stream channel cross sections. These 2-D profile lines were generated and used by AHEC2 to construct the 3-D cross sections by intersecting each 2-D profile line with all topographic contour data. The 3-D cross sections are a series of (X,Y,Z) triplets with the (x,y) portion defined by the intersection of a specific 2-D profile line with a specific contour line. The subject of the contour line determines the z portion, or elevation, of the triplet. The (x,z) data pairs in each triplet correspond to the station and elevation locations required on GR data cards in the HEC-2 input data file, as shown in Table 13. Note that this information is actually exported as (z,x) during the formatting process. It should also be noted that the first x value on a given cross section profile line is assigned a relative value of zero, and all remaining x values are referenced to this origin. This procedure is identical to that in the HEC-2 model as one looks downstream at the profile line. Hence, the first x position is located at the extreme left of the profile line as one looks downstream. The MOSS file maintains the original geographically referenced coordinate positions of all x values, but this information is not used in the HEC-2 model.

Results from the AHEC2 program are now imported to MOSS. The 2-D profile lines are not essential but allow the user to determine where contour data are missing. The 2-D profile lines are imported as a Type 2 map (line) with the input file name PROFILE.2D. The 3-D cross sections are critical to the second and final stage of the extraction process and must be imported to MOSS. The input file which is named PROFILE.3D, is imported as a Type 12 map [(x,y,z) line map]. Once imported, the resultant Type 12 map must be selected.

The selected ID will be used in the EXHEC2 program command procedure. This portion of the extraction program will take the (x,y,z) data pairs and reformat them into (z,x) pairs as required by the HEC-2 model input structure on GR cards, as seen in Table 13. The EXHEC2 program will ask the user to give an active data set for reformatting, a resultant target file name, and information on whether the file is for a subcritical or supercritical HEC-2 input data file. The program will not overwrite an existing file name unless specified by the user. The example given below illustrates this procedure.

EXHec2 — Invoke the HEC-2 reformatter program option.
Enter active data set ID to reformat to HEC-2 standard

```
[CR = Exit]
40
For LOSALA3D , EXHEC2 file name [EXHEC2]
SUBLOSALA — File name for Los Alamos Canyon subcritical run
Is this a SUB- or SUPER- critical run (SUB/SUPER) [SUB]
SUB
NUMBER OF DATA ITEMS TO BE REFORMATTED = 184
EXECUTING. PLEASE WAIT...
```

This example uses active ID 40 as the 3-D map of the cross section. The HEC-2 input data file will be called SUBLOSALA and is a subcritical run. The program informs the user that 184 3-D cross sections will be in the final HEC-2 input data file. SUBLOSALA is subsequently transferred to a 5.25-in. magnetic disk in ASCII format for direct use by the HEC-2 program. This data transfer procedure only creates T1, T2, X1, X3, and GR cards, as seen in Table 13. Hence, the HEC-2 user must still enter additional input parameters into this file before a successful HEC-2 simulation can be performed.

II. Insertion of Floodplain Boundaries

This section documents the procedure used to automatically reinsert HEC-2 floodplain boundaries into LANL's graphic information system for final map generation. Readers who are not familiar with the procedure can skip to the next section without loss in continuity. The MOSS source code used to reinsert HEC-2 flood plan boundaries into MOSS is listed on Disk No. 1 in this report.

Once the HEC-2 simulation has been successfully completed for a given stream channel segment, the HEC-2 floodplain boundaries must be read back into MOSS. This procedure is described below. Before this second transfer, however, the HEC-2 user must tailor model output for this floodplain boundary-insertion process. Required HEC-2 output includes the cross section's number; the left- and right-station numbers where the computed water surface intersects the ground; and the computed water-surface elevation, floodplain top width, floodplain depth, and cross-sectional flow area. The HEC-2 output file name must correspond to an original MOSS data-extraction output file, and all cross-section numbers must be identical in both files. The MOSS insertion program uses this HEC-2 file name and cross-section-numbering scheme to translate floodplain boundary data into unique, geographically referenced New Mexico state plain coordinates. The HEC-2 input data files listed on Disk No. 2 of this report are set up to provide the proper output to the MOSS insertion program. The first J3 card shown in Table 13 for each file actually provides this required output for the MOSS insertion procedure. All remaining HEC-2 output is extraneous and must be stripped from the HEC-2 output file. Hence, the HEC-2 user must edit output files with an independent file editor or word processor and remove all unnecessary information from an HEC-2 output file. This modified HEC-2 output file is now transferred back to the MOSS system in ASCII format on a 5.25-in magnetic disk. The actual insertion procedure can now begin.

To insert HEC-2 floodplain elevations into the MOSS system at known cross sections, a series of user-activated steps is performed on pre-existing MOSS data sets. These data sets correspond to the modified HEC-2 output files that were described above. The actual MOSS insertion procedure is briefly described here. The source program used to complete this task was developed by Autometric, Inc., under contract to LANL, and is maintained on the AUTOGIS-MOSS system by ENG-2; this source program is listed on Disk No. 1 of this report. The sample MOSS session listed below details all necessary interactive user responses in a typical floodplain boundary-insertion process.

FPHEC2 is the AUTOGIS-MOSS data-reformatting program, or command, and is the third and final step in the floodplain-modeling process. As mentioned above, this step makes use of data files generated from the actual HEC-2 modeling process and MOSS data files created with EXHEC2. The EXHEC2 command was described above; this command generates a 3-D floodplain MOSS import file. The FPHEC2 command format is specified as follows:

FPHec2 (active data set) (output file name).

The following dialog illustrates the use of this MOSS command in a typical floodplain data reinsertion procedure. Note that user responses are in bold letters.

Enter Command? FPHec2
Enter HEC-2 model results filename [CR = EXIT]
CANADA.DAT
Enter HEC-2 model Geo-Reference filename [CR = EXIT]
SUBCANA.REF
Enter resultant MOSS IMPORT floodplain name [CR = EXIT]
CANAFP.EXP
HEC RECORDS 158 REF RECORDS 156 CORDS 313

This example matches the HEC-2 output file named CANADA.DAT with the MOSS EXHEC2-generated Geo-Reference file named SUBCANA.REF and produces a MOSS import file named CANAFP.EXP. For each complete stream channel profile in both the MOSS Geo-Reference and the HEC-2 files, a pair of coordinate triplets (x,y,z) are generated. Once these triplets have been calculated, they are ordered by section number to form a 3-D polygon and written to the MOSS export file specified by the user. The HEC-2 output file must include each stream channel cross section number and the computed water-surface elevation. The Geo-Reference file's section numbers are checked to insure that they match. This is the only way to determine the actual New Mexico state plane ground coordinates that delineate the floodplain. The resulting MOSS import file should then be imported into MOSS as a Type 13 (3-D polygon) file. Finally, it should be noted that any HEC-2 sections that are not exactly matched with corresponding sections in the MOSS Geo-Reference file are not included in the final MOSS export file.

APPENDIX B
TABULATED HEC-1 INPUT PARAMETERS

GUAJE CANYON

HEC-1 INPUT DATA FILE PARAMETER CALCULATION
SEE UD DATA CARD FOR SCS UNIT HYDROGRAPH LAG TIME DEFINITIONS

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS BASIN LAG TIME (hrs)
L = CHANNEL LENGTH TO WATER DIVIDE (ft)
X = BASIN ELEVATION CHANGE OVER LENGTH L (ft)
CN= SCS CURVE NUMBER FOR AMC-II MOISTURE CONDITIONS (dim)
S = 1000/CN - 10 = POTENTIAL RAINFALL RETENTION (in)
Y = 100X/L = GROSS WATERSHED SLOPE (%)
A = SUB-BASIN DRAINAGE AREA (sq. miles)

BASIN NO.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	34000	3277	55	8.18	9.64	11.30	3.38
2	24000	947	68	4.71	3.95	3.25	2.86
3	46000	3600	69	4.49	7.83	9.59	3.33
4	12750	355	75	3.33	2.78	2.13	1.69
5	9000	215	70	4.29	2.39	1.45	1.59

HEC-1 INPUT DATA FILE PARAMETER CALCULATION
SEE RM DATA CARD FOR MUSKINGUM ROUTING PARAMETER DEFINITIONS

$0.1 < x < 0.3$
$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)
K = L/(3600*Vel) (hours)
Nstps = 60K/NMIN (dimensionless)
NSTPS = INTEGER VALUE FOR Nstps
NMIN = MINUTES FROM CARD IT
1/[2(1-x)] < CHECK < 1/(2x)
CHECK = (60K)/(NMIN*NSTPS)

x = 0.20
R(ft) = 2.00
n = 0.10
NMIN = 15.00
1/[2(1-x)] = 0.63
1/(2x) = 2.50

BASIN NO.	L (ft)	Vel	K	Nstps	NSTPS	CHECK	AMSKK
1	34000	7.3	1.29	5.14	5	1.03	1.29
2	24000	4.7	1.42	5.67	6	0.95	1.42
3	46000	6.6	1.93	7.72	8	0.97	1.93
4	12750	3.9	0.90	3.59	4	0.90	0.90
5	9000	3.7	0.68	2.73	3	0.91	0.68

BARRANCAS CANYON

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE UD DATA CARD FOR SCS UNIT HYDROGRAPH LAG TIME DEFINITIONS

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS BASIN LAG TIME (hrs)

L = CHANNEL LENGTH TO WATER DIVIDE (ft)

X = BASIN ELEVATION CHANGE OVER LENGTH L (ft)

CN= SCS CURVE NUMBER FOR AMC-II MOISTURE CONDITIONS (dim)

S = 1000/CN - 10 = POTENTIAL RAINFALL RETENTION (in)

Y = 100X/L = GROSS WATERSHED SLOPE (%)

A = SUB-BASIN DRAINAGE AREA (sq. miles)

BASIN NO.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	25500	1245	72	3.89	4.88	1.79	2.42
2	7250	750	76	3.16	10.34	0.33	0.54
3	23000	1267	72	3.89	5.51	2.52	2.10
4	3250	365	76	3.16	11.23	0.21	0.27

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE RM DATA CARD FOR MUSKINGUM ROUTING PARAMETER DEFINITIONS

$0.1 < x < 0.3$

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)

K = L/(3600*Vel) (hours)

Nstps = 60K/NMIN (dimensionless)

NSTPS = INTEGER VALUE FOR Nstps

NMIN = MINUTES FROM CARD IT

$1/[2(1-x)] < CHECK < 1/(2x)$

CHECK = (60K)/(NMIN*NSTPS)

x	=	0.20
R(ft)	=	2.00
n	=	0.10
NMIN	=	15.00
1/[2(1-x)]	=	0.63
1/(2x)	=	2.50

BASIN NO.	L (ft)	Vel	K	Nstps	NSTPS	CHECK	AMSKK
1	25500	5.2	1.36	5.42	5	1.08	1.36
2	7250	7.6	0.26	1.06	1	1.06	0.26
3	23000	5.6	1.15	4.60	5	0.92	1.15
4	3250	7.9	0.11	0.46	1	0.46	0.11

BAYO CANYON

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE UD DATA CARD FOR SCS UNIT HYDROGRAPH LAG TIME DEFINITIONS

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS BASIN LAG TIME (hrs)

L = CHANNEL LENGTH TO WATER DIVIDE (ft)

X = BASIN ELEVATION CHANGE OVER LENGTH L (ft)

CN= SCS CURVE NUMBER FOR AMC-II MOISTURE CONDITIONS (dim)

S = 1000/CN - 10 = POTENTIAL RAINFALL RETENTION (in)

Y = 100X/L = GROSS WATERSHED SLOPE (%)

A = SUB-BASIN DRAINAGE AREA (sq. miles)

BASIN NO.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	16750	745	65	5.38	4.45	1.57	2.19
2	15250	535	74	3.51	3.51	1.16	1.79
3	12750	945	75	3.33	7.41	1.19	1.04

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE RM DATA CARD FOR MUSKINGUM ROUTING PARAMETER DEFINITIONS

$0.1 < x < 0.3$

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)

K = L/(3600*Vel) (hours)

Nstps = 60K/NMIN (dimensionless)

NSTPS = INTEGER VALUE FOR Nstps

NMIN = MINUTES FROM CARD IT

$1/[2(1-x)] < CHECK < 1/(2x)$

CHECK = (60K)/(NMIN*NSTPS)

x	=	0.20
R(ft)	=	2.00
n	=	0.10
NMIN	=	15.00
1/[2(1-x)]	=	0.63
1/(2x)	=	2.50

BASIN NO.	L (ft)	Vel	K	Nstps	NSTPS	CHECK	AMSKK
1	16750	5.0	0.93	3.73	4	0.93	0.93
2	15250	4.4	0.96	3.82	4	0.96	0.96
3	12750	6.4	0.55	2.20	2	1.10	0.55

PUEBLO CANYON

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE UD DATA CARD FOR SCS UNIT HYDROGRAPH LAG TIME DEFINITIONS

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS BASIN LAG TIME (hrs)

L = CHANNEL LENGTH TO WATER DIVIDE (ft)

X = BASIN ELEVATION CHANGE OVER LENGTH L (ft)

CN= SCS CURVE NUMBER FOR AMC-II MOISTURE CONDITIONS (dim)

S = 1000/CN - 10 = POTENTIAL RAINFALL RETENTION (in)

Y = 100X/L = GROSS WATERSHED SLOPE (%)

A = SUB-BASIN DRAINAGE AREA (sq. miles)

BASIN NO.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	15000	1930	56	7.86	12.87	2.24	1.48
2	24000	694	65	5.38	2.89	4.61	3.62
3	14000	246	74	3.51	1.76	1.55	2.37

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE RM DATA CARD FOR MUSKINGUM ROUTING PARAMETER DEFINITIONS

$0.1 < x < 0.3$

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)

K = L/(3600*Vel) (hours)

Nstps = 60K/NMIN (dimensionless)

NSTPS = INTEGER VALUE FOR Nstps

NMIN = MINUTES FROM CARD IT

$1/[2(1-x)] < CHECK < 1/(2x)$

CHECK = (60K)/(NMIN*NSTPS)

x	=	0.20
R(ft)	=	2.00
n	=	0.10
NMIN	=	15.00
1/[2(1-x)]	=	0.63
1/(2x)	=	2.50

BASIN NO.	L (ft)	Vel	K	Nstps	NSTPS	CHECK	AMSKK
1	15000	8.5	0.49	1.96	2	0.98	0.49
2	24000	4.0	1.66	6.63	7	0.95	1.66
3	14000	3.1	1.24	4.96	5	0.99	1.24

LOS ALAMOS CANYON
HEC-1 INPUT DATA FILE PARAMETER CALCULATION
SEE UD DATA CARD FOR SCS UNIT HYDROGRAPH LAG TIME DEFINITIONS

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS BASIN LAG TIME (hrs)
L = CHANNEL LENGTH TO WATER DIVIDE (ft)
X = BASIN ELEVATION CHANGE OVER LENGTH L (ft)
CN= SCS CURVE NUMBER FOR AMC-II MOISTURE CONDITIONS (dim)
S = 1000/CN - 10 = POTENTIAL RAINFALL RETENTION (in)
Y = 100X/L = GROSS WATERSHED SLOPE (%)
A = SUB-BASIN DRAINAGE AREA (sq. miles)

BASIN NO.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	20000	1943	52	9.23	9.72	6.33	2.37
2	10000	531	62	6.13	5.31	0.74	1.43
3	35000	846	68	4.71	2.42	3.31	4.95
4	11750	525	80	2.50	4.47	1.96	1.08
5	5000	100	75	3.33	2.00	0.77	0.95
6	7750	165	75	3.33	2.13	0.67	1.30

HEC-1 INPUT DATA FILE PARAMETER CALCULATION
SEE RM DATA CARD FOR MUSKINGUM ROUTING PARAMETER DEFINITIONS

$0.1 < x < 0.3$
$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)
K = L/(3600*Vel) (hours)
Nstps = 60K/NMIN (dimensionless)
NSTPS = INTEGER VALUE FOR Nstps
NMIN = MINUTES FROM CARD IT
$1/[2(1-x)] < CHECK < 1/(2x)$
CHECK = (60K)/(NMIN*NSTPS)

x = 0.20
R(ft) = 2.00
n = 0.10
NMIN = 15.00
$1/[2(1-x)]$ = 0.63
$1/(2x)$ = 2.50

BASIN NO.	L (ft)	Vel	K	Nstps	NSTPS	CHECK	AMSKK
1	20000	7.4	0.75	3.01	3	1.00	0.75
2	10000	5.5	0.51	2.04	2	1.02	0.51
3	35000	3.7	2.64	10.57	11	0.96	2.64
4	11750	5.0	0.65	2.61	3	0.87	0.65
5	5000	3.3	0.42	1.66	2	0.83	0.42
6	7750	3.5	0.62	2.49	2	1.25	0.62

SANDIA CANYON

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE UD DATA CARD FOR SCS UNIT HYDROGRAPH LAG TIME DEFINITIONS

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS BASIN LAG TIME (hrs)

L = CHANNEL LENGTH TO WATER DIVIDE (ft)

X = BASIN ELEVATION CHANGE OVER LENGTH L (ft)

CN= SCS CURVE NUMBER FOR AMC-II MOISTURE CONDITIONS (dim)

S = 1000/CN - 10 = POTENTIAL RAINFALL RETENTION (in)

Y = 100X/L = GROSS WATERSHED SLOPE (%)

A = SUB-BASIN DRAINAGE AREA (sq. miles)

BASIN NO.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	36750	1000	68	4.71	2.72	2.65	4.85
2	11750	370	75	3.33	3.15	0.85	1.49
3	10000	300	76	3.16	3.00	1.32	1.31
4	9000	635	79	2.66	7.06	0.75	0.72

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE RM DATA CARD FOR MUSKINGUM ROUTING PARAMETER DEFINITIONS

$0.1 < x < 0.3$

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)

K = L/(3600*Vel) (hours)

Nstps = 60K/NMIN (dimensionless)

NSTPS = INTEGER VALUE FOR Nstps

NMIN = MINUTES FROM CARD IT

1/[2(1-x)] < CHECK < 1/(2x)

CHECK = (60K)/(NMIN*NSTPS)

x	=	0.20
R(ft)	=	2.00
n	=	0.10
NMIN	=	15.00
1/[2(1-x)]	=	0.63
1/(2x)	=	2.50

BASIN NO.	L (ft)	Vel	K	Nstps	NSTPS	CHECK	AMSKK
1	36750	3.9	2.62	10.46	10	1.05	2.62
2	11750	4.2	0.78	3.11	3	1.04	0.78
3	10000	4.1	0.68	2.71	3	0.90	0.68
4	9000	6.3	0.40	1.59	2	0.80	0.40

MORTANDAD CANYON

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE UD DATA CARD FOR SCS UNIT HYDROGRAPH LAG TIME DEFINITIONS

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS BASIN LAG TIME (hrs)

L = CHANNEL LENGTH TO WATER DIVIDE (ft)

X = BASIN ELEVATION CHANGE OVER LENGTH L (ft)

CN= SCS CURVE NUMBER FOR AMC-II MOISTURE CONDITIONS (dim)

S = 1000/CN - 10 = POTENTIAL RAINFALL RETENTION (in)

Y = 100X/L = GROSS WATERSHED SLOPE (%)

A = SUB-BASIN DRAINAGE AREA (sq. miles)

BASIN NO.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	9000	390	65	5.38	4.33	0.55	1.35
2	10500	277	67	4.93	2.64	0.81	1.86
3	6000	125	72	3.89	2.08	0.36	1.17
4	12250	203	72	3.89	1.66	1.61	2.31
5	16000	465	72	3.89	2.91	0.86	2.16
6	13500	855	74	3.51	6.33	1.72	1.21

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE RM DATA CARD FOR MUSKINGUM ROUTING PARAMETER DEFINITIONS

$0.1 < x < 0.3$

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)

K = L/(3600*Vel) (hours)

Nstps = 60K/NMIN (dimensionless)

NSTPS = INTEGER VALUE FOR Nstps

NMIN = MINUTES FROM CARD IT

1/[2(1-x)] < CHECK < 1/(2x)

CHECK = (60K)/(NMIN*NSTPS)

x	=	0.20
R(ft)	=	2.00
n	=	0.10
NMIN	=	15.00
1/[2(1-x)]	=	0.63
1/(2x)	=	2.50

BASIN NO.	L (ft)	Vel	K	Nstps	NSTPS	CHECK	AMSKK
1	9000	4.9	0.51	2.03	2	1.02	0.51
2	10500	3.8	0.76	3.04	3	1.01	0.76
3	6000	3.4	0.49	1.95	2	0.98	0.49
4	12250	3.0	1.12	4.47	4	1.12	1.12
5	16000	4.0	1.10	4.41	4	1.10	1.10
6	13500	6.0	0.63	2.52	3	0.84	0.63

CANADA DEL BUEY

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE UD DATA CARD FOR SCS UNIT HYDROGRAPH LAG TIME DEFINITIONS

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS BASIN LAG TIME (hrs)

L = CHANNEL LENGTH TO WATER DIVIDE (ft)

X = BASIN ELEVATION CHANGE OVER LENGTH L (ft)

CN= SCS CURVE NUMBER FOR AMC-II MOISTURE CONDITIONS (dim)

S = 1000/CN - 10 = POTENTIAL RAINFALL RETENTION (in)

Y = 100X/L = GROSS WATERSHED SLOPE (%)

A = SUB-BASIN DRAINAGE AREA (sq. miles)

BASIN NO.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	29500	836	69	4.49	2.83	2.10	3.88
2	14750	1345	72	3.89	9.12	2.42	1.14

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE RM DATA CARD FOR MUSKINGUM ROUTING PARAMETER DEFINITIONS

$0.1 < x < 0.3$

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)

K = L/(3600*Vel) (hours)

Nstps = 60K/NMIN (dimensionless)

NSTPS = INTEGER VALUE FOR Nstps

NMIN = MINUTES FROM CARD IT

1/[2(1-x)] < CHECK < 1/(2x)

CHECK = (60K)/(NMIN*NSTPS)

x	=	0.20
R(ft)	=	2.00
n	=	0.10
NMIN	=	15.00
1/[2(1-x)]	=	0.63
1/(2x)	=	2.50

BASIN NO.	L (ft)	Vel	K	Nstps	NSTPS	CHECK	AMSKK
1	29500	4.0	2.06	8.23	8	1.03	2.06
2	14750	7.1	0.57	2.29	2	1.15	0.57

RAJARITO CANYON

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE UD DATA CARD FOR SCS UNIT HYDROGRAPH LAG TIME DEFINITIONS

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS BASIN LAG TIME (hrs)

L = CHANNEL LENGTH TO WATER DIVIDE (ft)

X = BASIN ELEVATION CHANGE OVER LENGTH L (ft)

CN= SCS CURVE NUMBER FOR AMC-II MOISTURE CONDITIONS (dim)

S = 1000/CN - 10 = POTENTIAL RAINFALL RETENTION (in)

Y = 100X/L = GROSS WATERSHED SLOPE (%)

A = SUB-BASIN DRAINAGE AREA (sq. miles)

BASIN NO.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	17250	2711	52	9.23	15.72	1.99	1.66
2	18250	795	62	6.13	4.36	2.57	2.56
3	28250	2890	61	6.39	10.23	3.28	2.43
4	11000	205	70	4.29	1.86	0.67	2.12
5	19500	710	67	4.93	3.64	1.70	2.59
6	15000	225	72	3.89	1.50	1.15	2.86
7	15500	1050	73	3.70	6.77	2.24	1.34

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE RM DATA CARD FOR MUSKINGUM ROUTING PARAMETER DEFINITIONS

$0.1 < x < 0.3$ — x = 0.20

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec) — R(ft) = 2.00

K = L/(3600*Vel) (hours) — n = 0.10

Nstps = 60K/NMIN (dimensionless)

NSTPS = INTEGER VALUE FOR Nstps

NMIN = MINUTES FROM CARD IT — NMIN = 15.00

$1/[2(1-x)] < CHECK < 1/(2x)$ — $1/[2(1-x)]$ = 0.63

CHECK = (60K)/(NMIN*NSTPS) — $1/(2x)$ = 2.50

BASIN NO.	L (ft)	Vel	K	Nstps	NSTPS	CHECK	AMSKK
1	17250	9.4	0.51	2.04	2	1.02	0.51
2	18250	4.9	1.03	4.11	4	1.03	1.03
3	28250	7.6	1.04	4.15	4	1.04	1.04
4	11000	3.2	0.95	3.78	4	0.95	0.95
5	19500	4.5	1.20	4.80	5	0.96	1.20
6	15000	2.9	1.44	5.75	6	0.96	1.44
7	15500	6.2	0.70	2.80	3	0.93	0.70

POTRILLO CANYON

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE UD DATA CARD FOR SCS UNIT HYDROGRAPH LAG TIME DEFINITIONS

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS BASIN LAG TIME (hrs)

L = CHANNEL LENGTH TO WATER DIVIDE (ft)

X = BASIN ELEVATION CHANGE OVER LENGTH L (ft)

CN= SCS CURVE NUMBER FOR AMC-II MOISTURE CONDITIONS (dim)

S = 1000/CN - 10 = POTENTIAL RAINFALL RETENTION (in)

Y = 100X/L = GROSS WATERSHED SLOPE (%)

A = SUB-BASIN DRAINAGE AREA (sq. miles)

BASIN NO.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	28500	875	70	4.29	3.07	2.78	3.53
2	18000	630	71	4.08	3.50	1.03	2.23
3	9750	620	75	3.33	6.36	0.96	0.90

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE RM DATA CARD FOR MUSKINGUM ROUTING PARAMETER DEFINITIONS

$0.1 < x < 0.3$

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)

K = L/(3600*Vel) (hours)

Nstps = 60K/NMIN (dimensionless)

NSTPS = INTEGER VALUE FOR Nstps

NMIN = MINUTES FROM CARD IT

1/[2(1-x)] < CHECK < 1/(2x)

CHECK = (60K)/(NMIN*NSTPS)

x = 0.20

R(ft) = 2.00

n = 0.10

NMIN = 15.00

1/[2(1-x)] = 0.63

1/(2x) = 2.50

BASIN NO.	L (ft)	Vel	K	Nstps	NSTPS	CHECK	AMSKK
1	28500	4.1	1.91	7.64	8	0.95	1.91
2	18000	4.4	1.13	4.52	5	0.90	1.13
3	9750	6.0	0.45	1.82	2	0.91	0.45

WATER CANYON

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE UD DATA CARD FOR SCS UNIT HYDROGRAPH LAG TIME DEFINITIONS

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS BASIN LAG TIME (hrs)

L = CHANNEL LENGTH TO WATER DIVIDE (ft)

X = BASIN ELEVATION CHANGE OVER LENGTH L (ft)

CN= SCS CURVE NUMBER FOR AMC-II MOISTURE CONDITIONS (dim)

S = 1000/CN - 10 = POTENTIAL RAINFALL RETENTION (in)

Y = 100X/L = GROSS WATERSHED SLOPE (%)

A = SUB-BASIN DRAINAGE AREA (sq. miles)

BASIN NO.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	18000	2305	54	8.52	12.81	4.07	1.81
2	17750	705	62	6.13	3.97	2.63	2.62
3	19000	405	72	3.89	2.13	1.42	2.90
4	13750	615	72	3.89	4.47	1.97	1.55
5	5000	405	77	2.99	8.10	0.32	0.44

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE RM DATA CARD FOR MUSKINGUM ROUTING PARAMETER DEFINITIONS

$0.1 < x < 0.3$

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)

K = L/(3600*Vel) (hours)

Nstps = 60K/NMIN (dimensionless)

NSTPS = INTEGER VALUE FOR Nstps

NMIN = MINUTES FROM CARD IT

$1/[2(1-x)] < CHECK < 1/(2x)$

CHECK = (60K)/(NMIN*NSTPS)

x	=	0.20
R(ft)	=	2.00
n	=	0.10
NMIN	=	15.00
1/[2(1-x)]	=	0.63
1/(2x)	=	2.50

BASIN NO.	L (ft)	Vel	K	Nstps	NSTPS	CHECK	AMSKK
1	18000	8.5	0.59	2.36	2	1.18	0.59
2	17750	4.7	1.05	4.18	4	1.05	1.05
3	19000	3.5	1.53	6.11	6	1.02	1.53
4	13750	5.0	0.76	3.05	3	1.02	0.76
5	5000	6.7	0.21	0.83	1	0.83	0.21

CANON DE VALLE

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE UD DATA CARD FOR SCS UNIT HYDROGRAPH LAG TIME DEFINITIONS

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS BASIN LAG TIME (hrs)

L = CHANNEL LENGTH TO WATER DIVIDE (ft)

X = BASIN ELEVATION CHANGE OVER LENGTH L (ft)

CN= SCS CURVE NUMBER FOR AMC-II MOISTURE CONDITIONS (dim)

S = 1000/CN - 10 = POTENTIAL RAINFALL RETENTION (in)

Y = 100X/L = GROSS WATERSHED SLOPE (%)

A = SUB-BASIN DRAINAGE AREA (sq. miles)

BASIN NO.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	22500	2756	53	8.87	12.25	2.33	2.26
2	7500	393	63	5.87	5.24	0.78	1.12
3	12500	477	64	5.63	3.82	1.17	1.92

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE RM DATA CARD FOR MUSKINGUM ROUTING PARAMETER DEFINITIONS

$0.1 < x < 0.3$

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)

K = L/(3600*Vel) (hours)

Nstps = 60K/NMIN (dimensionless)

NSTPS = INTEGER VALUE FOR Nstps

NMIN = MINUTES FROM CARD IT

$1/[2(1-x)] < CHECK < 1/(2x)$

CHECK = (60K)/(NMIN*NSTPS)

x = 0.20

R(ft) = 2.00

n = 0.10

NMIN = 15.00

1/[2(1-x)] = 0.63

1/(2x) = 2.50

BASIN NO.	L (ft)	Vel	K	Nstps	NSTPS	CHECK	AMSKK
1	22500	8.3	0.75	3.02	3	1.01	0.75
2	7500	5.4	0.38	1.54	2	0.77	0.38
3	12500	4.6	0.75	3.01	3	1.00	0.75

ANCHO CANYON

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE UD DATA CARD FOR SCS UNIT HYDROGRAPH LAG TIME DEFINITIONS

==========

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS BASIN LAG TIME (hrs)

L = CHANNEL LENGTH TO WATER DIVIDE (ft)

X = BASIN ELEVATION CHANGE OVER LENGTH L (ft)

CN= SCS CURVE NUMBER FOR AMC-II MOISTURE CONDITIONS (dim)

S = 1000/CN - 10 = POTENTIAL RAINFALL RETENTION (in)

Y = 100X/L = GROSS WATERSHED SLOPE (%)

A = SUB-BASIN DRAINAGE AREA (sq. miles)

BASIN NO.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	25750	1044	68	4.71	4.05	2.19	2.99
2	22000	1035	69	4.49	4.70	2.48	2.38
3	13000	1102	74	3.51	8.48	1.11	1.01
4	10000	688	75	3.33	6.88	1.04	0.89
5	2500	168	75	3.33	6.72	0.19	0.30

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE RM DATA CARD FOR MUSKINGUM ROUTING PARAMETER DEFINITIONS

$0.1 < x < 0.3$	x	=	0.20
$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R(ft)	=	2.00
K = L/(3600*Vel) (hours)	n	=	0.10
Nstps = 60K/NMIN (dimensionless)			
NSTPS = INTEGER VALUE FOR Nstps			
NMIN = MINUTES FROM CARD IT	NMIN	=	15.00
1/[2(1-x)] < CHECK < 1/(2x)	1/[2(1-x)]	=	0.63
CHECK = (60K)/(NMIN*NSTPS)	1/(2x)	=	2.50

BASIN NO.	L (ft)	Vel	K	Nstps	NSTPS	CHECK	AMSKK
1	25750	4.8	1.50	6.01	6	1.00	1.50
2	22000	5.1	1.19	4.76	5	0.95	1.19
3	13000	6.9	0.52	2.10	2	1.05	0.52
4	10000	6.2	0.45	1.79	2	0.90	0.45
5	2500	6.1	0.11	0.45	1	0.45	0.11

CHAQUEHUI CANYON

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE UD DATA CARD FOR SCS UNIT HYDROGRAPH LAG TIME DEFINITIONS

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS BASIN LAG TIME (hrs)

L = CHANNEL LENGTH TO WATER DIVIDE (ft)

X = BASIN ELEVATION CHANGE OVER LENGTH L (ft)

CN= SCS CURVE NUMBER FOR AMC-II MOISTURE CONDITIONS (dim)

S = 1000/CN - 10 = POTENTIAL RAINFALL RETENTION (in)

Y = 100X/L = GROSS WATERSHED SLOPE (%)

A = SUB-BASIN DRAINAGE AREA (sq. miles)

BASIN NO.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	16500	1292	73	3.70	7.83	1.50	1.31

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE RM DATA CARD FOR MUSKINGUM ROUTING PARAMETER DEFINITIONS

$0.1 < x < 0.3$

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)

K = L/(3600*Vel) (hours)

Nstps = 60K/NMIN (dimensionless)

NSTPS = INTEGER VALUE FOR Nstps

NMIN = MINUTES FROM CARD IT

$1/[2(1-x)] < CHECK < 1/(2x)$

CHECK = (60K)/(NMIN*NSTPS)

x	=	0.20
R(ft)	=	2.00
n	=	0.10
NMIN	=	15.00
1/[2(1-x)]	=	0.63
1/(2x)	=	2.50

BASIN NO.	L (ft)	Vel	K	Nstps	NSTPS	CHECK	AMSKK
1	16500	6.6	0.69	2.77	3	0.92	0.69

CANON DE LOS FRIJOLES

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE UD DATA CARD FOR SCS UNIT HYDROGRAPH LAG TIME DEFINITIONS

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS BASIN LAG TIME (hrs)

L = CHANNEL LENGTH TO WATER DIVIDE (ft)

X = BASIN ELEVATION CHANGE OVER LENGTH L (ft)

CN= SCS CURVE NUMBER FOR AMC-II MOISTURE CONDITIONS (dim)

S = 1000/CN - 10 = POTENTIAL RAINFALL RETENTION (in)

Y = 100X/L = GROSS WATERSHED SLOPE (%)

A = SUB-BASIN DRAINAGE AREA (sq. miles)

BASIN NO.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	20200	2499	50	10.00	12.37	4.97	2.23
2	24400	1030	70	4.29	4.22	4.92	2.66
3	24000	633	68	4.71	2.64	8.13	3.50

HEC-1 INPUT DATA FILE PARAMETER CALCULATION

SEE RM DATA CARD FOR MUSKINGUM ROUTING PARAMETER DEFINITIONS

$0.1 < x < 0.3$

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)

K = L/(3600*Vel) (hours)

Nstps = 60K/NMIN (dimensionless)

NSTPS = INTEGER VALUE FOR Nstps

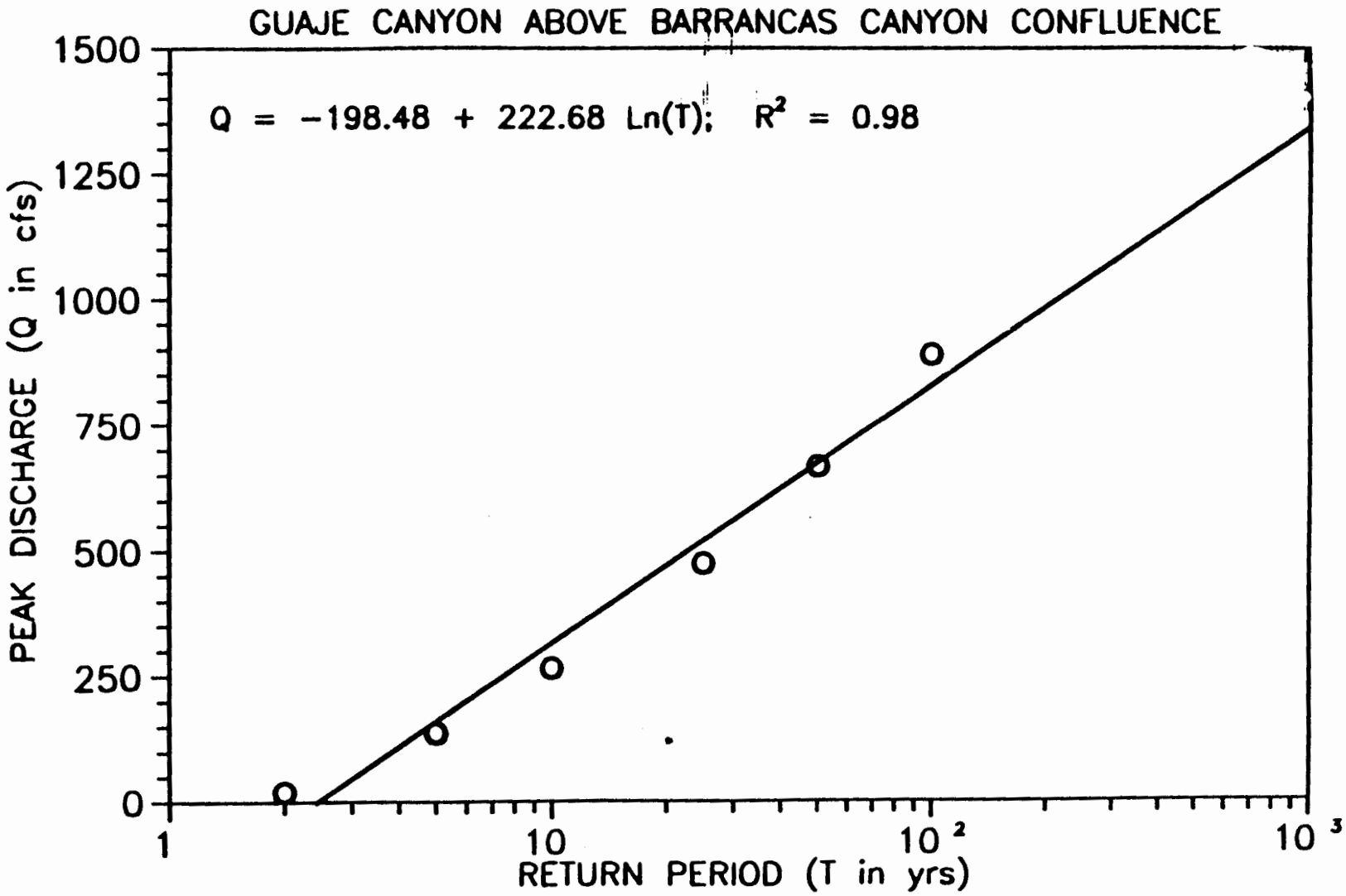
NMIN = MINUTES FROM CARD IT

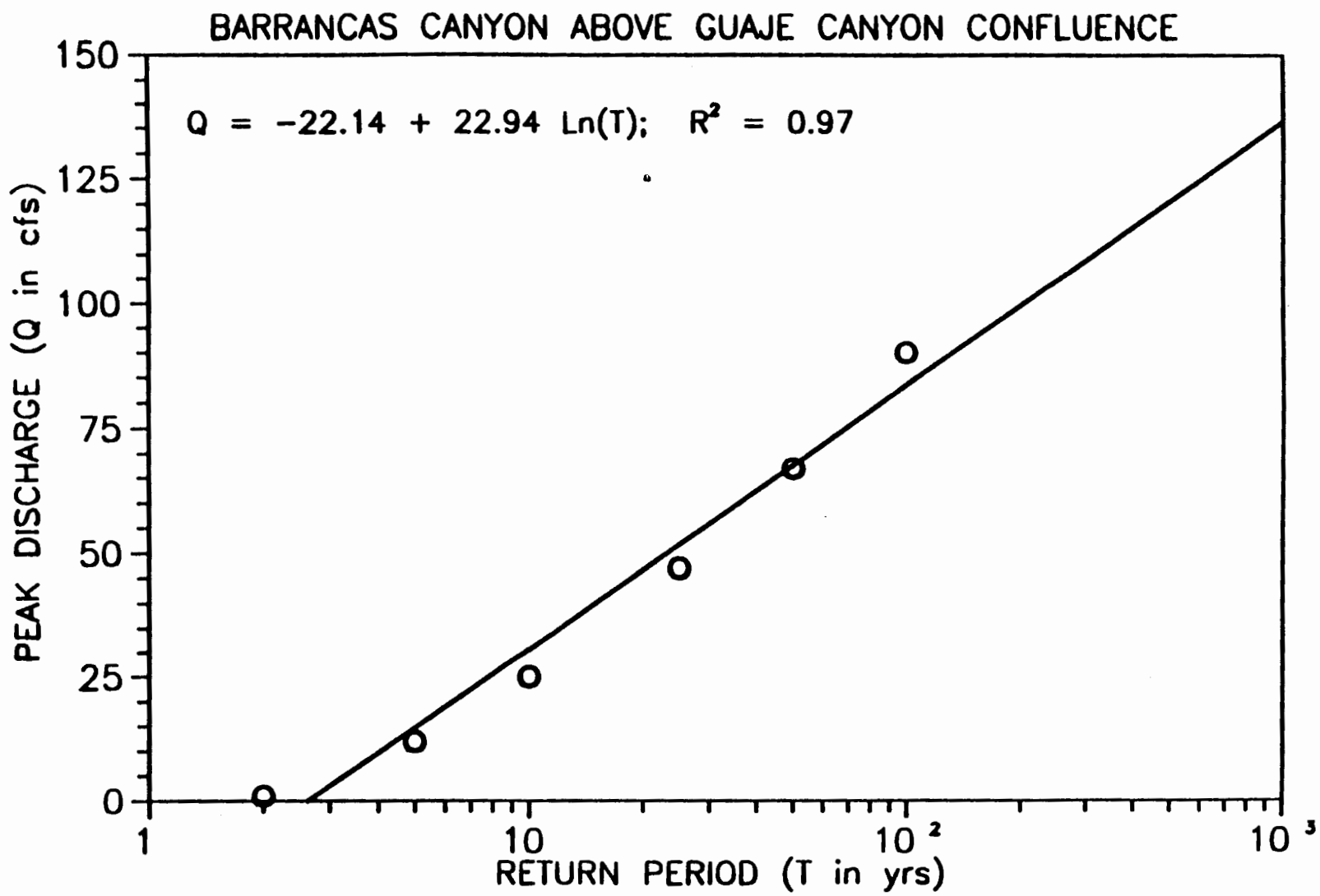
$1/[2(1-x)] < CHECK < 1/(2x)$

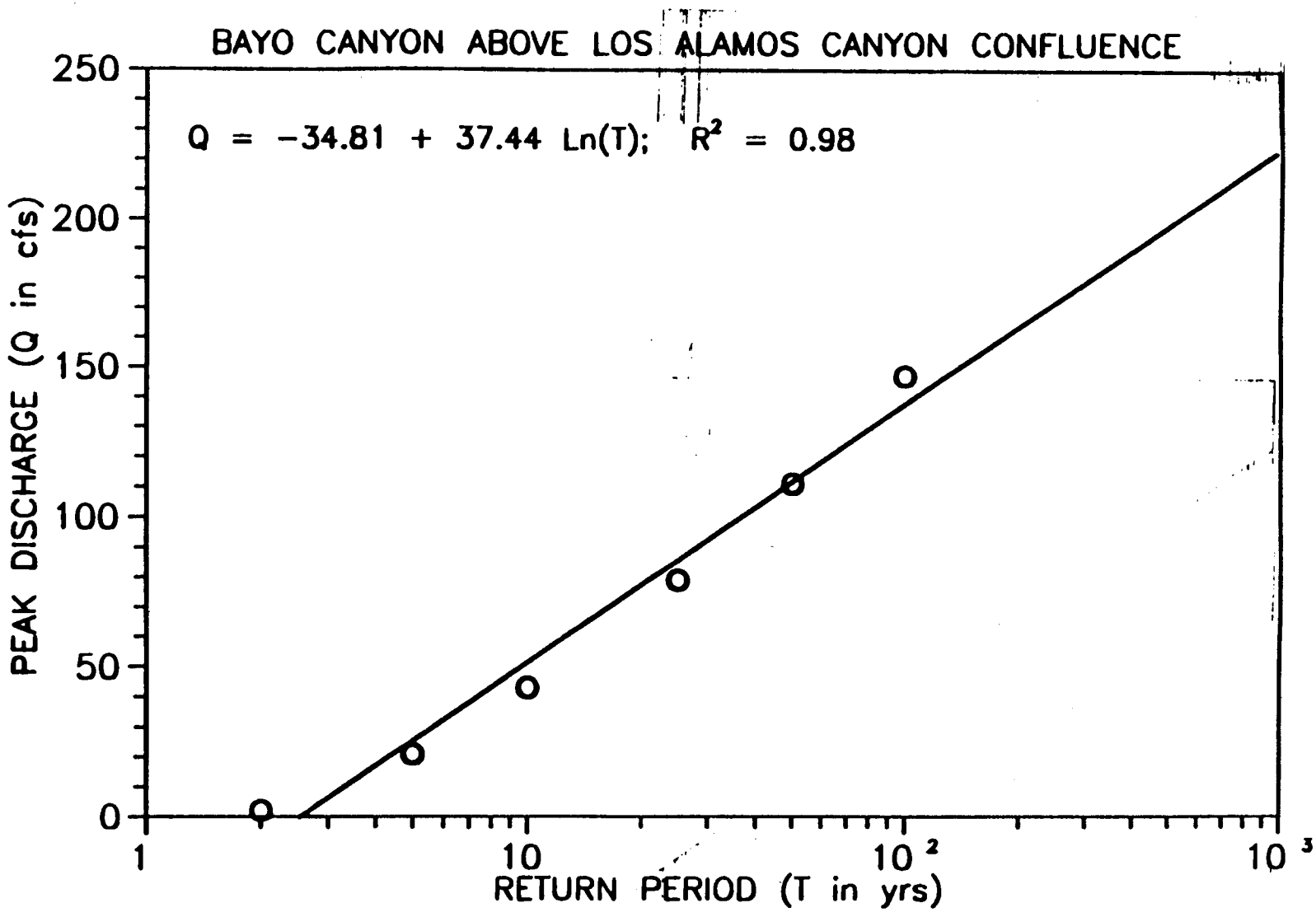
CHECK = (60K)/(NMIN*NSTPS)

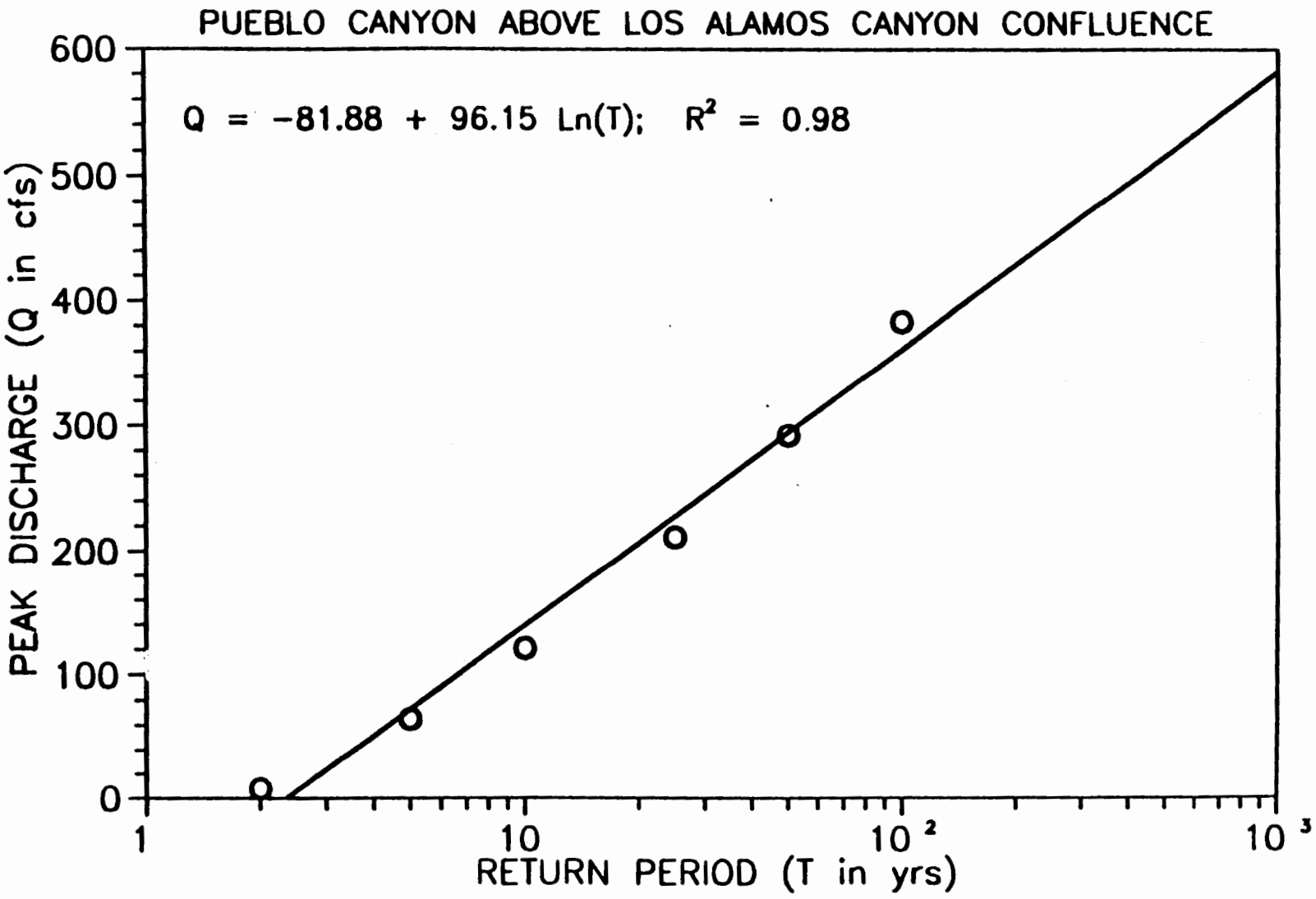
x	=	0.20
R(ft)	=	2.00
n	=	0.10
NMIN	=	15.00
1/[2(1-x)]	=	0.63
1/(2x)	=	2.50

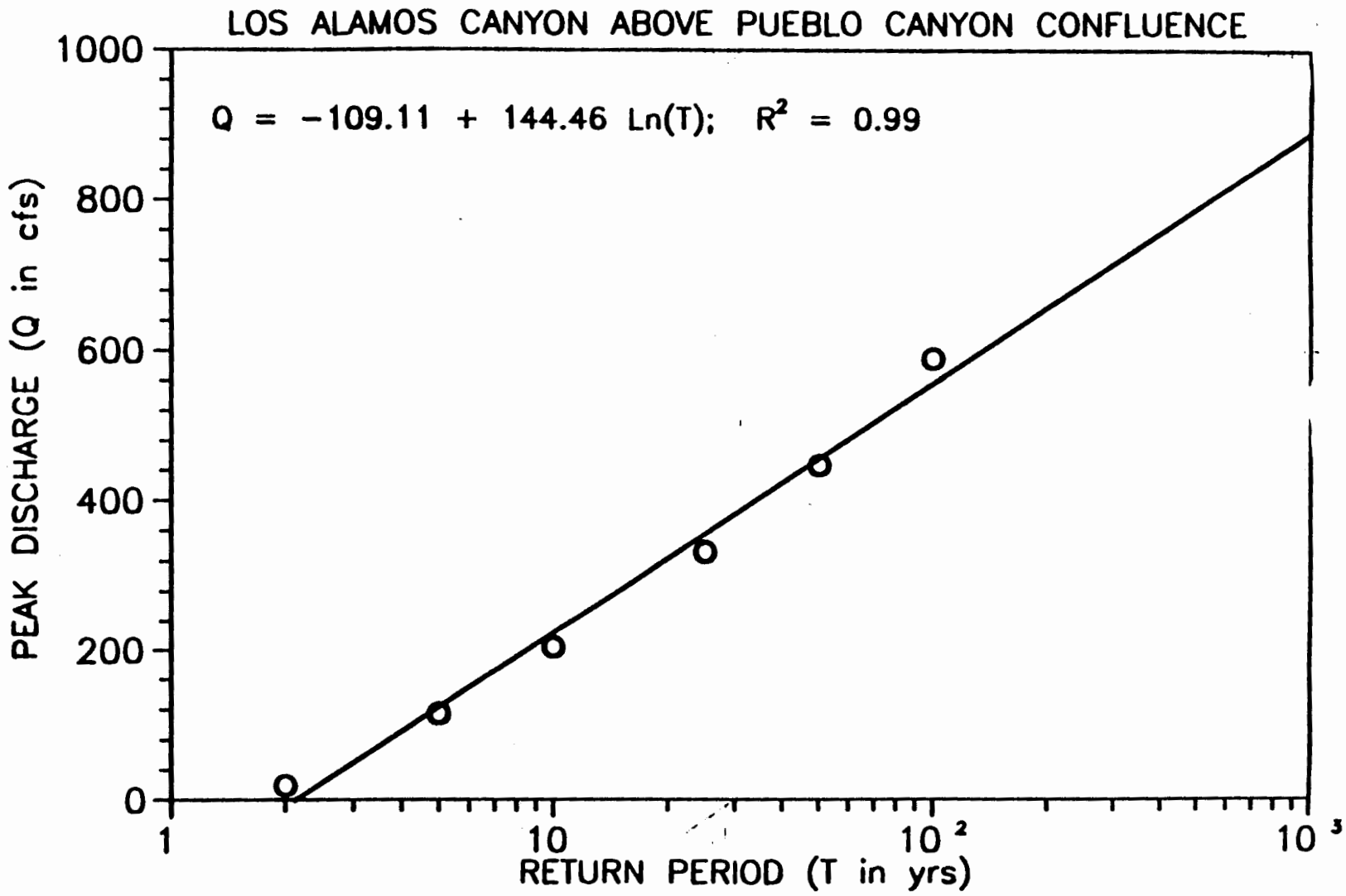
BASIN NO.	L (ft)	Vel	K	Nstps	NSTPS	CHECK	AMSKK
1	20200	8.3	0.67	2.70	3	0.90	0.67
2	24400	4.9	1.39	5.58	6	0.93	1.39
3	24000	3.8	1.74	6.94	7	0.99	1.74

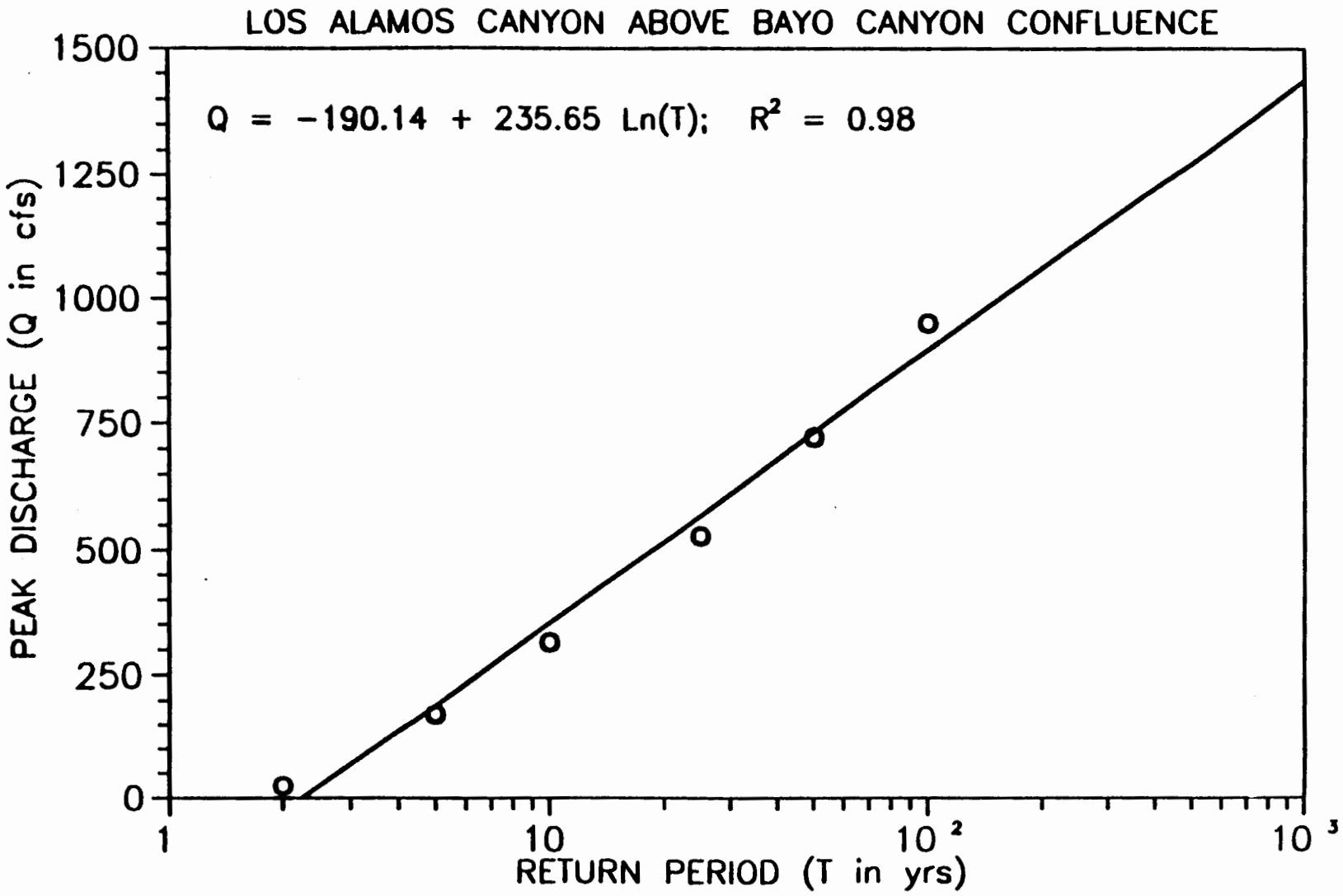

GUAJE CANYON ABOVE BARRANCAS CANYON CONFLUENCE
Q = −198.48 + 222.68 Ln(T); R² = 0.98
PEAK DISCHARGE (Q in cfs)
1500
1250
1000
750
500
250
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

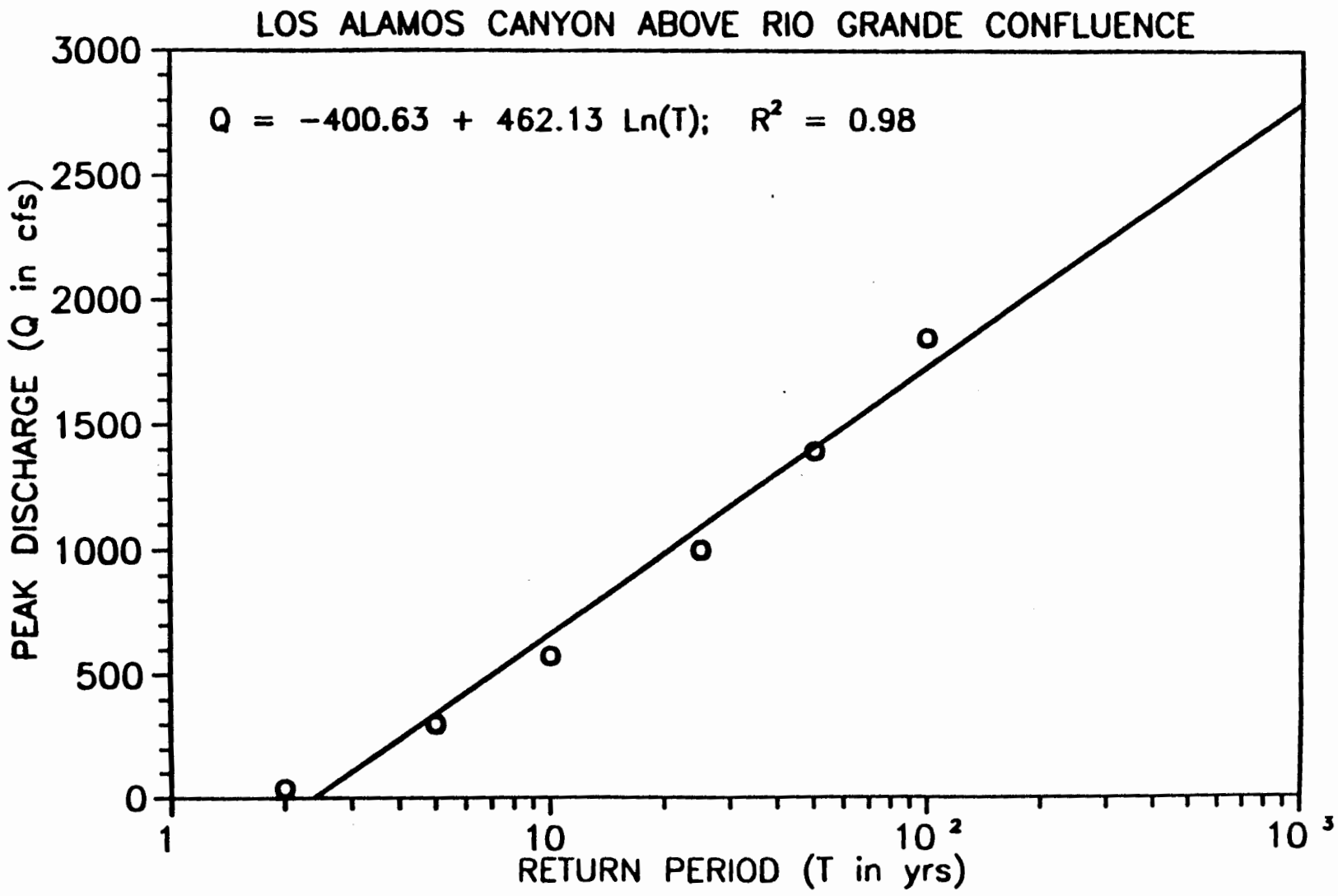

BARRANCAS CANYON ABOVE GUAJE CANYON CONFLUENCE
Q = −22.14 + 22.94 Ln(T); R² = 0.97
PEAK DISCHARGE (Q in cfs)
150
125
100
75
50
25
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

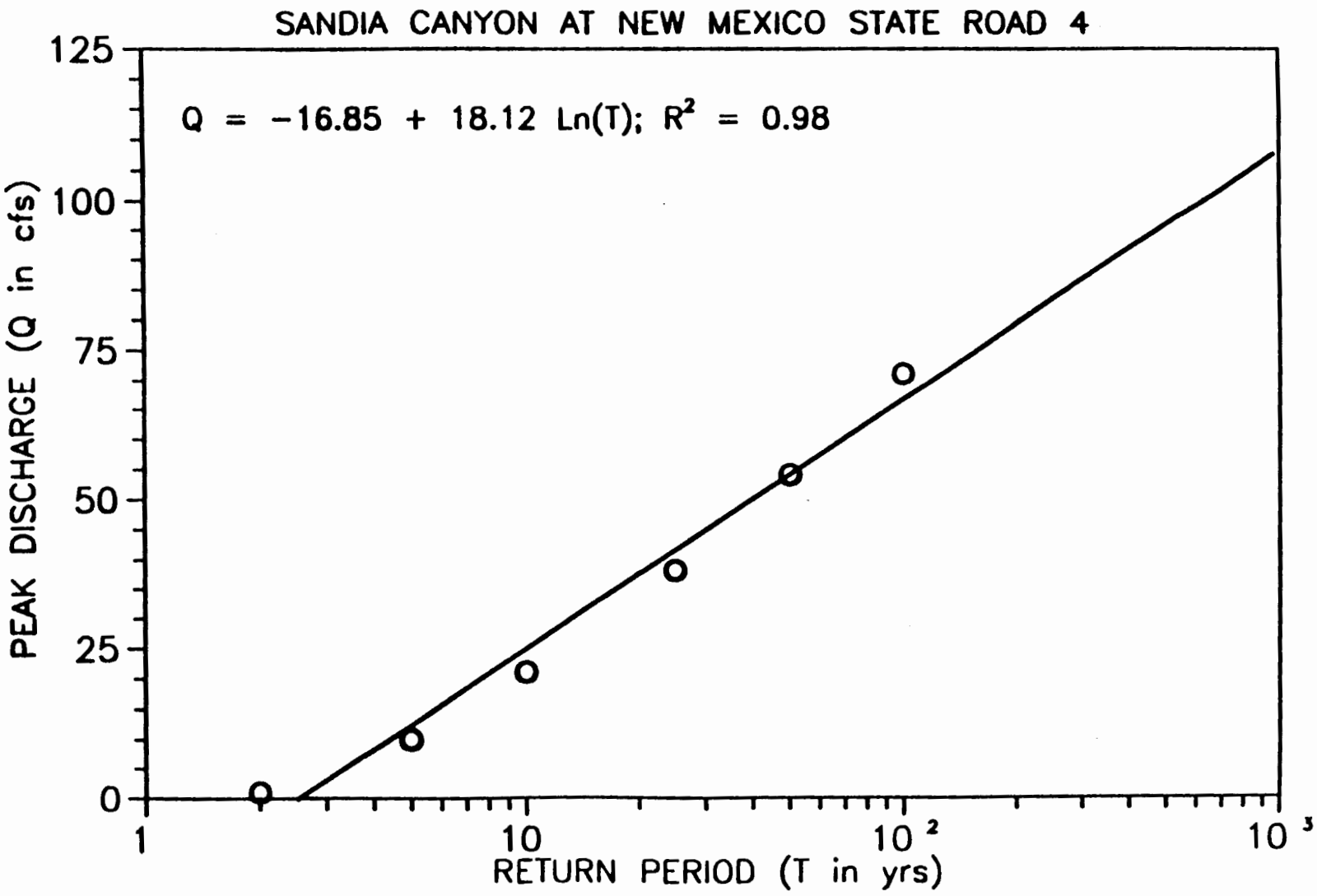

BAYO CANYON ABOVE LOS ALAMOS CANYON CONFLUENCE
Q = −34.81 + 37.44 Ln(T); R² = 0.98
PEAK DISCHARGE (Q in cfs)
250
200
150
100
50
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

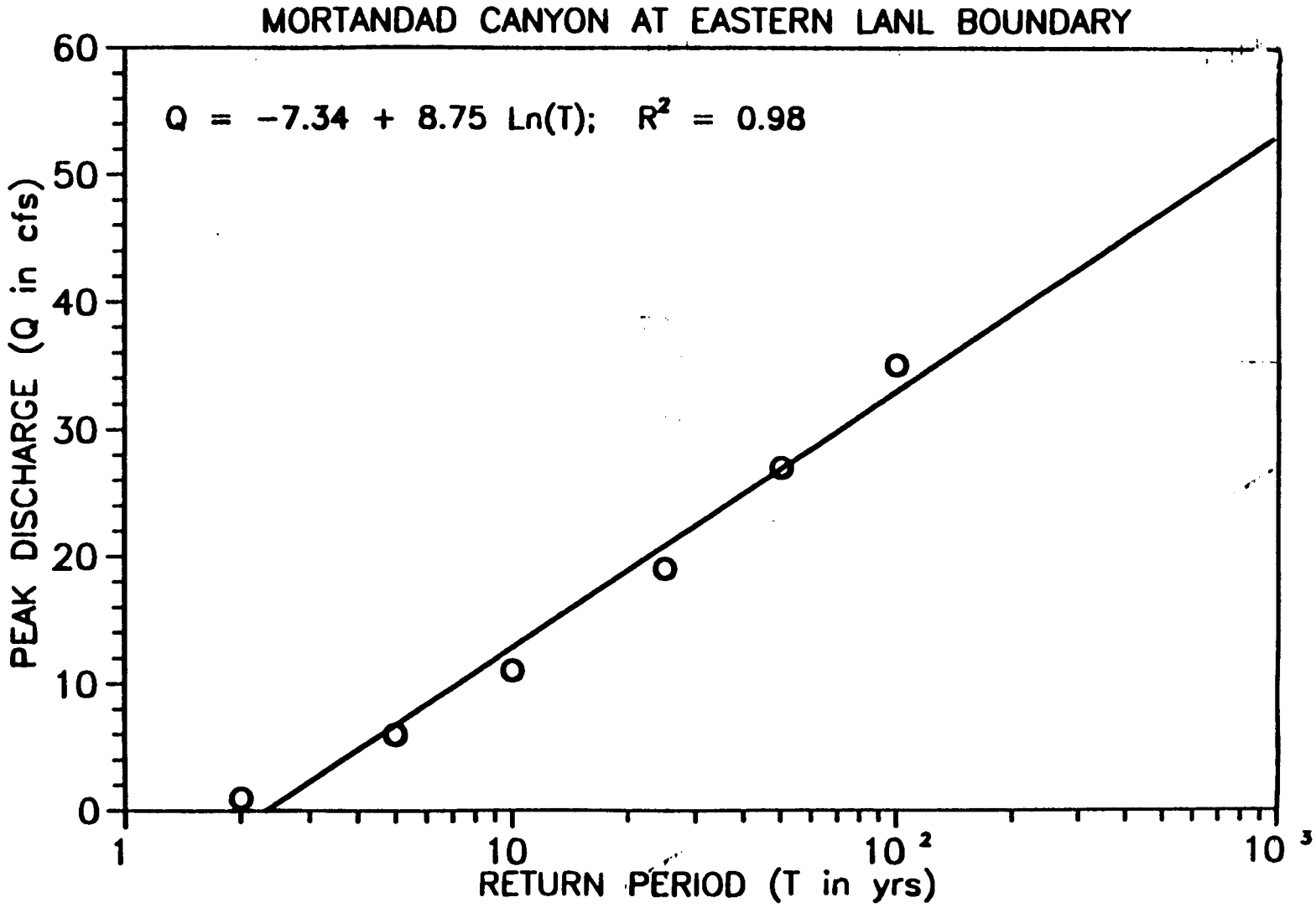

PUEBLO CANYON ABOVE LOS ALAMOS CANYON CONFLUENCE
Q = −81.88 + 96.15 Ln(T); R² = 0.98
PEAK DISCHARGE (Q in cfs)
600
500
400
300
200
100
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

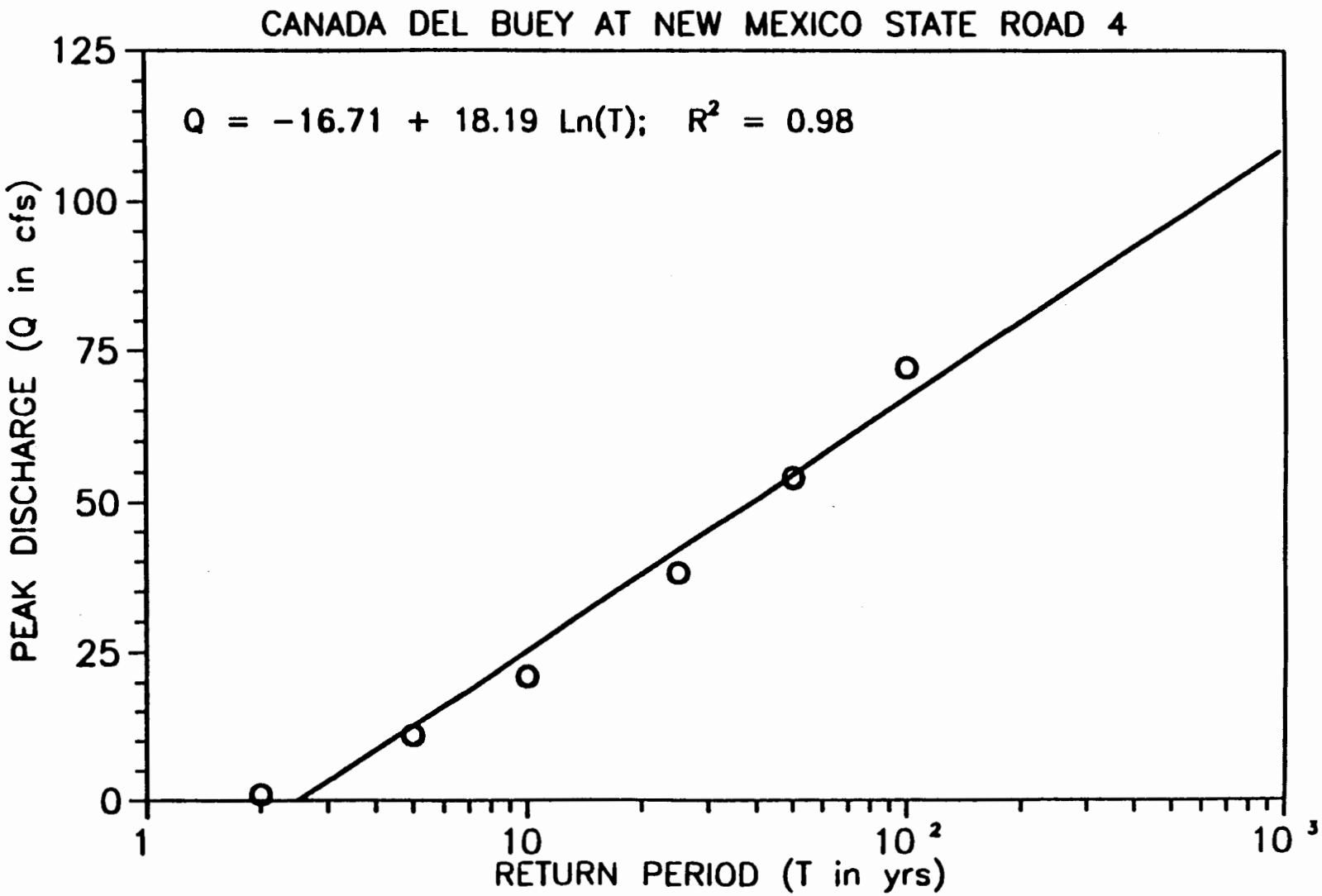

LOS ALAMOS CANYON ABOVE PUEBLO CANYON CONFLUENCE
Q = −109.11 + 144.46 Ln(T); R² = 0.99
PEAK DISCHARGE (Q in cfs)
1000
800
600
400
200
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

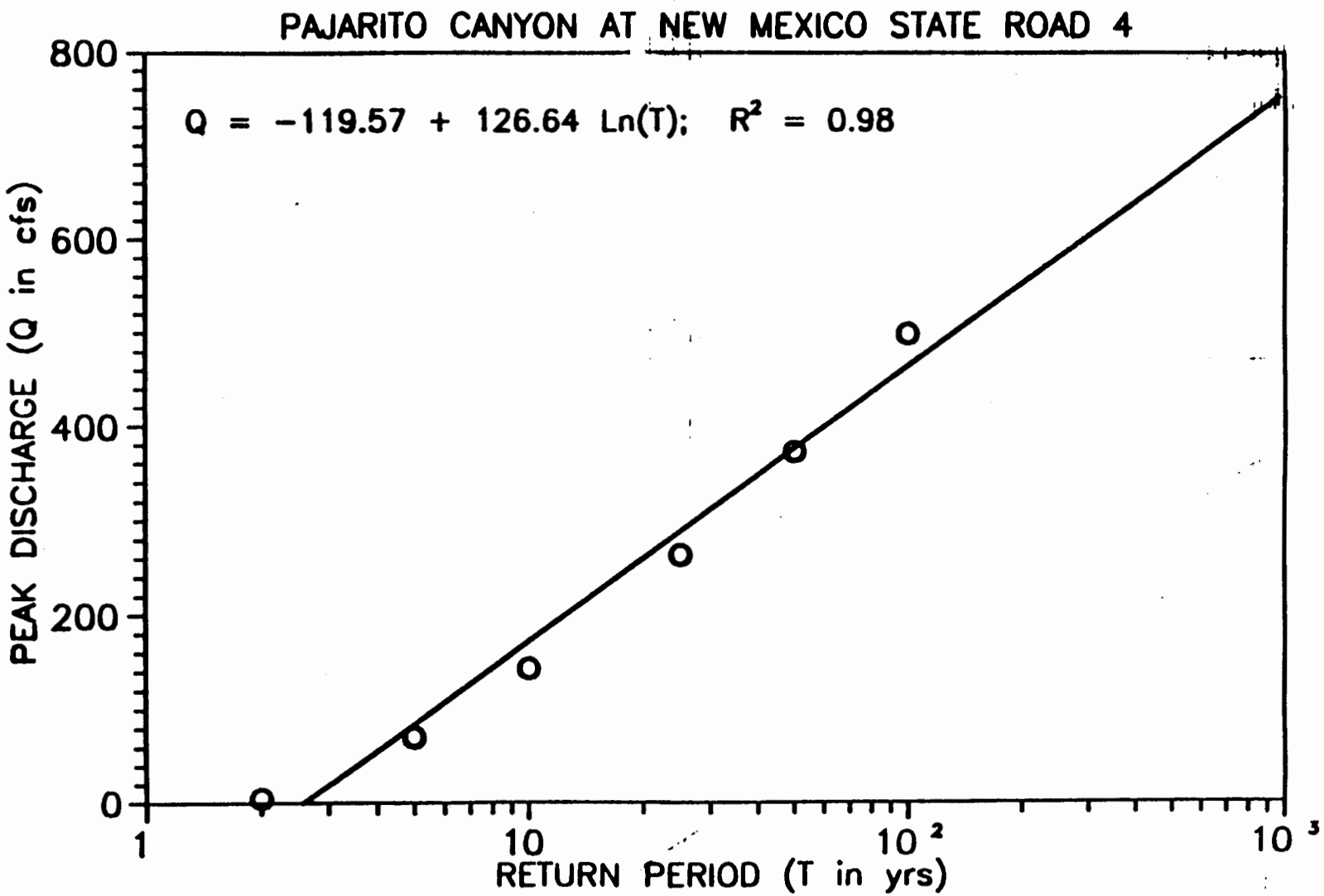

LOS ALAMOS CANYON ABOVE BAYO CANYON CONFLUENCE
Q = −190.14 + 235.65 Ln(T); R² = 0.98
PEAK DISCHARGE (Q in cfs)
1500
1250
1000
750
500
250
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

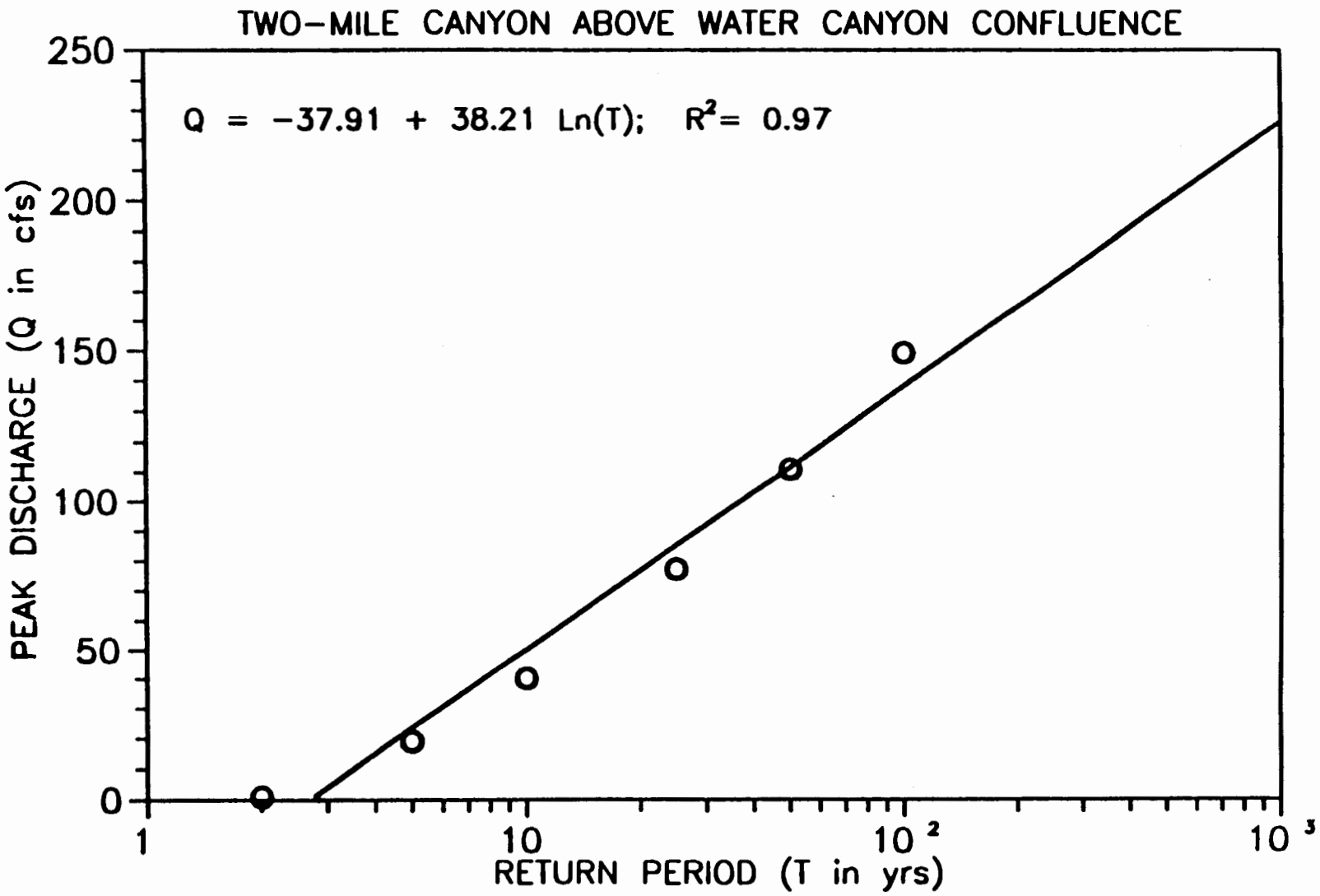

LOS ALAMOS CANYON ABOVE RIO GRANDE CONFLUENCE
Q = −400.63 + 462.13 Ln(T); R² = 0.98
PEAK DISCHARGE (Q in cfs)
3000
2500
2000
1500
1000
500
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

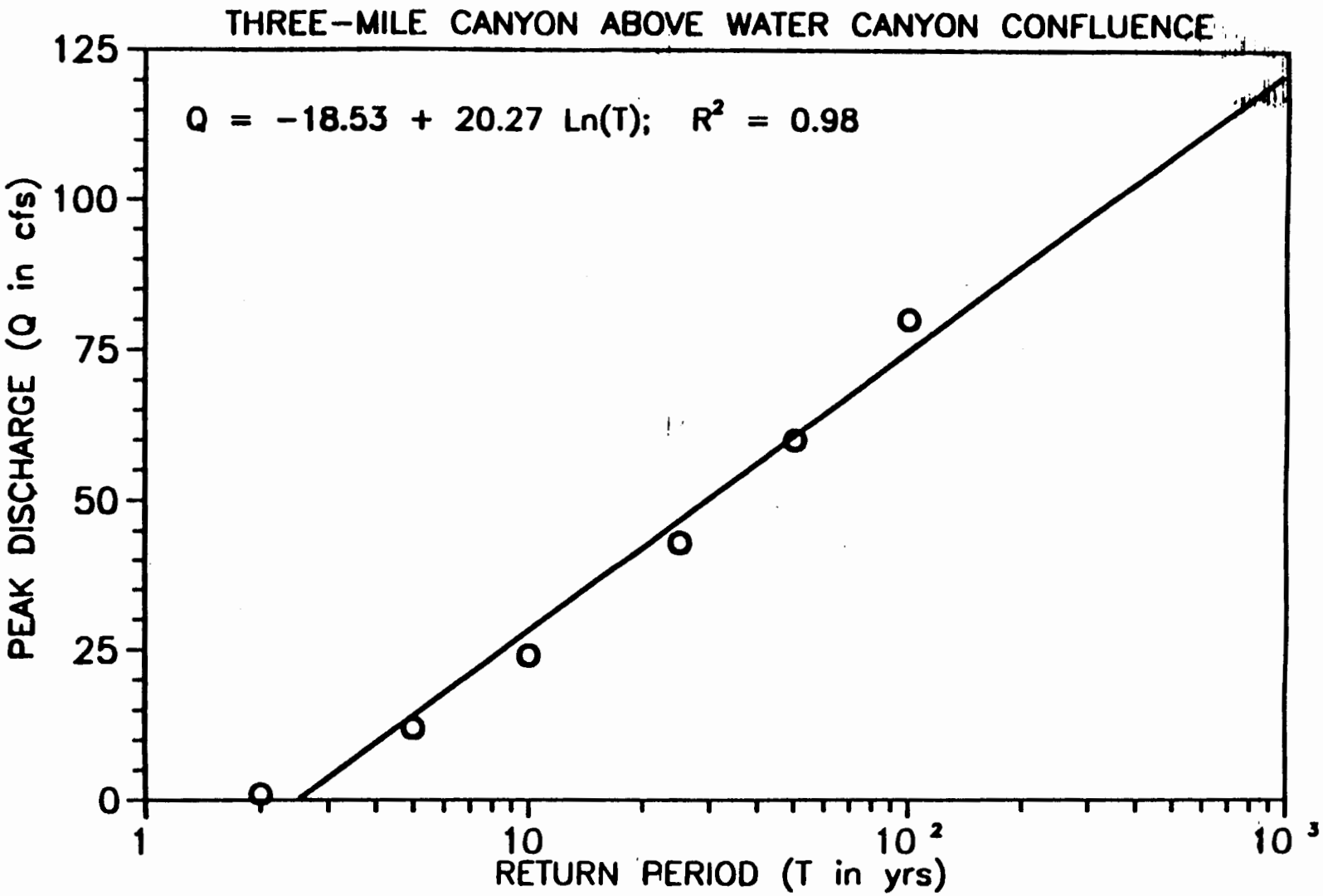

SANDIA CANYON AT NEW MEXICO STATE ROAD 4
Q = −16.85 + 18.12 Ln(T); R² = 0.98
PEAK DISCHARGE (Q in cfs)
125
100
75
50
25
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

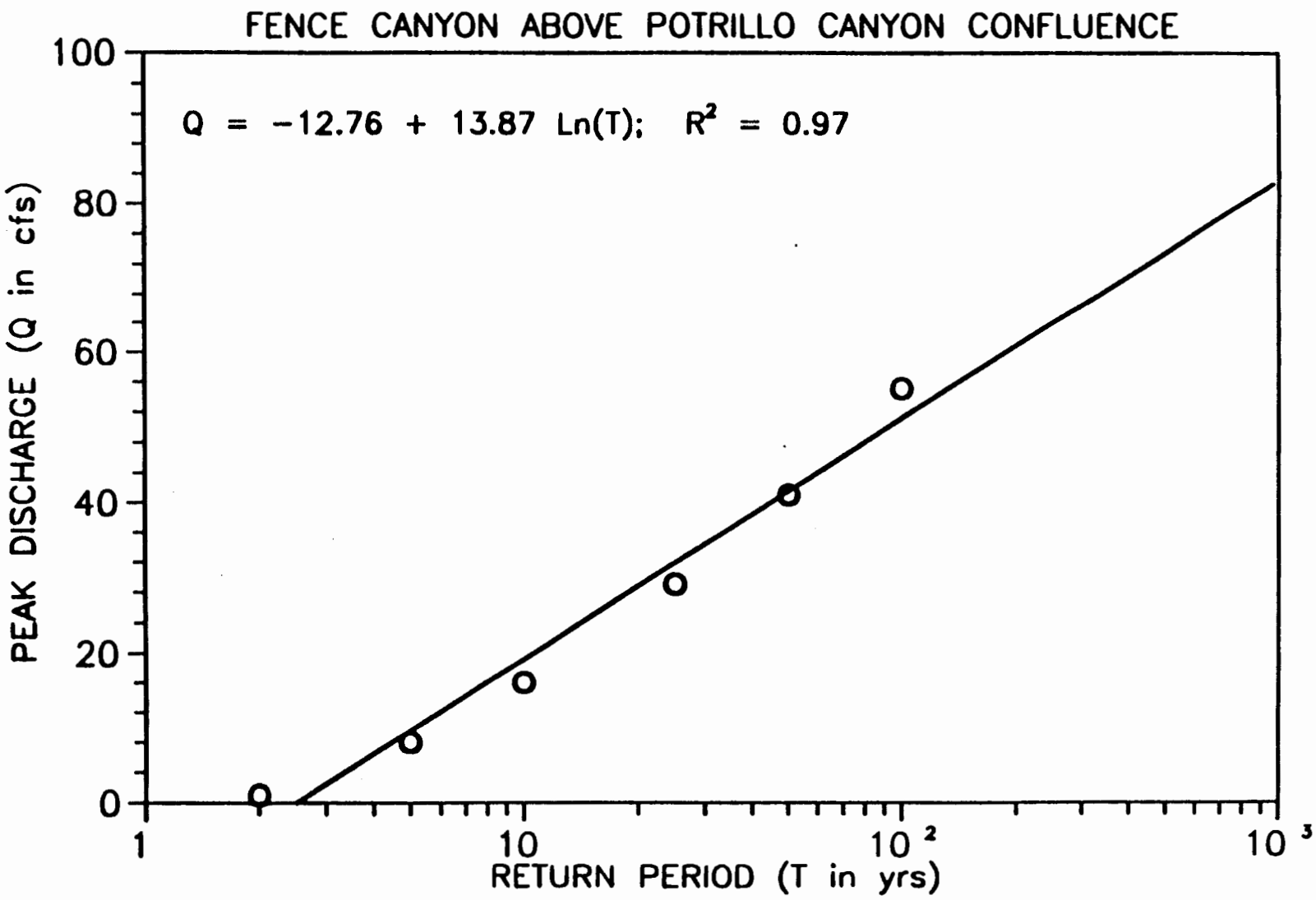

MORTANDAD CANYON AT EASTERN LANL BOUNDARY
Q = −7.34 + 8.75 Ln(T); R² = 0.98
PEAK DISCHARGE (Q in cfs)
0
10
20
30
40
50
60
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

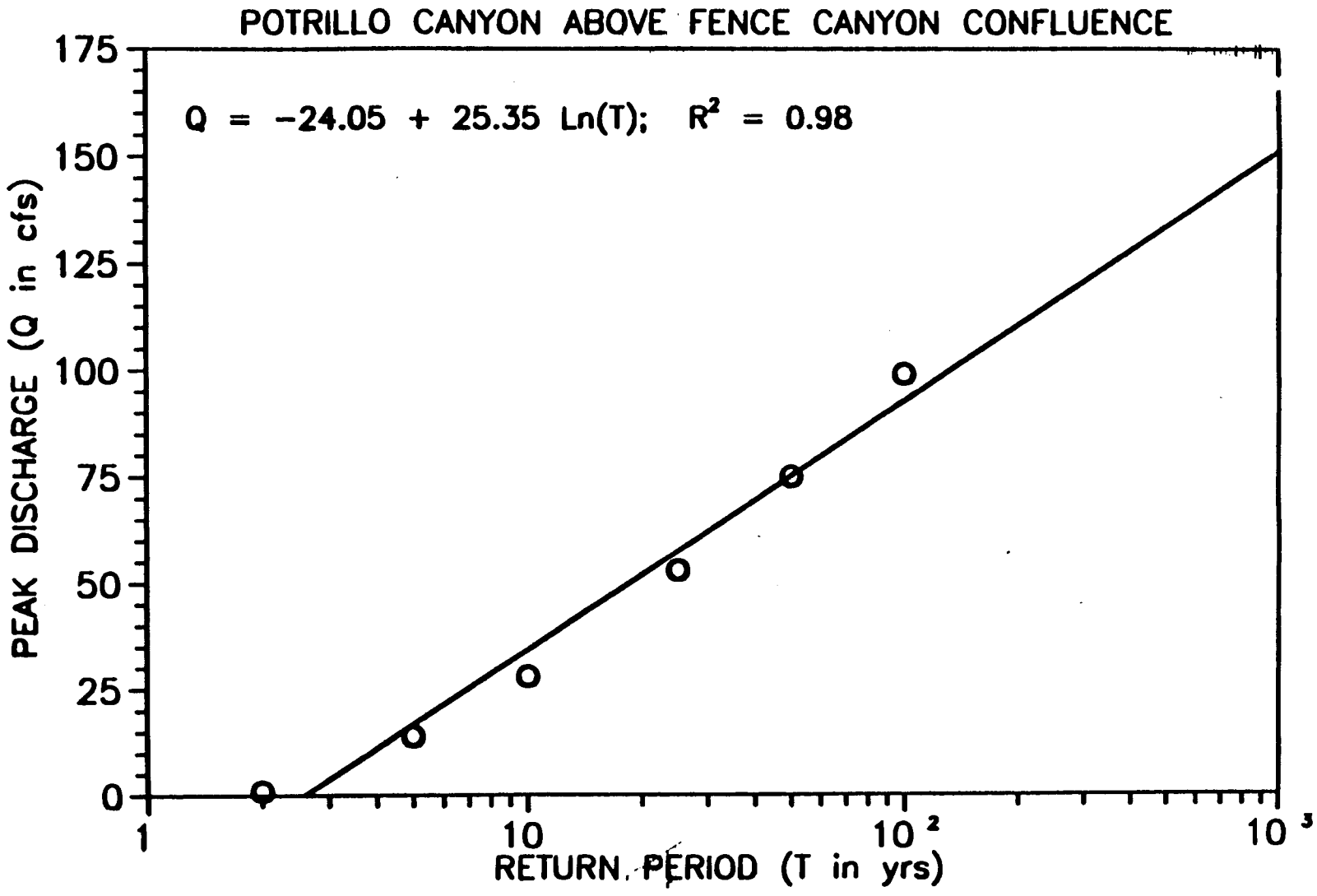

CANADA DEL BUEY AT NEW MEXICO STATE ROAD 4
Q = −16.71 + 18.19 Ln(T); R² = 0.98
PEAK DISCHARGE (Q in cfs)
125
100
75
50
25
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

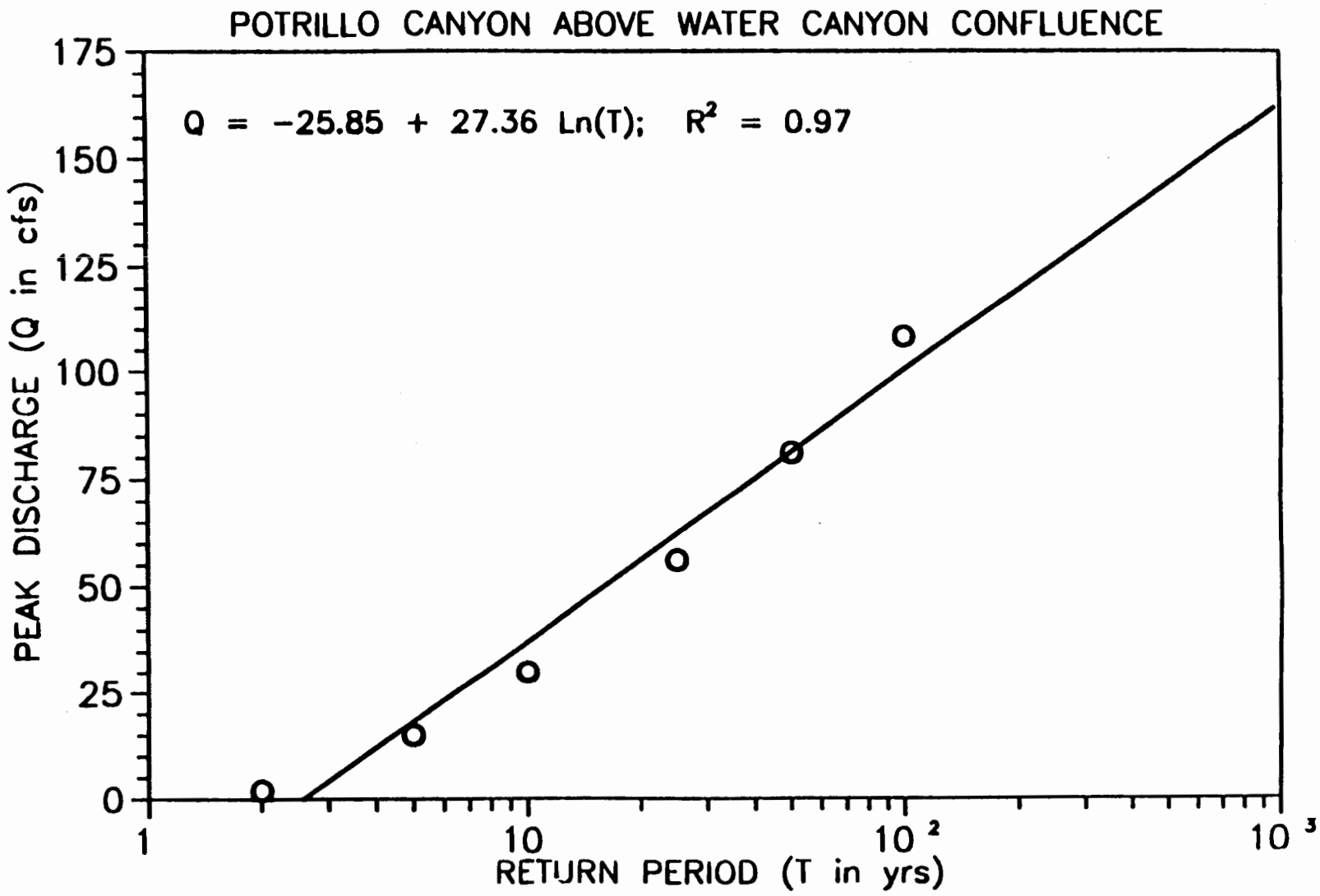

PAJARITO CANYON AT NEW MEXICO STATE ROAD 4
Q = −119.57 + 126.64 Ln(T); R² = 0.98
PEAK DISCHARGE (Q in cfs)
800
600
400
200
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

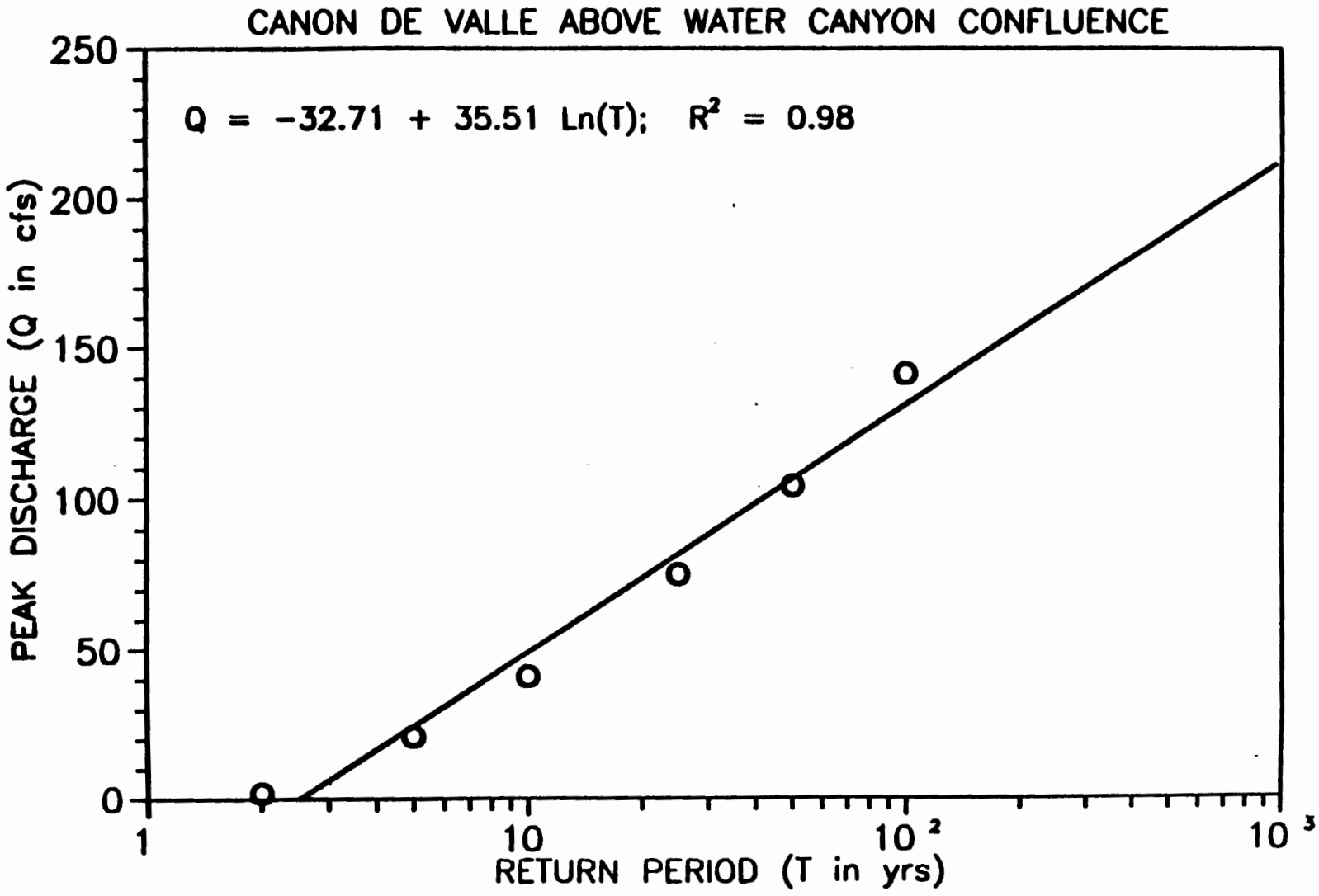

TWO-MILE CANYON ABOVE WATER CANYON CONFLUENCE
Q = -37.91 + 38.21 Ln(T); R² = 0.97
PEAK DISCHARGE (Q in cfs)
250
200
150
100
50
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

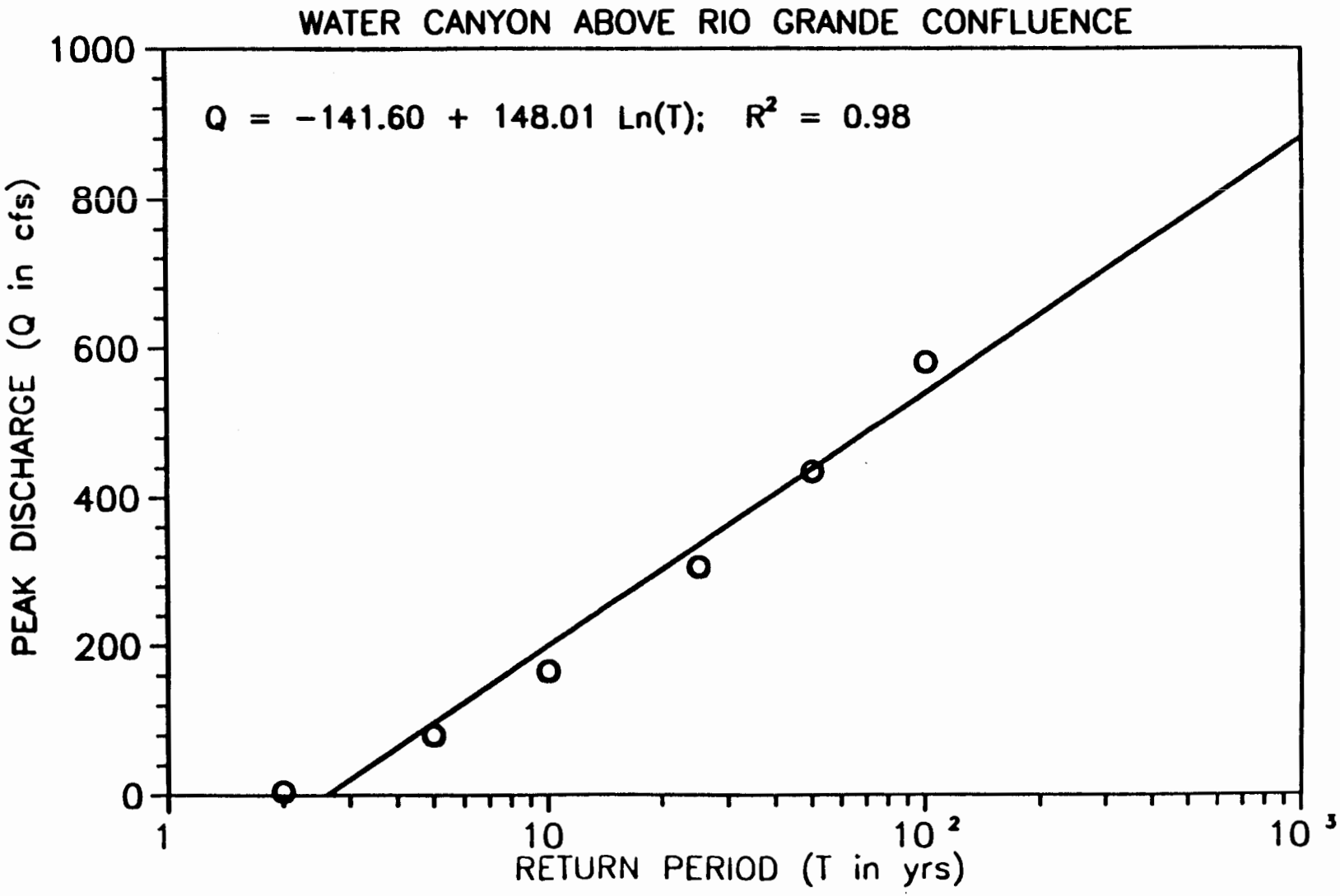

THREE-MILE CANYON ABOVE WATER CANYON CONFLUENCE
Q = -18.53 + 20.27 Ln(T); R² = 0.98
PEAK DISCHARGE (Q in cfs)
125
100
75
50
25
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

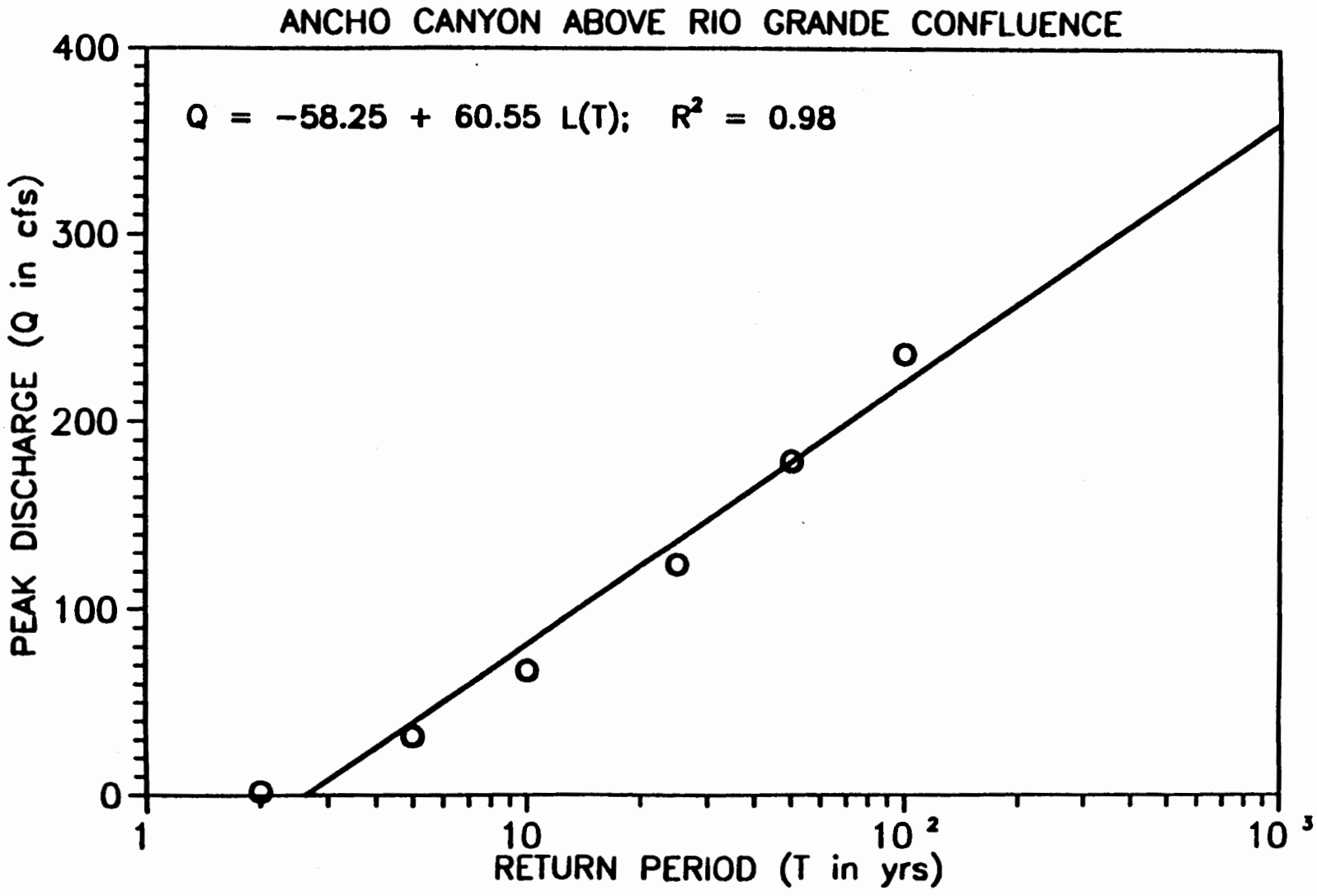

FENCE CANYON ABOVE POTRILLO CANYON CONFLUENCE
Q = −12.76 + 13.87 Ln(T); R² = 0.97
PEAK DISCHARGE (Q in cfs)
100
80
60
40
20
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

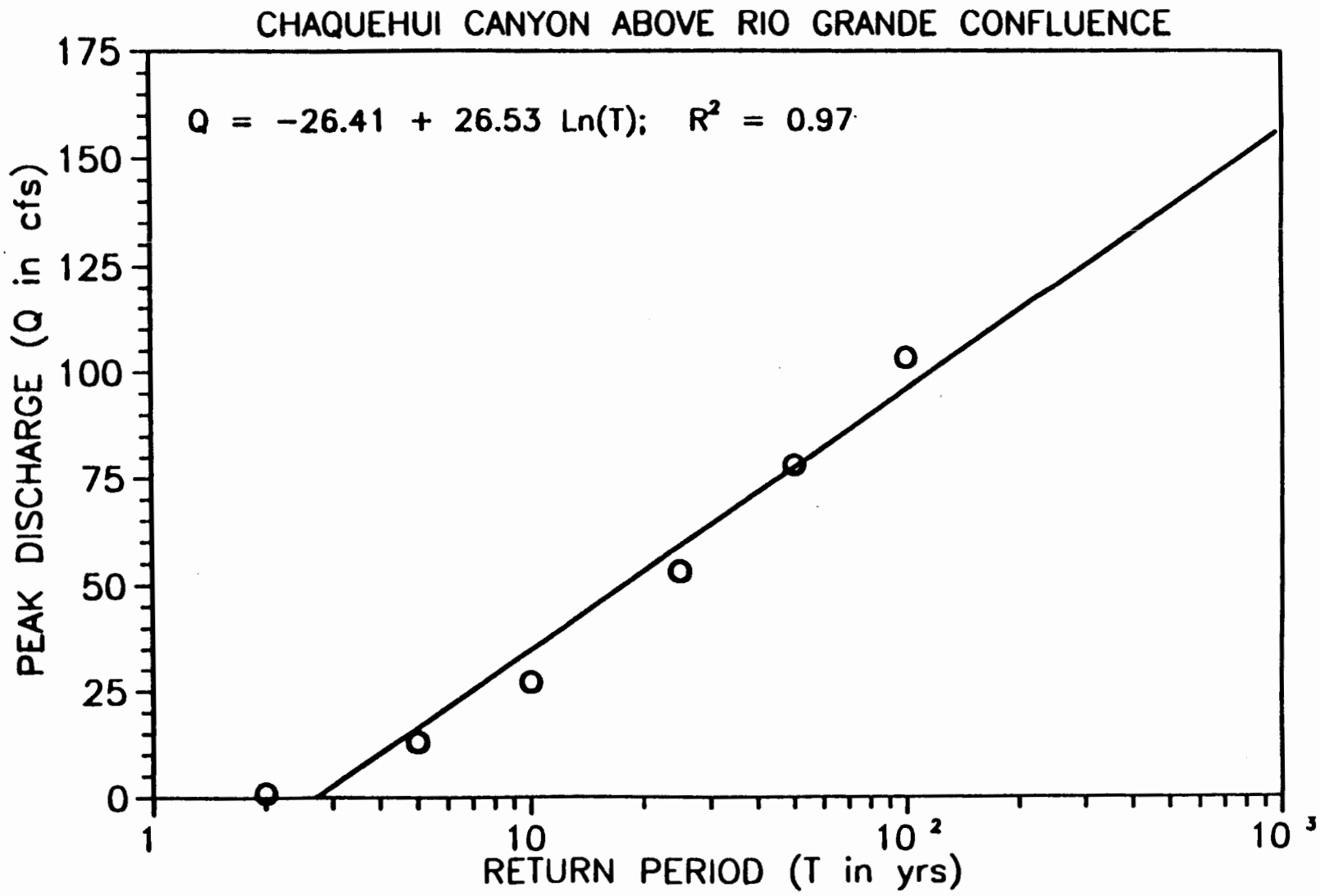

POTRILLO CANYON ABOVE FENCE CANYON CONFLUENCE
Q = −24.05 + 25.35 Ln(T); R² = 0.98
PEAK DISCHARGE (Q in cfs)
175
150
125
100
75
50
25
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

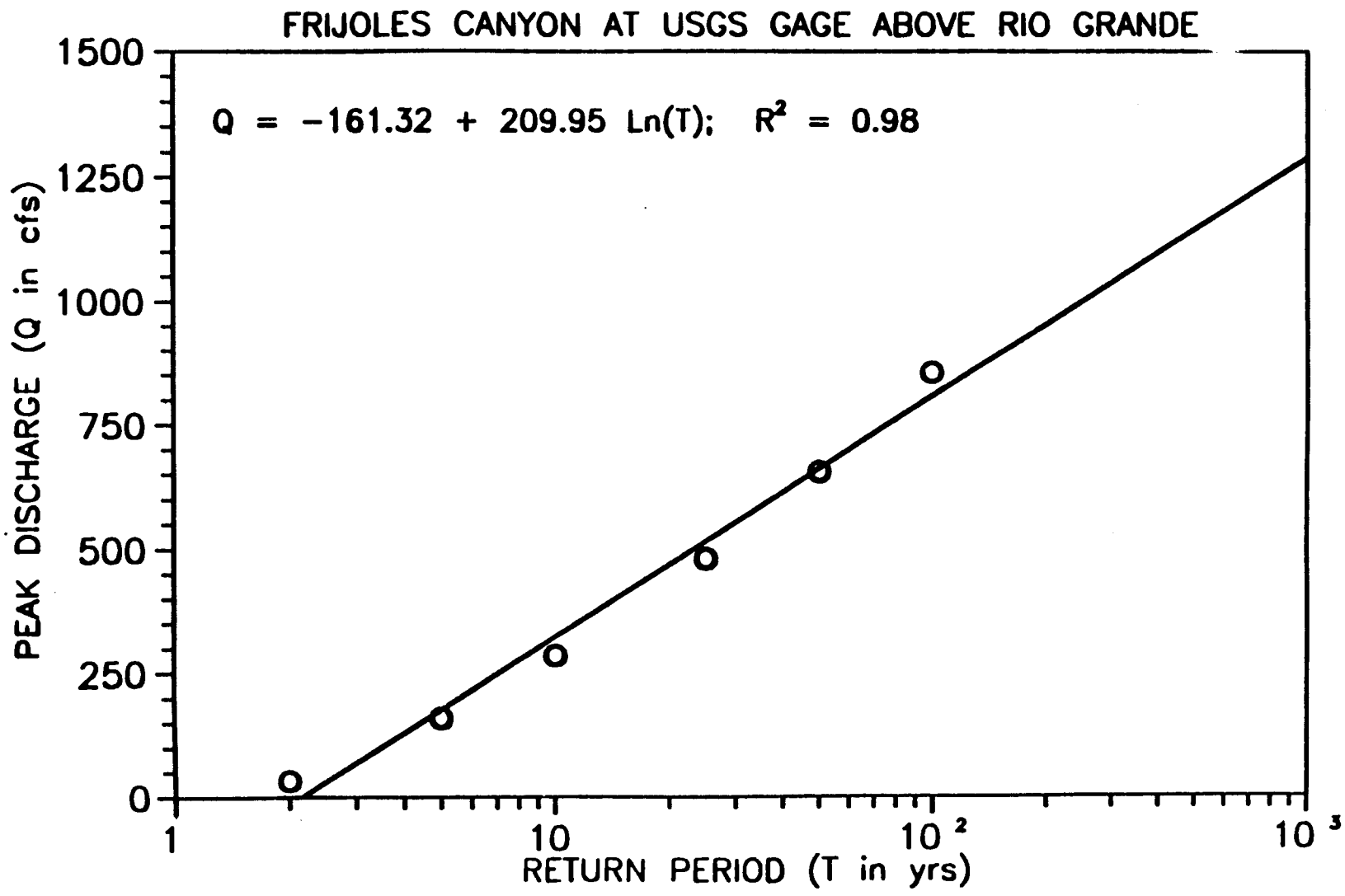

POTRILLO CANYON ABOVE WATER CANYON CONFLUENCE
Q = −25.85 + 27.36 Ln(T); R² = 0.97
PEAK DISCHARGE (Q in cfs)
175
150
125
100
75
50
25
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)


CANON DE VALLE ABOVE WATER CANYON CONFLUENCE
Q = −32.71 + 35.51 Ln(T); R² = 0.98
PEAK DISCHARGE (Q in cfs)
250
200
150
100
50
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)


WATER CANYON ABOVE RIO GRANDE CONFLUENCE
Q = −141.60 + 148.01 Ln(T); R² = 0.98
PEAK DISCHARGE (Q in cfs)
1000
800
600
400
200
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)


ANCHO CANYON ABOVE RIO GRANDE CONFLUENCE
Q = −58.25 + 60.55 L(T); R² = 0.98
PEAK DISCHARGE (Q in cfs)
400
300
200
100
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)


CHAQUEHUI CANYON ABOVE RIO GRANDE CONFLUENCE
Q = −26.41 + 26.53 Ln(T); R² = 0.97
PEAK DISCHARGE (Q in cfs)
175
150
125
100
75
50
25
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)


FRIJOLES CANYON AT USGS GAGE ABOVE RIO GRANDE
Q = −161.32 + 209.95 Ln(T); R² = 0.98
PEAK DISCHARGE (Q in cfs)
1500
1250
1000
750
500
250
0
1
10
10 ²
10 ³
RETURN PERIOD (T in yrs)

APPENDIX B

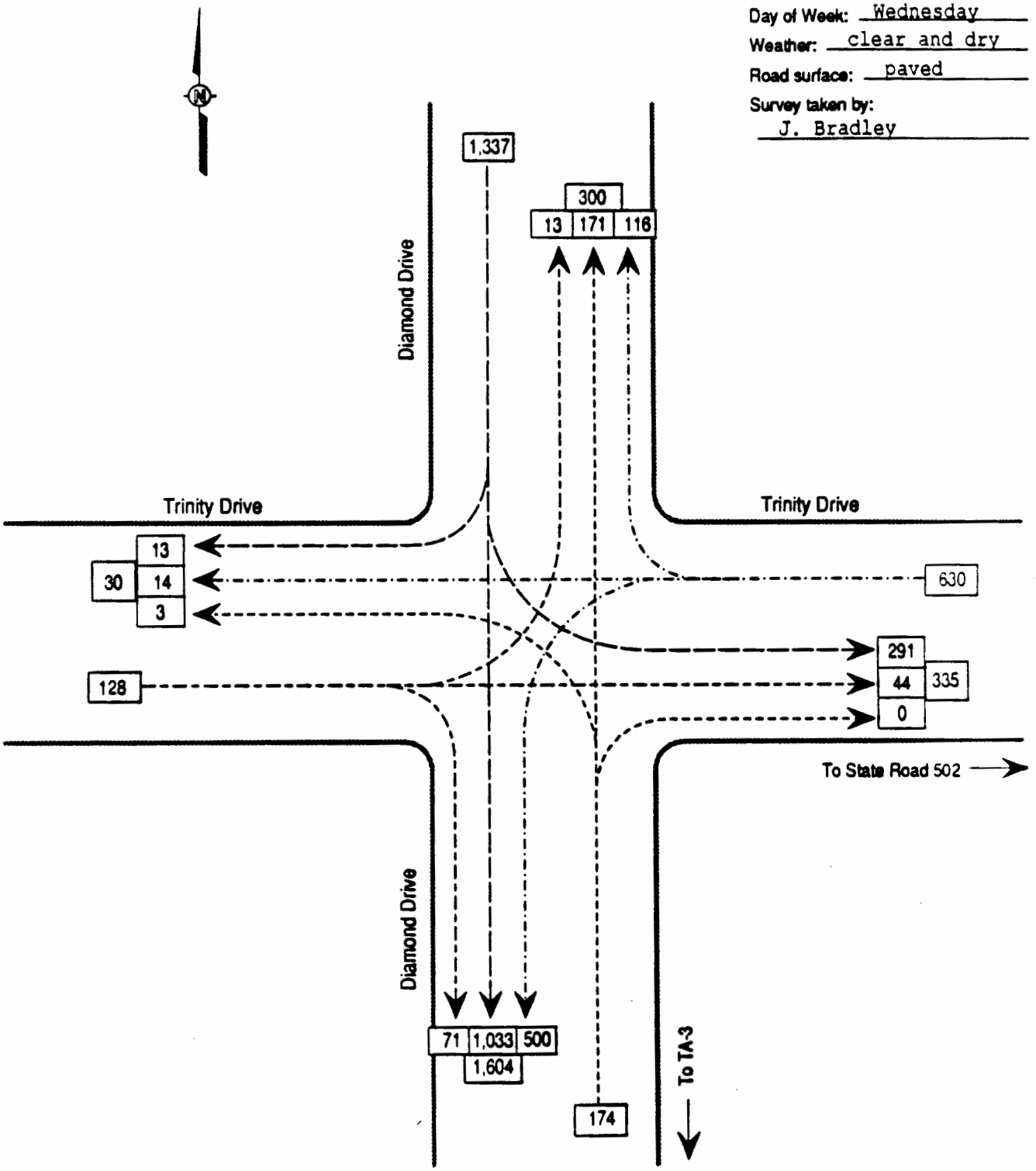
1991 and 1992 Traffic Studies at Intersection of Diamond Drive and Trinity Drive

301608.07 A1

LOS ALAMOS COUNTY
TRAFFIC ENGINEERING DEPARTMENT

Vehicular traffic count movements at the intersection of Diamond Drive and Trinity Drive.

Date of Survey: 10/2/91
Taken for 1 hour(s)
from: 07:15 to: 08:15
Day of Week: Wednesday
Weather: clear and dry
Road surface: paved
Survey taken by:
J. Bradley

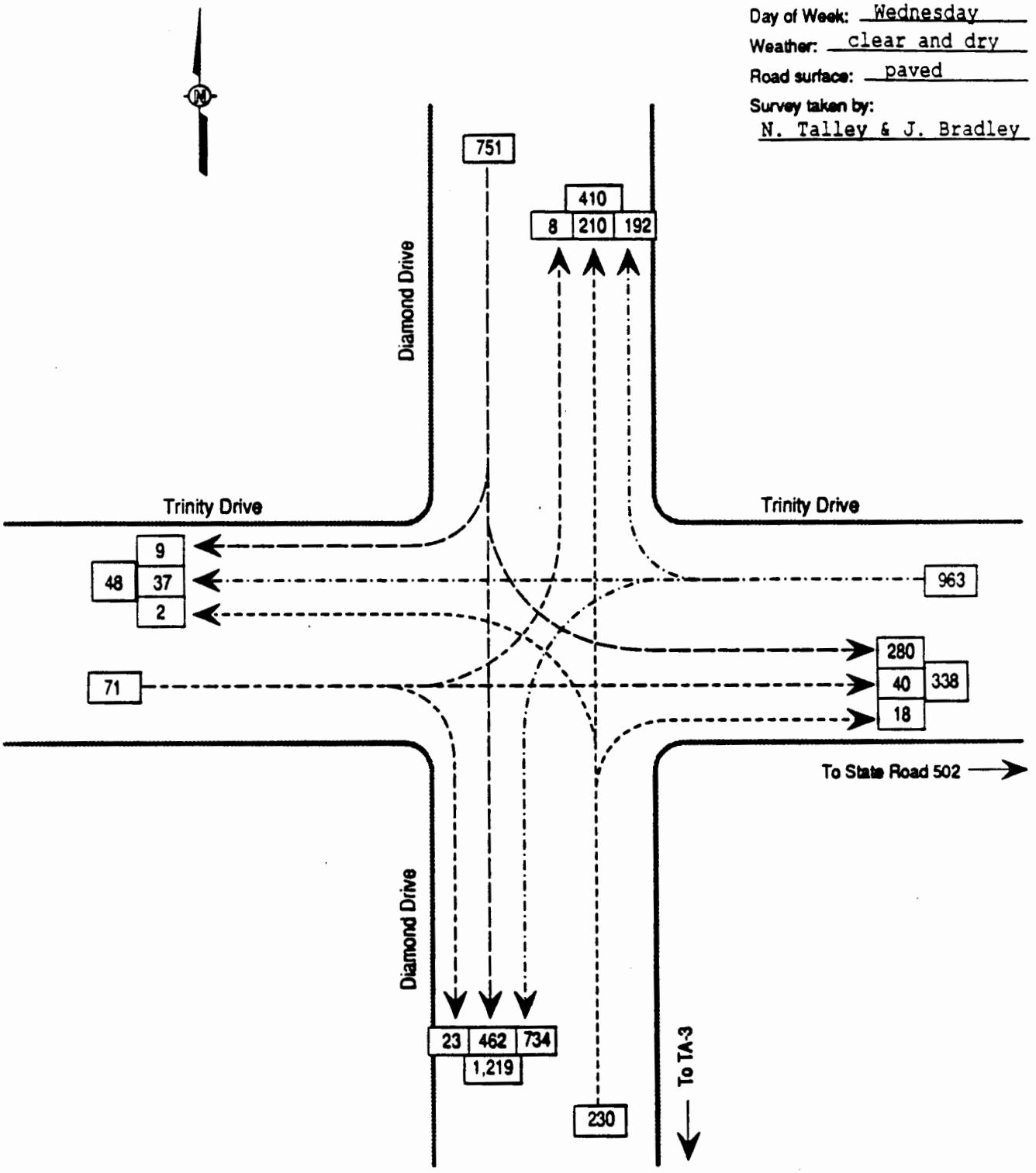


301608.07 A2

LOS ALAMOS COUNTY
TRAFFIC ENGINEERING DEPARTMENT

Vehicular traffic count movements at the intersection of Diamond Drive and Trinity Drive.

Date of Survey: 10/2/91
Taken for 1 hour(s)
from: 12:20 to: 13:20
Day of Week: Wednesday
Weather: clear and dry
Road surface: paved
Survey taken by:
N. Talley & J. Bradley



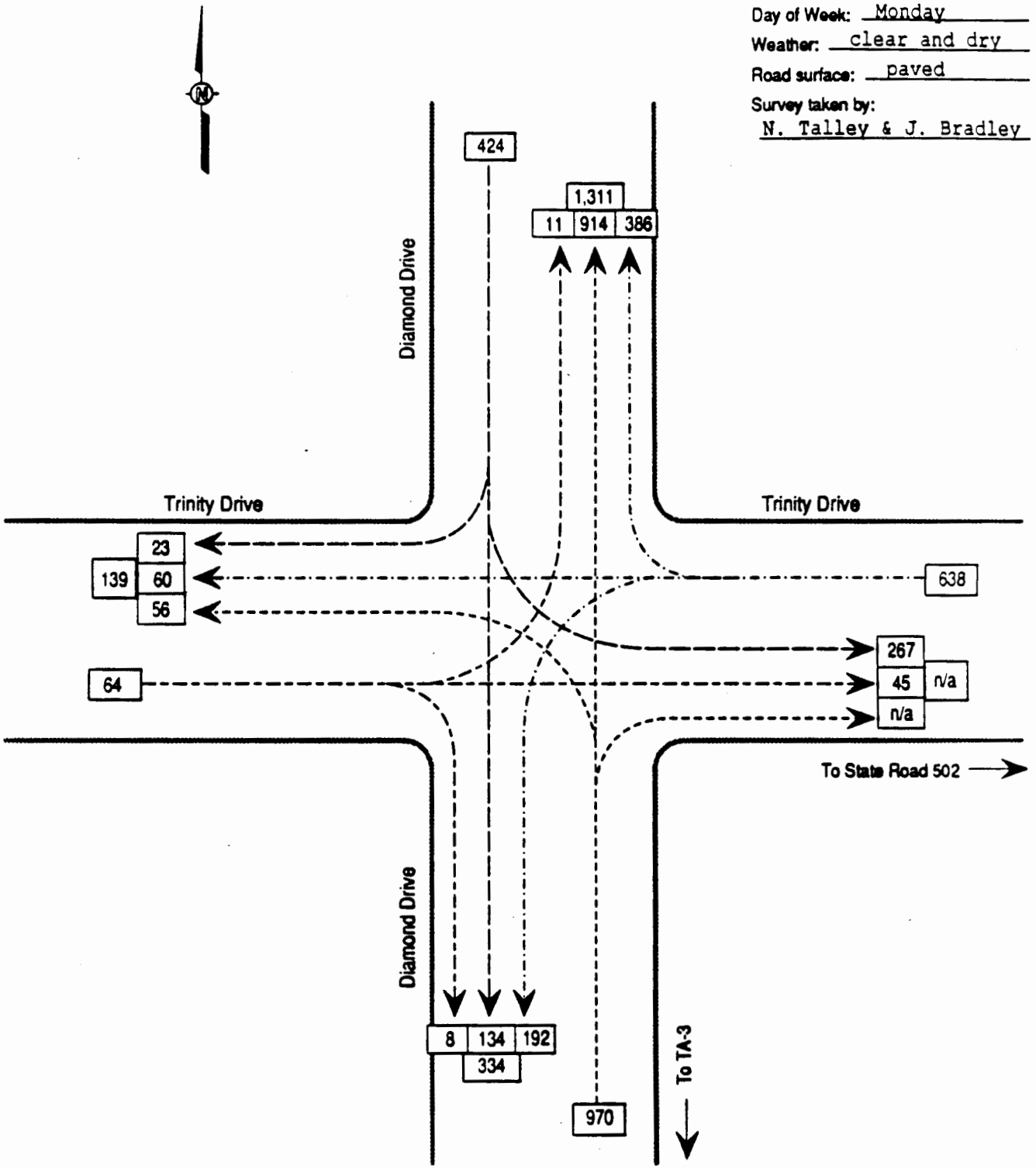
INTERNATIONAL TECHNOLOGY CORPORATION

301608.07 A3

LOS ALAMOS COUNTY
TRAFFIC ENGINEERING DEPARTMENT

Vehicular traffic count movements at the intersection of Diamond Drive and Trinity Drive.

Date of Survey: 10/7/91
Taken for 1 hour(s)
from: 16:25 to: 17:25
Day of Week: Monday
Weather: clear and dry
Road surface: paved
Survey taken by:
N. Talley & J. Bradley



INTERNATIONAL TECHNOLOGY CORPORATION

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNS.TXT
CHANNEL 1- NORTH BOUND
TAKEN BY - N. TALLEY

ROUTE - DIAMOND DRIVE
LOCATION - SOUTH OF TRINITY SIGNAL PRIOR TO WEST ROAD
CHANNEL 2- SOUTH BOUND
NOTE - COUNT INCLUDES DIAMOND TO TRINITY RAMP TRAFFIC

24 Hour Start Date

Daily Printout of 2 Channel Data

* NOT TO NM STATE TRAFFIC MONITORING STANDARDS

Tuesday September 29, 1992

Period Ends	North Bound	South Bound	Total	Hour Total
0:15	21	5	26	
0:30	7	2	9	
0:45	7	2	9	
1:00	7	6	13	57
1:15	5	4	9	
1:30	8	1	9	
1:45	3	5	8	
2:00	5	7	12	38
2:15	2	0	2	
2:30	1	7	8	
2:45	5	1	6	
3:00	4	1	5	21
3:15	8	1	9	
3:30	2	3	5	
3:45	2	2	4	
4:00	3	4	7	25
4:15	1	4	5	
4:30	3	4	7	
4:45	3	6	9	
5:00	1	9	10	31
5:15	8	7	15	
5:30	5	16	21	
5:45	7	15	22	
6:00	9	32	41	99
6:15	14	38	52	
6:30	16	56	72	
6:45	33	148	181	
7:00	48	258	306	611
7:15	70	308	378	
7:30	134	411	545	
7:45	126	449	575	
8:00	196	557	753	2251
8:15	135	542	677	
8:30	151	343	494	
8:45	109	265	374	
9:00	150	170	320	1865
9:15	112	172	284	
9:30	136	163	299	
9:45	118	142	260	
10:00	155	158	313	1156
10:15	136	136	272	
10:30	151	130	281	
10:45	122	128	250	
11:00	157	146	303	1106
11:15	199	154	353	
11:30	233	168	401	
11:45	365	162	527	
12:00	444	183	627	1908
12:15	470	189	659	
12:30	259	255	514	
12:45	194	355	549	
13:00	191	427	618	2340
13:15	192	341	533	
13:30	157	322	479	
13:45	163	261	424	
14:00	151	193	344	1780
14:15	95	179	274	
14:30	118	158	276	
14:45	222	146	368	
15:00	198	180	378	1296
15:15	181	133	314	
15:30	166	178	344	
15:45	317	148	465	
16:00	320	195	515	1638
16:15	480	160	640	
16:30	395	139	534	
16:45	417	138	555	
17:00	397	133	530	2259
17:15	546	164	710	
17:30	527	174	701	
17:45	388	174	562	
18:00	267	125	392	2365
18:15	237	116	353	
18:30	206	79	285	
18:45	137	82	219	
19:00	161	85	246	1103
19:15	100	83	183	
19:30	95	82	177	
19:45	131	97	228	
20:00	64	66	130	718
20:15	66	56	122	
20:30	57	54	111	
20:45	62	45	107	
21:00	38	53	91	431
21:15	37	46	83	
21:30	30	23	53	
21:45	31	35	66	
22:00	25	16	41	243
22:15	24	16	40	
22:30	23	24	47	
22:45	27	14	41	
23:00	17	17	34	162
23:15	24	8	32	
23:30	12	7	19	
23:45	33	10	43	
24:00	18	6	24	118
24 Hr Total	12103	11518	23621	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNS.TXT
CHANNEL 1- NORTH BOUND
TAKEN BY - M. TALLEY

ROUTE - DIAMOND DRIVE
LOCATION - SOUTH OF TRINITY SIGNAL PRIOR TO WEST ROAD
CHANNEL 2- SOUTH BOUND
NOTE - COUNT INCLUDES DIAMOND TO TRINITY RAMP TRAFFIC

24 Hour Start Date

Daily Printout of 2 Channel Data

Wednesday September 30, 1992

Period Ends	North Bound	South Bound	Total	Hour Total
0:15	8	1	9	
0:30	7	3	10	
0:45	6	5	11	
1:00	2	1	3	33
1:15	2	3	5	
1:30	0	2	2	
1:45	6	0	6	
2:00	1	1	2	15
2:15	5	3	8	
2:30	5	3	8	
2:45	0	0	0	
3:00	1	3	4	20
3:15	4	0	4	
3:30	1	0	1	
3:45	1	2	3	
4:00	2	6	8	16
4:15	0	4	4	
4:30	5	5	10	
4:45	2	6	8	
5:00	1	2	3	25
5:15	7	13	20	
5:30	4	17	21	
5:45	9	23	32	
6:00	14	39	53	126
6:15	10	44	54	
6:30	23	59	82	
6:45	43	130	173	
7:00	36	260	296	605
7:15	63	302	365	
7:30	122	395	517	
7:45	160	500	660	
8:00	162	529	691	2233
8:15	161	493	654	
8:30	149	335	484	
8:45	120	252	372	
9:00	142	207	349	1859
9:15	81	173	254	
9:30	105	171	276	
9:45	118	140	258	
10:00	126	149	275	1063
10:15	143	146	289	
10:30	119	118	237	
10:45	124	151	275	
11:00	178	141	319	1120
11:15	177	160	337	
11:30	247	137	384	
11:45	382	158	540	
12:00	458	184	642	1903
2:15	471	198	669	
12:30	279	270	549	
12:45	174	326	500	
13:00	51	443	494	2212
13:15	7	423	430	
13:30	2	293	295	
13:45	0	231	231	
14:00	172	188	360	1316
14:15	159	160	319	
14:30	172	174	346	
14:45	151	202	353	
15:00	170	191	361	1379
15:15	196	164	360	
15:30	175	152	327	
15:45	299	140	439	
16:00	294	151	445	1571
16:15	483	145	628	
16:30	426	166	592	
16:45	478	132	610	
17:00	402	150	552	2382
17:15	517	166	683	
17:30	455	165	620	
17:45	389	135	524	
18:00	257	123	380	2207
18:15	223	117	340	
18:30	184	97	281	
18:45	175	97	272	
19:00	149	90	239	1132
19:15	109	67	176	
19:30	68	88	156	
19:45	66	61	127	
20:00	68	55	123	582
20:15	63	52	115	
20:30	50	65	115	
20:45	58	71	129	
21:00	33	52	85	444
21:15	26	55	81	
21:30	41	43	84	
21:45	35	27	62	
22:00	30	34	64	291
22:15	27	23	50	
22:30	28	18	46	
22:45	20	27	47	
23:00	26	18	44	187
23:15	15	11	26	
23:30	17	13	30	
23:45	23	6	29	
24:00	21	7	28	113
24 Hr Total	11276	11558	22834	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNS.TXT
CHANNEL 1- NORTH BOUND
TAKEN BY - N. TALLEY

ROUTE - DIAMOND DRIVE
LOCATION - SOUTH OF TRINITY SIGNAL PRIOR TO WEST ROAD
CHANNEL 2- SOUTH BOUND
NOTE - COUNT INCLUDES DIAMOND TO TRINITY RAMP TRAFFIC

24 Hour Start Date

Daily Printout of 2 Channel Data

Thursday October 1, 1992

Period Ends	North Bound	South Bound	Total	Hour Total
0:15	10	8	18	
0:30	10	0	10	
0:45	6	3	9	
1:00	4	3	7	44
1:15	7	2	9	
1:30	5	3	8	
1:45	0	1	1	
2:00	1	0	1	19
2:15	1	1	2	
2:30	5	1	6	
2:45	1	0	1	
3:00	2	1	3	12
3:15	3	0	3	
3:30	3	0	3	
3:45	1	3	4	
4:00	1	3	4	14
4:15	4	6	10	
4:30	2	3	5	
4:45	3	5	8	
5:00	1	4	5	28
5:15	5	8	13	
5:30	1	8	9	
5:45	5	13	18	
6:00	10	28	38	78
6:15	16	51	67	
6:30	17	59	76	
6:45	29	112	141	
7:00	59	271	330	614
7:15	78	304	382	
7:30	130	425	555	
7:45	140	452	592	
8:00	162	539	701	2230
8:15	185	503	688	
8:30	141	340	481	
8:45	126	256	382	
9:00	152	217	369	1920
9:15	108	173	281	
9:30	125	178	303	
9:45	118	149	267	
10:00	154	173	327	1178
10:15	138	138	276	
10:30	148	141	289	
10:45	146	146	292	
11:00	174	144	318	1175
11:15	237	175	412	
11:30	246	174	420	
11:45	444	170	614	
12:00	473	183	656	2102
12:15	509	207	716	
12:30	294	259	553	
12:45	207	379	586	
13:00	186	477	663	2518
13:15	177	433	610	
13:30	186	315	501	
13:45	149	201	350	
14:00	145	179	324	1785
14:15	155	171	326	
14:30	191	149	340	
14:45	157	183	340	
15:00	182	162	344	1350
15:15	192	159	351	
15:30	170	144	314	
15:45	327	122	449	
16:00	298	204	502	1616
16:15	487	179	666	
16:30	411	165	576	
16:45	487	142	629	
17:00	390	131	521	2392
17:15	577	174	751	
17:30	453	203	656	
17:45	370	140	510	
18:00	266	141	407	2324
18:15	253	137	390	
18:30	172	111	283	
18:45	154	113	267	
19:00	139	97	236	1176
19:15	109	84	193	
19:30	84	79	163	
19:45	91	63	154	
20:00	54	61	115	625
20:15	64	57	121	
20:30	37	44	81	
20:45	35	38	73	
21:00	57	44	101	376
21:15	45	56	101	
21:30	40	33	73	
21:45	33	33	66	
22:00	32	34	66	306
22:15	40	31	71	
22:30	28	20	48	
22:45	18	20	38	
23:00	20	11	31	188
23:15	15	12	27	
23:30	15	7	22	
23:45	33	8	41	
24:00	16	8	24	114
24 Hr Total	12387	11797	24184	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNN.TXT
CHANNEL 1- SOUTH BOUND
TAKEN BY - N. TALLEY

ROUTE - DIAMOND DRIVE
LOCATION - NORTH OF TRINITY SIGNAL PRIOR TO CANYON SIGNAL
CHANNEL 2- NORTH BOUND

24 Hour Start Date

Daily Printout of 2 Channel Data

*NOT TO NM STATE TRAFFIC MONITORING STANDARDS

Saturday September 26, 1992

Period Ends	South Bound	North Bound	Total	Hour Total
0:15	11	19	30	
0:30	8	16	24	
0:45	12	17	29	
1:00	3	14	17	100
1:15	6	15	21	
1:30	2	15	17	
1:45	6	11	17	
2:00	5	10	15	70
2:15	2	5	7	
2:30	3	4	7	
2:45	0	7	7	
3:00	2	0	2	23
3:15	1	1	2	
3:30	3	0	3	
3:45	1	2	3	
4:00	6	4	10	18
4:15	0	1	1	
4:30	3	1	4	
4:45	3	4	7	
5:00	5	1	6	18
5:15	3	1	4	
5:30	7	7	14	
5:45	17	4	21	
6:00	17	4	21	60
6:15	18	9	27	
6:30	17	11	28	
6:45	24	5	29	
7:00	48	11	59	143
7:15	47	17	64	
7:30	51	31	82	
7:45	51	27	78	
8:00	79	42	121	345
8:15	69	37	106	
8:30	79	45	124	
8:45	82	36	118	
9:00	113	64	177	525
9:15	123	56	179	
9:30	107	71	178	
9:45	100	54	154	
10:00	131	74	205	716
10:15	114	75	189	
10:30	132	95	227	
10:45	130	89	219	
11:00	129	89	218	853
11:15	131	89	220	
11:30	127	115	242	
11:45	139	125	264	
12:00	112	124	236	962
12:15	132	116	248	
12:30	114	103	217	
12:45	113	97	210	
13:00	151	92	243	918
13:15	113	103	216	
13:30	117	93	210	
13:45	112	102	214	
14:00	106	86	192	832
14:15	110	88	198	
14:30	137	84	221	
14:45	140	107	247	
15:00	105	93	198	864
15:15	87	83	170	
15:30	93	124	217	
15:45	126	87	213	
16:00	95	74	169	769
16:15	97	89	186	
16:30	92	110	202	
16:45	92	101	193	
17:00	100	105	205	786
17:15	73	94	167	
17:30	89	118	207	
17:45	92	98	190	
18:00	82	88	170	734
18:15	79	96	175	
18:30	75	95	170	
18:45	78	91	169	
19:00	66	97	163	677
19:15	63	86	149	
19:30	55	85	140	
19:45	55	73	128	
20:00	56	74	130	547
20:15	45	63	108	
20:30	29	62	91	
20:45	54	62	116	
21:00	43	50	93	408
21:15	38	60	98	
21:30	36	51	87	
21:45	38	51	89	
22:00	33	52	85	359
22:15	23	67	90	
22:30	22	49	71	
22:45	32	67	99	
23:00	23	51	74	334
23:15	32	39	71	
23:30	23	25	48	
23:45	23	28	51	
24:00	33	28	61	231
24 Hr Total	5901	5391	11292	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNN.TXT
CHANNEL 1- SOUTH BOUND
TAKEN BY - N. TALLEY

ROUTE - DIAMOND DRIVE
LOCATION - NORTH OF TRINITY SIGNAL PRIOR TO CANYON SIGNAL
CHANNEL 2- NORTH BOUND

24 Hour Start Date

Daily Printout of 2 Channel Data

Sunday September 27, 1992

Period Ends	South Bound	North Bound	Total	Hour Total
0:15	66	26	92	
0:30	32	25	57	
0:45	14	15	29	
1:00	15	11	26	204
1:15	9	10	19	
1:30	9	12	21	
1:45	9	8	17	
2:00	7	11	18	75
2:15	9	6	15	
2:30	5	8	13	
2:45	3	17	20	
3:00	6	4	10	58
3:15	8	1	9	
3:30	2	6	8	
3:45	2	6	8	
4:00	5	1	6	31
4:15	2	6	8	
4:30	3	4	7	
4:45	4	2	6	
5:00	2	3	5	26
5:15	4	2	6	
5:30	3	0	3	
5:45	9	4	13	
6:00	9	2	11	33
6:15	6	4	10	
6:30	17	12	29	
6:45	18	2	20	
7:00	21	8	29	88
7:15	11	13	24	
7:30	21	15	36	
7:45	45	24	69	
8:00	34	29	63	192
8:15	35	34	69	
8:30	53	33	86	
8:45	68	57	125	
9:00	81	112	193	473
9:15	85	73	158	
9:30	83	71	154	
9:45	74	70	144	
10:00	103	60	163	619
10:15	85	60	145	
10:30	80	53	133	
10:45	88	59	147	
11:00	87	72	159	584
11:15	86	74	160	
11:30	111	71	182	
11:45	112	73	185	
12:00	112	73	185	712
2:15	113	77	190	
12:30	126	92	218	
12:45	105	76	181	
13:00	89	80	169	758
13:15	97	81	178	
13:30	106	91	197	
13:45	109	66	175	
14:00	99	81	180	730
14:15	101	91	192	
14:30	108	84	192	
14:45	89	77	166	
15:00	105	79	184	734
15:15	85	87	172	
15:30	86	60	146	
15:45	73	76	149	
16:00	89	106	195	662
16:15	82	90	172	
16:30	90	96	186	
16:45	75	72	147	
17:00	77	87	164	669
17:15	58	103	161	
17:30	73	98	171	
17:45	72	86	158	
18:00	94	105	199	689
18:15	86	86	172	
18:30	53	76	129	
18:45	65	79	144	
19:00	60	104	164	609
19:15	66	74	140	
19:30	50	70	120	
19:45	60	57	117	
20:00	49	82	131	508
20:15	35	74	109	
20:30	30	33	63	
20:45	25	66	91	
21:00	26	34	60	323
21:15	26	32	58	
21:30	25	33	58	
21:45	19	22	41	
22:00	13	28	41	198
22:15	23	37	60	
22:30	6	11	17	
22:45	11	24	35	
23:00	10	17	27	139
23:15	3	14	17	
23:30	9	12	21	
23:45	3	13	16	
24:00	4	8	12	66
24 Hr Total	4711	4469	9180	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNN.TXT
CHANNEL 1- SOUTH BOUND
TAKEN BY - N. TALLEY

ROUTE - DIAMOND DRIVE
LOCATION - NORTH OF TRINITY SIGNAL PRIOR TO CANYON SIGNAL
CHANNEL 2- NORTH BOUND

24 Hour Start Date

Daily Printout of 2 Channel Data

Monday September 28, 1992

Period Ends	South Bound	North Bound	Total	Hour Total
0:15	3	6	9	
0:30	5	4	9	
0:45	3	5	8	
1:00	4	3	7	33
1:15	1	2	3	
1:30	0	6	6	
1:45	2	7	9	
2:00	2	3	5	23
2:15	0	1	1	
2:30	2	6	8	
2:45	1	3	4	
3:00	2	1	3	16
3:15	0	2	2	
3:30	3	1	4	
3:45	6	1	7	
4:00	3	1	4	17
4:15	4	0	4	
4:30	5	1	6	
4:45	4	4	8	
5:00	4	5	9	27
5:15	5	2	7	
5:30	12	1	13	
5:45	17	1	18	
6:00	33	13	46	84
6:15	28	7	35	
6:30	66	21	87	
6:45	89	20	109	
7:00	185	41	226	457
7:15	218	71	289	
7:30	313	127	440	
7:45	390	121	511	
8:00	437	158	595	1835
8:15	372	133	505	
8:30	272	89	361	
8:45	169	88	257	
9:00	179	116	295	1418
9:15	130	73	203	
9:30	126	66	192	
9:45	93	75	168	
10:00	104	89	193	756
10:15	115	78	193	
10:30	87	85	172	
10:45	92	86	178	
11:00	113	125	238	781
11:15	94	99	193	
11:30	87	112	199	
11:45	160	138	298	
12:00	152	222	374	1064
2:15	132	233	365	
12:30	155	161	316	
12:45	212	118	330	
13:00	230	127	357	1368
13:15	217	114	331	
13:30	164	135	299	
13:45	159	95	254	
14:00	116	107	223	1107
14:15	125	92	217	
14:30	108	82	190	
14:45	120	121	241	
15:00	149	151	300	948
15:15	121	138	259	
15:30	119	114	233	
15:45	140	142	282	
16:00	196	137	333	1107
16:15	164	223	387	
16:30	125	215	340	
16:45	113	265	378	
17:00	111	263	374	1479
17:15	147	372	519	
17:30	157	399	556	
17:45	178	261	439	
18:00	106	216	322	1836
18:15	96	199	295	
18:30	81	167	248	
18:45	112	128	240	
19:00	116	128	244	1027
19:15	96	101	197	
19:30	88	112	200	
19:45	70	61	131	
20:00	40	77	117	645
20:15	74	60	134	
20:30	57	58	115	
20:45	37	38	75	
21:00	39	47	86	410
21:15	65	33	98	
21:30	39	40	79	
21:45	27	47	74	
22:00	29	34	63	314
22:15	15	38	53	
22:30	14	32	46	
22:45	13	18	31	
23:00	12	22	34	164
23:15	15	26	41	
23:30	14	16	30	
23:45	7	16	23	
24:00	4	21	25	119
24 Hr Total	8916	8119	17035	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNN.TXT
CHANNEL 1- SOUTH BOUND
TAKEN BY - N. TALLEY

ROUTE - DIAMOND DRIVE
LOCATION - NORTH OF TRINITY SIGNAL PRIOR TO CANYON SIGNAL
CHANNEL 2- NORTH BOUND

24 Hour Start Date

Daily Printout of 2 Channel Data

Tuesday September 29, 1992

Period Ends	South Bound	North Bound	Total	Hour Total
0:15	8	12	20	
0:30	6	9	15	
0:45	1	6	7	
1:00	4	8	12	54
1:15	3	6	9	
1:30	2	5	7	
1:45	2	6	8	
2:00	1	4	5	29
2:15	3	1	4	
2:30	3	3	6	
2:45	0	3	3	
3:00	0	4	4	17
3:15	2	4	6	
3:30	4	1	5	
3:45	2	2	4	
4:00	6	1	7	22
4:15	2	2	4	
4:30	2	0	2	
4:45	5	6	11	
5:00	3	2	5	22
5:15	8	2	10	
5:30	12	3	15	
5:45	18	3	21	
6:00	30	4	34	80
6:15	33	12	45	
6:30	62	16	78	
6:45	119	31	150	
7:00	180	39	219	492
7:15	249	65	314	
7:30	326	118	444	
7:45	358	116	474	
8:00	434	150	584	1816
8:15	356	128	484	
8:30	274	102	376	
8:45	162	70	232	
9:00	139	93	232	1324
9:15	136	79	215	
9:30	127	65	192	
9:45	98	92	190	
10:00	92	91	183	780
10:15	88	77	165	
10:30	91	97	188	
10:45	102	73	175	
11:00	112	101	213	741
11:15	112	95	207	
11:30	99	119	218	
11:45	155	179	334	
12:00	136	240	376	1135
2:15	144	205	349	
12:30	138	158	296	
12:45	202	94	296	
13:00	224	140	364	1305
13:15	201	140	341	
13:30	175	130	305	
13:45	144	109	253	
14:00	130	96	226	1125
14:15	111	80	191	
14:30	126	95	221	
14:45	114	163	277	
15:00	117	151	268	957
15:15	111	120	231	
15:30	150	104	254	
15:45	146	182	328	
16:00	208	188	396	1209
16:15	178	243	421	
16:30	114	221	335	
16:45	111	237	348	
17:00	109	258	367	1471
17:15	118	375	493	
17:30	150	392	542	
17:45	169	294	463	
18:00	145	225	370	1868
18:15	104	232	336	
18:30	134	157	291	
18:45	109	122	231	
19:00	132	158	290	1148
19:15	99	108	207	
19:30	109	89	198	
19:45	93	111	204	
20:00	60	78	138	747
20:15	65	78	143	
20:30	67	64	131	
20:45	55	64	119	
21:00	60	64	124	517
21:15	43	54	97	
21:30	33	53	86	
21:45	37	33	70	
22:00	24	42	66	319
22:15	26	31	57	
22:30	20	45	65	
22:45	17	29	46	
23:00	18	19	37	205
23:15	9	22	31	
23:30	20	14	34	
23:45	1	18	19	
24:00	3	16	19	103
24 Hr Total	9040	8446	17486	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNN.TXT
CHANNEL 1- SOUTH BOUND
TAKEN BY - N. TALLEY

ROUTE - DIAMOND DRIVE
LOCATION - NORTH OF TRINITY SIGNAL PRIOR TO CANYON SIGNA
CHANNEL 2- NORTH BOUND

24 Hour Start Date

Daily Printout of 2 Channel Data

Wednesday September 30, 1992

Period Ends	South Bound	North Bound	Total	Hour Total
0:15	7	8	15	
0:30	3	8	11	
0:45	1	8	9	
1:00	3	7	10	45
1:15	1	4	5	
1:30	1	2	3	
1:45	1	2	3	
2:00	2	1	3	14
2:15	4	2	6	
2:30	1	3	4	
2:45	0	0	0	
3:00	2	1	3	13
3:15	0	2	2	
3:30	1	0	1	
3:45	1	0	1	
4:00	6	1	7	11
4:15	3	2	5	
4:30	2	2	4	
4:45	4	5	9	
5:00	6	3	9	27
5:15	6	3	9	
5:30	14	2	16	
5:45	21	5	26	
6:00	39	13	52	103
6:15	43	10	53	
6:30	55	22	77	
6:45	106	24	130	
7:00	199	42	241	501
7:15	223	65	288	
7:30	309	113	422	
7:45	382	126	508	
8:00	408	136	544	1762
8:15	374	138	512	
8:30	270	115	385	
8:45	177	84	261	
9:00	168	98	266	1424
9:15	144	69	213	
9:30	129	69	198	
9:45	107	67	174	
10:00	93	88	181	766
10:15	101	74	175	
10:30	84	75	159	
10:45	87	85	172	
11:00	111	144	255	761
11:15	126	89	215	
11:30	104	110	214	
11:45	125	184	309	
12:00	164	228	392	1130
2:15	185	241	426	
12:30	162	170	332	
12:45	187	128	315	
13:00	258	106	364	1437
13:15	214	135	349	
13:30	158	113	271	
13:45	152	90	242	
14:00	136	131	267	1129
14:15	119	116	235	
14:30	119	118	237	
14:45	157	127	284	
15:00	184	122	306	1062
15:15	142	131	273	
15:30	126	118	244	
15:45	141	172	313	
16:00	146	173	319	1149
16:15	149	237	386	
16:30	146	197	343	
16:45	96	261	357	
17:00	119	268	387	1473
17:15	114	375	489	
17:30	141	365	506	
17:45	139	330	469	
18:00	126	215	341	1805
18:15	112	200	312	
18:30	100	143	243	
18:45	122	144	266	
19:00	146	182	328	1149
19:15	102	84	186	
19:30	90	102	192	
19:45	65	70	135	
20:00	55	75	130	643
20:15	61	67	128	
20:30	89	73	162	
20:45	85	62	147	
21:00	48	57	105	542
21:15	58	40	98	
21:30	37	74	111	
21:45	25	45	70	
22:00	32	56	88	367
22:15	14	34	48	
22:30	26	28	54	
22:45	17	29	46	
23:00	15	30	45	193
23:15	5	20	25	
23:30	13	12	25	
23:45	3	16	19	
24:00	6	10	16	85
24 Hr Total	9160	8431	17591	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNN.TXT
CHANNEL 1- SOUTH BOUND
TAKEN BY - N. TALLEY

ROUTE - DIAMOND DRIVE
LOCATION - NORTH OF TRINITY SIGNAL PRIOR TO CANYON SIGNAL
CHANNEL 2- NORTH BOUND

24 Hour Start Date

Daily Printout of 2 Channel Data

Thursday October 1, 1992

Period Ends	South Bound	North Bound	Total	Hour Total
0:15	4	9	13	
0:30	3	9	12	
0:45	5	5	10	
1:00	0	1	1	36
1:15	2	3	5	
1:30	3	3	6	
1:45	2	1	3	
2:00	0	0	0	14
2:15	2	4	6	
2:30	2	3	5	
2:45	0	2	2	
3:00	1	3	4	17
3:15	0	1	1	
3:30	1	1	2	
3:45	3	1	4	
4:00	3	4	7	14
4:15	3	0	3	
4:30	3	3	6	
4:45	2	2	4	
5:00	6	3	9	22
5:15	6	2	8	
5:30	8	2	10	
5:45	17	0	17	
6:00	27	6	33	68
6:15	37	13	50	
6:30	65	18	83	
6:45	115	34	149	
7:00	196	35	231	513
7:15	244	72	316	
7:30	308	114	422	
7:45	354	116	470	
8:00	406	134	540	1748
8:15	348	143	491	
8:30	287	108	395	
8:45	186	87	273	
9:00	158	104	262	1421
9:15	125	69	194	
9:30	120	66	186	
9:45	105	83	188	
10:00	115	92	207	775
10:15	101	100	201	
10:30	92	88	180	
10:45	102	83	185	
11:00	97	114	211	777
11:15	111	109	220	
11:30	112	134	246	
11:45	155	177	332	
12:00	140	234	374	1172
2:15	148	236	384	
2:30	148	138	286	
12:45	214	114	328	
13:00	245	136	381	1379
13:15	197	123	320	
13:30	183	145	328	
13:45	134	109	243	
14:00	122	108	230	1121
14:15	113	103	216	
14:30	138	110	248	
14:45	130	120	250	
15:00	148	124	272	986
15:15	110	136	246	
15:30	145	105	250	
15:45	123	183	306	
16:00	235	159	394	1196
16:15	158	246	404	
16:30	152	236	388	
16:45	106	280	386	
17:00	130	259	389	1567
17:15	142	374	516	
17:30	143	374	517	
17:45	167	255	422	
18:00	153	235	388	1843
18:15	143	195	338	
18:30	146	166	312	
18:45	135	162	297	
19:00	115	145	260	1207
19:15	116	111	227	
19:30	109	87	196	
19:45	85	112	197	
20:00	63	78	141	761
20:15	55	75	130	
20:30	70	81	151	
20:45	43	44	87	
21:00	58	72	130	498
21:15	52	58	110	
21:30	33	59	92	
21:45	31	60	91	
22:00	42	49	91	384
22:15	30	55	85	
22:30	17	36	53	
22:45	16	29	45	
23:00	13	27	40	223
23:15	10	17	27	
23:30	12	14	26	
23:45	4	14	18	
24:00	3	16	19	90
24 Hr Total	9267	8565	17832	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNW.TXT
HANNEL 1- WEST & EAST BOUND
.AKEN BY - N. TALLEY

ROUTE - TRINITY DRIVE
LOCATION - WEST OF DIAMOND SIGNAL IN WESTERN AREA

24 Hour Start Date

Daily Printout of 2 Channel Data

* NOT TO NM STATE
TRAFFIC MONITORING STANDARDS

Saturday September 26, 1992

Period Ends	West East	Total	Hour Total
0:15	2	2	
0:30	7	7	
0:45	3	3	
1:00	2	2	14
1:15	2	2	
1:30	1	1	
1:45	3	3	
2:00	0	0	6
2:15	0	0	
2:30	0	0	
2:45	3	3	
3:00	1	1	4
3:15	0	0	
3:30	0	0	
3:45	1	1	
4:00	0	0	1
4:15	0	0	
4:30	0	0	
4:45	0	0	
5:00	1	1	1
5:15	1	1	
5:30	3	3	
5:45	3	3	
6:00	0	0	7
6:15	5	5	
6:30	2	2	
6:45	7	7	
7:00	3	3	17
7:15	8	8	
7:30	8	8	
7:45	9	9	
8:00	5	5	30
8:15	20	20	
8:30	27	27	
8:45	25	25	
9:00	26	26	98
9:15	32	32	
9:30	27	27	
9:45	35	35	
10:00	37	37	131
10:15	35	35	
10:30	21	21	
10:45	30	30	
11:00	18	18	104
11:15	37	37	
11:30	36	36	
11:45	31	31	
12:00	36	36	140
2:15	22	22	
12:30	38	38	
12:45	41	41	
13:00	33	33	134
13:15	31	31	
13:30	28	28	
13:45	32	32	
14:00	32	32	123
14:15	16	16	
14:30	23	23	
14:45	26	26	
15:00	20	20	85
15:15	28	28	
15:30	31	31	
15:45	35	35	
16:00	20	20	114
16:15	14	14	
16:30	12	12	
16:45	18	18	
17:00	23	23	67
17:15	14	14	
17:30	12	12	
17:45	23	23	
18:00	20	20	69
18:15	30	30	
18:30	13	13	
18:45	24	24	
19:00	12	12	79
19:15	16	16	
19:30	11	11	
19:45	19	19	
20:00	12	12	58
20:15	13	13	
20:30	4	4	
20:45	9	9	
21:00	7	7	33
21:15	1	1	
21:30	2	2	
21:45	8	8	
22:00	6	6	17
22:15	8	8	
22:30	8	8	
22:45	0	0	
23:00	5	5	21
23:15	0	0	
23:30	3	3	
23:45	4	4	
24:00	4	4	11
24 Hr Total	1364	1364	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNW.TXT
CHANNEL 1- WEST & EAST BOUND
TAKEN BY - N. TALLEY

ROUTE - TRINITY DRIVE
LOCATION - WEST OF DIAMOND SIGNAL IN WESTERN AREA

24 Hour Start Date

Daily Printout of 2 Channel Data

Sunday September 27, 1992

Period Ends	West East	Total	Hour Total
0:15	11	11	
0:30	16	16	
0:45	0	0	
1:00	2	2	29
1:15	0	0	
1:30	2	2	
1:45	0	0	
2:00	1	1	3
2:15	0	0	
2:30	0	0	
2:45	0	0	
3:00	0	0	0
3:15	0	0	
3:30	0	0	
3:45	1	1	
4:00	0	0	1
4:15	0	0	
4:30	1	1	
4:45	2	2	
5:00	0	0	3
5:15	0	0	
5:30	0	0	
5:45	0	0	
6:00	0	0	0
6:15	3	3	
6:30	2	2	
6:45	7	7	
7:00	6	6	18
7:15	10	10	
7:30	9	9	
7:45	11	11	
8:00	11	11	41
8:15	15	15	
8:30	12	12	
8:45	13	13	
9:00	15	15	55
9:15	18	18	
9:30	23	23	
9:45	8	8	
10:00	24	24	73
10:15	13	13	
10:30	25	25	
10:45	28	28	
11:00	29	29	95
11:15	20	20	
11:30	11	11	
11:45	17	17	
12:00	26	26	74
12:15	33	33	
12:30	34	34	
12:45	41	41	
13:00	28	28	136
13:15	29	29	
13:30	29	29	
13:45	25	25	
14:00	44	44	127
14:15	19	19	
14:30	32	32	
14:45	27	27	
15:00	18	18	96
15:15	15	15	
15:30	23	23	
15:45	30	30	
16:00	29	29	97
16:15	44	44	
16:30	36	36	
16:45	29	29	
17:00	41	41	150
17:15	22	22	
17:30	27	27	
17:45	41	41	
18:00	50	50	140
18:15	44	44	
18:30	31	31	
18:45	34	34	
19:00	44	44	153
19:15	36	36	
19:30	24	24	
19:45	14	14	
20:00	24	24	98
20:15	30	30	
20:30	7	7	
20:45	16	16	
21:00	18	18	71
21:15	19	19	
21:30	20	20	
21:45	7	7	
22:00	8	8	54
22:15	8	8	
22:30	5	5	
22:45	4	4	
23:00	2	2	19
23:15	3	3	
23:30	5	5	
23:45	0	0	
24:00	3	3	11
24 Hr Total	1544	1544	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNW.TXT
HANNEL 1- WEST & EAST BOUND
AKEN BY - N. TALLEY

ROUTE - TRINITY DRIVE
LOCATION - WEST OF DIAMOND SIGNAL IN WESTERN AREA

24 Hour Start Date

Daily Printout of 2 Channel Data

Monday September 28, 1992

Period Ends	West East	Total	Hour Total
0:15	3	3	
0:30	1	1	
0:45	0	0	
1:00	0	0	4
1:15	1	1	
1:30	2	2	
1:45	0	0	
2:00	4	4	7
2:15	0	0	
2:30	0	0	
2:45	0	0	
3:00	0	0	0
3:15	0	0	
3:30	0	0	
3:45	0	0	
4:00	0	0	0
4:15	0	0	
4:30	0	0	
4:45	2	2	
5:00	1	1	3
5:15	2	2	
5:30	1	1	
5:45	5	5	
6:00	2	2	10
6:15	6	6	
6:30	1	1	
6:45	4	4	
7:00	17	17	28
7:15	25	25	
7:30	39	39	
7:45	37	37	
8:00	66	66	167
8:15	43	43	
8:30	41	41	
8:45	35	35	
9:00	32	32	151
9:15	20	20	
9:30	36	36	
9:45	29	29	
10:00	29	29	114
10:15	39	39	
10:30	35	35	
10:45	43	43	
11:00	33	33	150
11:15	53	53	
11:30	32	32	
11:45	47	47	
12:00	65	65	197
12:15	58	58	
12:30	54	54	
12:45	58	58	
13:00	43	43	213
13:15	60	60	
13:30	34	34	
13:45	40	40	
14:00	31	31	165
14:15	45	45	
14:30	37	37	
14:45	47	47	
15:00	37	37	166
15:15	49	49	
15:30	37	37	
15:45	51	51	
16:00	64	64	201
16:15	54	54	
16:30	63	63	
16:45	63	63	
17:00	90	90	270
17:15	83	83	
17:30	67	67	
17:45	76	76	
18:00	60	60	286
18:15	61	61	
18:30	54	54	
18:45	57	57	
19:00	45	45	217
19:15	37	37	
19:30	46	46	
19:45	24	24	
20:00	14	14	121
20:15	28	28	
20:30	33	33	
20:45	28	28	
21:00	16	16	105
21:15	17	17	
21:30	22	22	
21:45	13	13	
22:00	7	7	59
22:15	10	10	
22:30	8	8	
22:45	9	9	
23:00	6	6	33
23:15	2	2	
23:30	5	5	
23:45	5	5	
24:00	2	2	14
24 Hr Total	2681	2681	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNW.TXT
CHANNEL 1- WEST & EAST BOUND
TAKEN BY - N. TALLEY

ROUTE - TRINITY DRIVE
LOCATION - WEST OF DIAMOND SIGNAL IN WESTERN AREA

24 Hour Start Date

Daily Printout of 2 Channel Data

Tuesday September 29, 1992

Period Ends	West East	Total	Hour Total
0:15	0	0	
0:30	0	0	
0:45	0	0	
1:00	0	0	0
1:15	2	2	
1:30	0	0	
1:45	1	1	
2:00	0	0	3
2:15	0	0	
2:30	0	0	
2:45	0	0	
3:00	0	0	0
3:15	0	0	
3:30	0	0	
3:45	0	0	
4:00	0	0	0
4:15	0	0	
4:30	0	0	
4:45	0	0	
5:00	4	4	4
5:15	3	3	
5:30	1	1	
5:45	1	1	
6:00	6	6	11
6:15	6	6	
6:30	6	6	
6:45	9	9	
7:00	20	20	41
7:15	24	24	
7:30	41	41	
7:45	36	36	
8:00	40	40	141
8:15	52	52	
8:30	30	30	
8:45	30	30	
9:00	26	26	138
9:15	27	27	
9:30	20	20	
9:45	34	34	
10:00	41	41	122
10:15	31	31	
10:30	26	26	
10:45	33	33	
11:00	57	57	147
11:15	34	34	
11:30	34	34	
11:45	42	42	
12:00	58	58	168
12:15	57	57	
12:30	32	32	
12:45	36	36	
13:00	44	44	169
13:15	36	36	
13:30	22	22	
13:45	21	21	
14:00	23	23	102
14:15	32	32	
14:30	26	26	
14:45	20	20	
15:00	29	29	107
15:15	27	27	
15:30	28	28	
15:45	41	41	
16:00	32	32	128
16:15	40	40	
16:30	28	28	
16:45	43	43	
17:00	35	35	146
17:15	44	44	
17:30	56	56	
17:45	34	34	
18:00	37	37	171
18:15	39	39	
18:30	30	30	
18:45	31	31	
19:00	46	46	146
19:15	24	24	
19:30	26	26	
19:45	31	31	
20:00	24	24	105
20:15	20	20	
20:30	20	20	
20:45	13	13	
21:00	17	17	70
21:15	9	9	
21:30	14	14	
21:45	3	3	
22:00	14	14	40
22:15	8	8	
22:30	4	4	
22:45	4	4	
23:00	2	2	18
23:15	1	1	
23:30	4	4	
23:45	2	2	
24:00	1	1	8
24 Hr Total	1985	1985	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNW.TXT
CHANNEL 1- WEST & EAST BOUND
TAKEN BY - N. TALLEY

ROUTE - TRINITY DRIVE
LOCATION - WEST OF DIAMOND SIGNAL IN WESTERN AREA

24 Hour Start Date

Daily Printout of 2 Channel Data

Wednesday September 30, 1992

Period Ends	West	East	Total	Hour Total
0:15	1		1	
0:30	1		1	
0:45	0		0	
1:00	0		0	2
1:15	0		0	
1:30	0		0	
1:45	0		0	
2:00	0		0	0
2:15	1		1	
2:30	0		0	
2:45	0		0	
3:00	0		0	1
3:15	0		0	
3:30	0		0	
3:45	0		0	
4:00	0		0	0
4:15	0		0	
4:30	0		0	
4:45	1		1	
5:00	0		0	1
5:15	1		1	
5:30	0		0	
5:45	1		1	
6:00	4		4	6
6:15	9		9	
6:30	4		4	
6:45	5		5	
7:00	10		10	28
7:15	15		15	
7:30	17		17	
7:45	32		32	
8:00	49		49	113
8:15	29		29	
8:30	32		32	
8:45	22		22	
9:00	22		22	105
9:15	21		21	
9:30	16		16	
9:45	15		15	
10:00	30		30	82
10:15	31		31	
10:30	26		26	
10:45	21		21	
11:00	29		29	107
11:15	32		32	
11:30	33		33	
11:45	35		35	
12:00	38		38	138
12:15	34		34	
12:30	30		30	
12:45	31		31	
13:00	35		35	130
13:15	41		41	
13:30	21		21	
13:45	24		24	
14:00	30		30	116
14:15	29		29	
14:30	33		33	
14:45	40		40	
15:00	45		45	147
15:15	20		20	
15:30	32		32	
15:45	32		32	
16:00	28		28	112
16:15	29		29	
16:30	32		32	
16:45	36		36	
17:00	42		42	139
17:15	39		39	
17:30	37		37	
17:45	45		45	
18:00	33		33	154
18:15	36		36	
18:30	33		33	
18:45	37		37	
19:00	32		32	138
19:15	25		25	
19:30	21		21	
19:45	12		12	
20:00	12		12	70
20:15	18		18	
20:30	18		18	
20:45	12		12	
21:00	10		10	58
21:15	13		13	
21:30	9		9	
21:45	7		7	
22:00	7		7	36
22:15	11		11	
22:30	6		6	
22:45	5		5	
23:00	3		3	25
23:15	1		1	
23:30	0		0	
23:45	2		2	
24:00	5		5	8
24 Hr Total	1716		1716	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNW.TXT
CHANNEL 1- WEST & EAST BOUND
AKEN BY - N. TALLEY

ROUTE - TRINITY DRIVE
LOCATION - WEST OF DIAMOND SIGNAL IN WESTERN AREA

24 Hour Start Date

Daily Printout of 2 Channel Data

Thursday October 1, 1992

Period Ends	West East	Total	Hour Total
0:15	0	0	
0:30	2	2	
0:45	0	0	
1:00	0	0	2
1:15	1	1	
1:30	1	1	
1:45	1	1	
2:00	0	0	3
2:15	0	0	
2:30	0	0	
2:45	0	0	
3:00	0	0	0
3:15	0	0	
3:30	0	0	
3:45	0	0	
4:00	1	1	1
4:15	0	0	
4:30	0	0	
4:45	3	3	
5:00	0	0	3
5:15	2	2	
5:30	0	0	
5:45	2	2	
6:00	2	2	6
6:15	6	6	
6:30	5	5	
6:45	3	3	
7:00	9	9	23
7:15	19	19	
7:30	19	19	
7:45	26	26	
8:00	44	44	108
8:15	31	31	
8:30	24	24	
8:45	28	28	
9:00	31	31	114
9:15	29	29	
9:30	24	24	
9:45	26	26	
10:00	19	19	98
10:15	22	22	
10:30	13	13	
10:45	25	25	
11:00	18	18	78
11:15	24	24	
11:30	24	24	
11:45	31	31	
12:00	44	44	123
12:15	35	35	
12:30	25	25	
12:45	35	35	
13:00	44	44	139
13:15	26	26	
13:30	39	39	
13:45	28	28	
14:00	21	21	114
14:15	21	21	
14:30	24	24	
14:45	26	26	
15:00	36	36	107
15:15	35	35	
15:30	28	28	
15:45	32	32	
16:00	34	34	129
16:15	32	32	
16:30	39	39	
16:45	32	32	
17:00	42	42	145
17:15	46	46	
17:30	46	46	
17:45	41	41	
18:00	43	43	176
18:15	32	32	
18:30	33	33	
18:45	38	38	
19:00	31	31	134
19:15	32	32	
19:30	35	35	
19:45	17	17	
20:00	17	17	101
20:15	16	16	
20:30	19	19	
20:45	11	11	
21:00	11	11	57
21:15	15	15	
21:30	24	24	
21:45	11	11	
22:00	9	9	59
22:15	15	15	
22:30	7	7	
22:45	1	1	
23:00	1	1	24
23:15	4	4	
23:30	1	1	
23:45	2	2	
24:00	2	2	9
24 Hr Total	1753	1753	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
ITE ID - DIAMTRNE.TXT
CHANNEL 1- EAST BOUND
TAKEN BY - N. TALLEY

ROUTE - TRINITY DRIVE
LOCATION - EAST OF DIAMOND SIGNAL NEAR HOSPITAL ENT.
CHANNEL 2- WEST BOUND

24 Hour Start Date

Daily Printout of 2 Channel Data

* NOT TO NM STATE TRAFFIC MONITORING STANDARDS

Saturday Sep 26, 1992

Period Ends	East Bound	West Bound	Total	Hour Total
0:15	19	24	43	
0:30	12	9	21	
0:45	8	9	17	
1:00	6	12	18	99
1:15	7	5	12	
1:30	6	3	9	
1:45	4	10	14	
2:00	10	4	14	49
2:15	7	1	8	
2:30	2	3	5	
2:45	2	1	3	
3:00	2	3	5	21
3:15	1	1	2	
3:30	4	0	4	
3:45	1	5	6	
4:00	5	7	12	24
4:15	1	2	3	
4:30	3	1	4	
4:45	2	2	4	
5:00	4	13	17	28
5:15	4	3	7	
5:30	6	7	13	
5:45	10	9	19	
6:00	11	6	17	56
6:15	9	7	16	
6:30	15	12	27	
6:45	17	25	42	
7:00	33	37	70	155
7:15	36	21	57	
7:30	44	34	78	
7:45	41	27	68	
8:00	68	29	97	300
8:15	73	39	112	
8:30	61	37	98	
8:45	92	56	148	
9:00	92	52	144	502
9:15	124	53	177	
9:30	92	74	166	
9:45	98	65	163	
10:00	116	79	195	701
10:15	127	80	207	
10:30	147	80	227	
10:45	121	103	224	
11:00	145	89	234	892
11:15	129	85	214	
11:30	141	99	240	
11:45	133	120	253	
12:00	146	113	259	966
12:15	157	123	280	
12:30	135	143	278	
12:45	129	122	251	
13:00	133	114	247	1056
13:15	105	115	220	
13:30	104	109	213	
13:45	125	128	253	
14:00	105	110	215	901
14:15	117	104	221	
14:30	108	111	219	
14:45	122	99	221	
15:00	103	101	204	865
15:15	81	112	193	
15:30	84	111	195	
15:45	114	67	181	
16:00	126	88	214	783
16:15	97	75	172	
16:30	99	96	195	
16:45	85	120	205	
17:00	97	104	201	773
17:15	84	87	171	
17:30	81	84	165	
17:45	85	87	172	
18:00	62	73	135	643
18:15	91	76	167	
18:30	88	77	165	
18:45	80	58	138	
19:00	78	50	128	598
19:15	76	64	140	
19:30	66	73	139	
19:45	89	53	142	
20:00	52	67	119	540
20:15	54	66	120	
20:30	37	49	86	
20:45	36	63	99	
21:00	24	43	67	372
21:15	50	42	92	
21:30	24	48	72	
21:45	39	45	84	
22:00	17	48	65	313
22:15	19	46	65	
22:30	19	31	50	
22:45	25	42	67	
23:00	21	51	72	254
23:15	22	37	59	
23:30	11	25	36	
23:45	19	17	36	
24:00	21	20	41	172
24 Hr Total	5833	5230	11063	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNE.TXT
CHANNEL 1- EAST BOUND
TAKEN BY - N. TALLEY

ROUTE - TRINITY DRIVE
LOCATION - EAST OF DIAMOND SIGNAL NEAR HOSPITAL ENT.
CHANNEL 2- WEST BOUND

24 Hour Start Date

Daily Printout of 2 Channel Data

Sunday September 27, 1992

Period Ends	East Bound	West Bound	Total	Hour Total
0:15	32	18	50	
0:30	13	20	33	
0:45	15	11	26	
1:00	10	7	17	126
1:15	10	7	17	
1:30	10	2	12	
1:45	4	7	11	
2:00	1	9	10	50
2:15	3	4	7	
2:30	4	2	6	
2:45	2	4	6	
3:00	5	6	11	30
3:15	3	1	4	
3:30	4	2	6	
3:45	2	4	6	
4:00	2	5	7	23
4:15	3	4	7	
4:30	3	2	5	
4:45	2	4	6	
5:00	4	9	13	31
5:15	1	4	5	
5:30	6	4	10	
5:45	5	6	11	
6:00	4	8	12	38
6:15	11	2	13	
6:30	12	7	19	
6:45	19	8	27	
7:00	14	12	26	85
7:15	19	10	29	
7:30	28	28	56	
7:45	30	13	43	
8:00	29	19	48	176
8:15	39	27	66	
8:30	55	34	89	
8:45	45	38	83	
9:00	91	47	138	376
9:15	71	44	115	
9:30	71	38	109	
9:45	47	44	91	
10:00	88	57	145	460
10:15	70	54	124	
10:30	53	50	103	
10:45	66	56	122	
11:00	71	45	116	465
11:15	73	59	132	
11:30	90	57	147	
11:45	91	74	165	
12:00	103	67	170	614
12:15	87	64	151	
12:30	115	93	208	
12:45	102	94	196	

Period Ends	East Bound	West Bound	Total	Hour Total
13:00	91	100	191	746
13:15	83	84	167	
13:30	87	84	171	
13:45	98	78	176	
14:00	109	72	181	695
14:15	87	106	193	
14:30	92	89	181	
14:45	82	77	159	
15:00	91	82	173	706
15:15	65	94	159	
15:30	87	59	146	
15:45	60	79	139	
16:00	81	89	170	614
16:15	77	80	157	
16:30	82	71	153	
16:45	63	69	132	
17:00	78	72	150	592
17:15	84	77	161	
17:30	60	71	131	
17:45	78	66	144	
18:00	81	82	163	599
18:15	88	67	155	
18:30	75	75	150	
18:45	56	64	120	
19:00	57	81	138	563
19:15	68	56	124	
19:30	44	63	107	
19:45	58	39	97	
20:00	41	67	108	436
20:15	29	68	97	
20:30	27	28	55	
20:45	26	63	89	
21:00	27	13	40	281
21:15	26	40	66	
21:30	9	21	30	
21:45	20	17	37	
22:00	10	22	32	165
22:15	19	28	47	
22:30	12	13	25	
22:45	10	27	37	
23:00	16	12	28	137
23:15	4	15	19	
23:30	7	15	22	
23:45	5	5	10	
24:00	11	8	19	70
24 Hr Total	4199	3879	8078	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNE.TXT
CHANNEL 1- EAST BOUND
TAKEN BY - N. TALLEY

ROUTE - TRINITY DRIVE
LOCATION - EAST OF DIAMOND SIGNAL NEAR HOSPITAL ENT.
CHANNEL 2- WEST BOUND

24 Hour Start Date

Daily Printout of 2 Channel Data

Monday September 28, 1992

Period Ends	East Bound	West Bound	Total	Hour Total
0:15	5	4	9	
0:30	7	7	14	
0:45	4	6	10	
1:00	3	2	5	38
1:15	7	1	8	
1:30	1	1	2	
1:45	2	4	6	
2:00	3	3	6	22
2:15	2	5	7	
2:30	1	0	1	
2:45	3	3	6	
3:00	0	0	0	14
3:15	3	1	4	
3:30	3	3	6	
3:45	2	1	3	
4:00	2	3	5	18
4:15	7	1	8	
4:30	2	3	5	
4:45	2	7	9	
5:00	3	12	15	37
5:15	3	2	5	
5:30	9	2	11	
5:45	13	9	22	
6:00	16	12	28	66
6:15	18	19	37	
6:30	22	19	41	
6:45	34	58	92	
7:00	69	127	196	366
7:15	90	130	220	
7:30	114	162	276	
7:45	127	226	353	
8:00	179	244	423	1272
8:15	168	209	377	
8:30	148	141	289	
8:45	132	147	279	
9:00	162	127	289	1234
9:15	153	149	302	
9:30	141	120	261	
9:45	136	114	250	
10:00	145	115	260	1073
10:15	158	145	303	
10:30	133	108	241	
10:45	134	118	252	
11:00	159	102	261	1057
11:15	176	150	326	
11:30	179	134	313	
11:45	329	157	486	
2:00	316	189	505	1630
12:15	388	220	608	
12:30	238	265	503	
12:45	190	281	471	
13:00	203	375	578	2160
13:15	204	298	502	
13:30	160	256	416	
13:45	168	176	344	
14:00	154	179	333	1595
14:15	160	160	320	
14:30	149	153	302	
14:45	160	139	299	
15:00	147	200	347	1268
15:15	184	158	342	
15:30	195	118	313	
15:45	228	127	355	
16:00	269	162	431	1441
16:15	391	155	546	
16:30	299	158	457	
16:45	308	187	495	
17:00	272	163	435	1933
17:15	336	244	580	
17:30	327	234	561	
17:45	275	176	451	
18:00	217	172	389	1981
18:15	155	170	325	
18:30	113	137	250	
18:45	123	95	218	
19:00	119	76	195	988
19:15	110	75	185	
19:30	90	93	183	
19:45	69	69	138	
20:00	45	66	111	617
20:15	63	63	126	
20:30	54	59	113	
20:45	49	45	94	
21:00	44	44	88	421
21:15	47	32	79	
21:30	34	47	81	
21:45	23	27	50	
22:00	25	38	63	273
22:15	18	25	43	
22:30	15	39	54	
22:45	14	22	36	
23:00	12	15	27	160
23:15	19	26	45	
23:30	18	16	34	
23:45	26	7	33	
24:00	18	12	30	142
24 Hr Total	10450	9356	19806	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNE.TXT
CHANNEL 1- EAST BOUND
TAKEN BY - N. TALLEY

ROUTE - TRINITY DRIVE
LOCATION - EAST OF DIAMOND SIGNAL NEAR HOSPITAL ENT.
CHANNEL 2- WEST BOUND

24 Hour Start Date

Daily Printout of 2 Channel Data

Tuesday September 29, 1992

Period Ends	East Bound	West Bound	Total	Hour Total
0:15	16	9	25	
0:30	6	7	13	
0:45	4	2	6	
1:00	3	6	9	53
1:15	3	5	8	
1:30	2	2	4	
1:45	3	5	8	
2:00	1	6	7	27
2:15	7	1	8	
2:30	0	2	2	
2:45	1	2	3	
3:00	2	1	3	16
3:15	2	2	4	
3:30	3	0	3	
3:45	2	1	3	
4:00	6	4	10	20
4:15	2	7	9	
4:30	4	2	6	
4:45	3	6	9	
5:00	3	12	15	39
5:15	7	3	10	
5:30	4	7	11	
5:45	9	7	16	
6:00	17	10	27	64
6:15	18	23	41	
6:30	21	18	39	
6:45	44	72	116	
7:00	68	139	207	403
7:15	91	145	236	
7:30	133	190	323	
7:45	137	205	342	
8:00	158	268	426	1327
8:15	157	255	412	
8:30	165	162	327	
8:45	133	156	289	
9:00	175	133	308	1336
9:15	123	123	246	
9:30	158	124	282	
9:45	131	133	264	
10:00	152	129	281	1073
10:15	131	123	254	
10:30	145	124	269	
10:45	150	134	284	
11:00	156	151	307	1114
11:15	196	134	330	
11:30	199	149	348	
11:45	316	171	487	
12:00	338	194	532	1697
12:15	368	196	564	
12:30	208	250	458	
12:45	192	301	493	
13:00	207	346	553	2068
13:15	181	268	449	
13:30	150	262	412	
13:45	153	215	368	
14:00	162	159	321	1550
14:15	132	164	296	
14:30	139	141	280	
14:45	189	169	358	
15:00	196	189	385	1319
15:15	164	150	314	
15:30	167	158	325	
15:45	234	135	369	
16:00	288	161	449	1457
16:15	390	157	547	
16:30	305	177	482	
16:45	282	157	439	
17:00	265	186	451	1919
17:15	306	207	513	
17:30	312	245	557	
17:45	282	210	492	
18:00	198	157	355	1917
18:15	175	157	332	
18:30	189	124	313	
18:45	137	102	239	
19:00	154	93	247	1131
19:15	109	101	210	
19:30	112	71	183	
19:45	104	95	199	
20:00	66	70	136	728
20:15	66	76	142	
20:30	58	58	116	
20:45	53	53	106	
21:00	48	62	110	474
21:15	42	65	107	
21:30	27	56	83	
21:45	34	30	64	
22:00	17	37	54	308
22:15	26	27	53	
22:30	20	42	62	
22:45	14	16	30	
23:00	12	22	34	179
23:15	12	7	19	
23:30	19	18	37	
23:45	18	11	29	
24:00	14	15	29	114
24 Hr Total	10601	9732	20333	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNE.TXT
CHANNEL 1- EAST BOUND
TAKEN BY - N. TALLEY

ROUTE - TRINITY DRIVE
LOCATION - EAST OF DIAMOND SIGNAL NEAR HOSPITAL ENT.
CHANNEL 2- WEST BOUND

24 Hour Start Date

Daily Printout of 2 Channel Data

Wednesday September 30, 1992

Period Ends	East Bound	West Bound	Total	Hour Total
0:15	7	3	10	
0:30	10	10	20	
0:45	2	9	11	
1:00	2	7	9	50
1:15	3	6	9	
1:30	0	2	2	
1:45	3	2	5	
2:00	2	0	2	18
2:15	4	3	7	
2:30	3	1	4	
2:45	0	0	0	
3:00	0	2	2	13
3:15	3	1	4	
3:30	3	0	3	
3:45	0	0	0	
4:00	4	2	6	13
4:15	3	3	6	
4:30	4	3	7	
4:45	2	5	7	
5:00	3	7	10	30
5:15	4	9	13	
5:30	7	7	14	
5:45	8	9	17	
6:00	17	15	32	76
6:15	20	21	41	
6:30	22	27	49	
6:45	49	61	110	
7:00	67	134	201	401
7:15	77	142	219	
7:30	101	186	287	
7:45	134	221	355	
8:00	182	263	445	1306
8:15	161	209	370	
8:30	173	165	338	
8:45	139	132	271	
9:00	152	141	293	1272
9:15	135	123	258	
9:30	140	125	265	
9:45	149	110	259	
10:00	131	134	265	1047
10:15	151	136	287	
10:30	138	113	251	
10:45	124	143	267	
11:00	147	122	269	1074
11:15	171	152	323	
11:30	221	130	351	
11:45	314	169	483	
12:00	356	216	572	1729
12:15	412	197	609	
12:30	225	257	482	
12:45	188	283	471	

Period Ends	East Bound	West Bound	Total	Hour Total
13:00	206	357	563	2125
13:15	221	345	566	
13:30	188	253	441	
13:45	159	207	366	
14:00	170	158	328	1701
14:15	162	162	324	
14:30	171	175	346	
14:45	163	195	358	
15:00	178	169	347	1375
15:15	186	146	332	
15:30	183	134	317	
15:45	244	148	392	
16:00	255	165	420	1461
16:15	370	164	534	
16:30	323	145	468	
16:45	323	178	501	
17:00	265	176	441	1944
17:15	315	245	560	
17:30	296	279	575	
17:45	250	211	461	
18:00	179	139	318	1914
18:15	183	149	332	
18:30	132	102	234	
18:45	148	112	260	
19:00	158	127	285	1111
19:15	125	83	208	
19:30	70	103	173	
19:45	69	71	140	
20:00	69	67	136	657
20:15	66	76	142	
20:30	44	62	106	
20:45	68	63	131	
21:00	44	60	104	483
21:15	41	47	88	
21:30	27	67	94	
21:45	32	36	68	
22:00	16	53	69	319
22:15	16	41	57	
22:30	25	17	42	
22:45	19	32	51	
23:00	13	17	30	180
23:15	8	23	31	
23:30	14	12	26	
23:45	12	8	20	
24:00	15	7	22	99
24 Hr Total	10594	9804	20398	

09-02-1992

LOS ALAMOS COUNTY - TRAFFIC ENGINEERING
TRAFFIC COUNTS - DIAMOND & TRINITY

COUNTY - LOS ALAMOS
SITE ID - DIAMTRNE.TXT
CHANNEL 1- EAST BOUND
TAKEN BY - N. TALLEY

ROUTE - TRINITY DRIVE
LOCATION - EAST OF DIAMOND SIGNAL NEAR HOSPITAL ENT.
CHANNEL 2- WEST BOUND

24 Hour Start Date

Daily Printout of 2 Channel Data

Thursday October 1, 1992

Period Ends	East Bound	West Bound	Total	Hour Total
0:15	7	12	19	
0:30	6	4	10	
0:45	2	2	4	
1:00	5	4	9	42
1:15	3	1	4	
1:30	2	1	3	
1:45	2	0	2	
2:00	0	1	1	10
2:15	1	2	3	
2:30	4	1	5	
2:45	1	2	3	
3:00	2	3	5	16
3:15	1	0	1	
3:30	3	0	3	
3:45	1	0	1	
4:00	4	7	11	16
4:15	3	4	7	
4:30	3	1	4	
4:45	1	7	8	
5:00	2	3	5	24
5:15	7	5	12	
5:30	2	8	10	
5:45	11	4	15	
6:00	15	8	23	60
6:15	16	29	45	
6:30	19	11	30	
6:45	46	54	100	
7:00	79	153	232	407
7:15	96	129	225	
7:30	120	196	316	
7:45	134	196	330	
8:00	165	292	457	1328
8:15	182	233	415	
8:30	173	155	328	
8:45	137	160	297	
9:00	155	151	306	1346
9:15	139	137	276	
9:30	119	109	228	
9:45	114	126	240	
10:00	142	137	279	1023
10:15	147	131	278	
10:30	145	122	267	
10:45	145	139	284	
11:00	147	141	288	1117
11:15	237	147	384	
11:30	195	161	356	
11:45	391	159	550	
12:00	396	211	607	1897
12:15	406	223	629	
12:30	248	274	522	
12:45	215	333	548	
13:00	210	403	613	2312
13:15	171	352	523	
13:30	180	297	477	
13:45	184	197	381	
14:00	165	167	332	1713
14:15	163	166	329	
14:30	200	153	353	
14:45	164	169	333	
15:00	191	171	362	1377
15:15	186	184	370	
15:30	199	143	342	
15:45	283	146	429	
16:00	278	153	431	1572
16:15	408	159	567	
16:30	320	202	522	
16:45	324	187	511	
17:00	280	163	443	2043
17:15	347	237	584	
17:30	280	269	549	
17:45	273	186	459	
18:00	217	190	407	1999
18:15	225	193	418	
18:30	155	124	279	
18:45	138	136	274	
19:00	126	118	244	1215
19:15	113	104	217	
19:30	127	88	215	
19:45	74	83	157	
20:00	71	93	164	753
20:15	65	91	156	
20:30	49	68	117	
20:45	56	74	130	
21:00	47	59	106	509
21:15	42	60	102	
21:30	35	65	100	
21:45	31	60	91	
22:00	32	42	74	367
22:15	28	53	81	
22:30	19	35	54	
22:45	16	36	52	
23:00	14	11	25	212
23:15	13	26	39	
23:30	13	10	23	
23:45	25	10	35	
24:00	12	13	25	122
24 Hr Total	11145	10335	21480	

APPENDIX C

Manufacturer's Information on Protective Coating Materials

PLASITE ®

TECHNICAL BULLETIN

7100
July 1984
(Replaces March 1980)

PLASITE 7100 HI-RESISTANT PROTECTIVE COATING

TYPE: A cross linked epoxy-phenolic cured with an alkaline curing agent and formulated with particular attention to wide chemical resistance and ease of handling.
INTENDED USE: PLASITE 7100 is an ideal heavy maintenance coating due to its thixotropic qualities and excellent edge coverage. PLASITE 7100 is similar in vehicle formulation to PLASITE 7122 but has a different pigment ratio and lower solids. It has lower comparative gloss and higher build characteristics. PLASITE 7122 is generally superior for immersion service. Refer to ZONE OF USAGE below.

FOR INDUSTRIAL USE ONLY!

CHEMICAL RESISTANCE: Excellent chemical resistance to a wide range of acids, alkalies, solvents and water solutions. Refer to CHEMICAL RESISTANCE on Page 2.
TEMPERATURE RESISTANCE: Non-immersion basis is 400°F for short periods; 250°F continuous. Continuous immersion temperatures depend on particular reagent.
SURFACE PREPARATION: Steel surfaces shall be prepared by blasting as required by ZONE OF USAGE. Refer to PRIMERS on Page 2.
APPLICATION: PLASITE 7100H is formulated for standard production spray equipment. PLASITE 7100B is formulated for brush and roller application and should be force cured for immersion service. Refer to last page for details on APPLICATION PROCEDURE.
COLORS: Green; Light gray; Medium gray; Black; White; Tile red; Clear. Special colors are available.
FILM THICKNESS PER COAT: A 6 to 7 mil film is easily produced in one multi-pass spray coat. A 2 to 4 mil film may be produced in one "flow on" brush coat.
COVERAGE: 769 mil ft^2/gallon ± 4% theoretical. For estimating purposes, 90 ft^2/gallon will produce a 6 to 7 mil film (20% loss included). Two coats will produce a 12 to 15 mil film for immersion service.
DRYING TIME: Surface will normally be tack free in 2 to 3 hours at 70°F.
CURING TIME: 5 days at 90°F to 7 days at 70°F. Refer to page 2 for force curing.

PHYSICAL SPECIFICATIONS

PIGMENTS: Titanium dioxide, inerts and tinting colors.
SOLIDS: 60% by Weight; 48% ± 2% by Volume depending on color.
POT LIFE: Approximately 24 hours at 70°F.
SHELF LIFE: 24 months at 70°F. Material in stock should be turned upside down every 3 to 6 months.
SPRAY VISCOSITY: 16 ± 7 seconds Ford Cup #4 depending on color.
SHIPPING WT.: Approximately 12 lbs./gallon.
ELECTRICAL RESISTANCE: 3.9 x 10^{12} ohm-cm
Volume Resistivity. ASTM D257-66.

***ABRASIVE RESISTANCE:** 61 milligrams average loss, 1000 Cycles Taber CS-17 Wheel, 1000 Gr. Wt., Lt. Gray Color.
***SURFACE HARDNESS:** Konig Pendulum Hardness of 124 seconds (Glass Standard = 250 seconds); ASTM Method D4366-84.
THERMAL SHOCK: Unaffected in 5 cycles, -70°F to +200°F.
GLOSS: 52.5 at 60°.
***NOTE:** Above tests were conducted on film cured at 150°F.

VOLATILE ORGANIC COMPOUNDS CONTENT

	COATING AS SUPPLIED (ASTM METHOD D2369)		THINNED 10% BY VOLUME WITH PLASITE 71 THINNER	
Color	Lbs./Gal.	Grams/Liter	*Lbs./Gal.	*Grams/Liter
Lt. Gray	3.58 ±2%	429 ±2%	3.87 ±2%	463 ±2%

NOTE: VOC content varies between colors. Contact PLASITE Technical Service Department for VOC of specific colors.
*Determined theoretically by using ASTM Method test results.

ZONE OF USAGE

A ZONE: Includes immersion service for process, transportation and storage vessels, as well as exteriors of high temperature equipment, sumps, sewers, exhaust ducts, concrete bases and floors, or other surfaces subject to combinations of high temperature and heavy spills of corrosive chemicals. SSPC-SP5 blast and a film thickness of 12 to 15 mils required.

B ZONE: Interior process areas where structural steel, floors, equipment, ducts and other surfaces are subject to attack by strong fumes, occasional spills and splashes at intermediate temperatures. SSPC-SP5 or SSPC-SP10 blast and a film thickness of 12 to 15 mils required. With surface preparation as indicated, the finish coating is considered self-priming although, if desired, a heavy duty primer may be incorporated as part of the system.

C ZONE: Interior and exterior area surfaces subject to fumes of fairly high concentration at ambient temperatures. Heavy or medium duty primer over SSPC-SP6 or SSPC-SP7 blast and a total film thickness, primer and topcoat, of 7 to 10 mils required.

D ZONE: Process plant exteriors subject to chemical atmosphere and weathering. Medium duty primer over SSPC-SP7 or SSPC-SP3 surface preparation and a total film thickness, primer and topcoat, of 6 to 8 mils required.

R:4/90
7100-1

WISCONSIN PROTECTIVE COATINGS CORP.
614 Elizabeth Street
P.O. Box 8147
Green Bay, WI 54308-8147
414-437-6561

Represented by:

CHEMICAL RESISTANCE

The following list of laboratory tests is an indication of the range of chemical resistance. These tests consist of 1" x 5" mild steel test panels coated to a film thickness of 12 mils. The panels are one-half immersed in the solution at temperatures of 70° to 80°F for a period of six months with no effect on the coating.

ACIDS	ALKALIES	SOLVENTS	MISCELLANEOUS	
50% Sulfuric*	50% Sodium Hydroxide	Alcohol	50% Calcium Chloride	Reformate
50% Oxalic*	40% Potassium Hydroxide	Iso-Propyl	Glycol	Naptha
30% Phosphoric*	Calcium Hydroxide	Butyl, Decyl	Latex Rubber	Gasoline
25% Boric*	50% Sodium Carbonate	Gasoline	Linseed Oil	Sour Crude Oil
50% Citric*	Tri-Sodium Phosphate	Kerosene	Brine	
		Iso-Propyl Acetate	Ferric Chloride*	

***NOTE:**
Although the chemical tests indicated may show that PLASITE 7100 is unaffected by immersion as listed, it is not meant to imply an express guarantee in actual service. The service is dependent upon proper application and actual operating conditions and it is generally recommended that users confirm adaptability of the product for a specific use by their own tests.

PLASITE 7100 is classified as a relatively thin film coating and should not be used for total and continuous immersion in certain chemicals, such as, those acids referred to under CHEMICAL RESISTANCE which have extremely high corrosion rate to mild steel and other substrates. Use in such chemical exposure should be confined to fumes and spills.

THINNERS

The following thinners are recommended:

PLASITE 71 Thinner: A medium fast thinner to be used under most conditions.

PLASITE 72 Thinner: A relatively slow thinner and must be force cured when coating is used in Zone A applications. It is an aid to force curing and eliminating solvent popping and improves flow-out of coating.

PLASITE 69 Thinner: Recommended for airless or conventional spray. It is a special blend of fast evaporating solvents and containing no hydrocarbons.

The amount of thinner required will vary depending on air and surface temperatures and application equipment. Normal application temperatures and conditions will require the addition of approximately 10% by volume with approximately 5% additional thinner added for each 5° of increased temperature. Airless spray equipment and above normal temperatures require additional thinning.

It is recommended that the amount of thinner included on each order amount to approximately 20% of the coating ordered.

PRIMERS

Primers of the inhibitive type must be used when steel surfaces are not blasted to white metal and when finish coatings are below 8 mils in thickness.

PLASITE 7100 ANTI-CORROSIVE PRIMER described in Bulletin 7100-ACP is an epoxy-phenolic catalyzed primer of heavy duty type applicable for B, C, and D Zones.

PLASITE 7102 HEAVY DUTY PRIMER described in Bulletin 7102 is an epoxy metal primer with superior bond and water resistance as well as chemical resistance for A, B, C and D Zones.

These primers may be applied by either brush or spray application.

CURING

1. Normally polymerization and curing will take place in 5 to 7 days at 70°F. This coating should not be applied when air temperature or temperature of surface to be coated is below 50°F. Within 24 hours after coating is applied, a minimum substrate temperature of 70°F is required for proper polymerization.
2. Force curing at elevated temperature does increase resistance to certain exposures; therefore, when exposure is severe, force curing is recommended to obtain maximum resistance. Force curing is recommended for the PLASITE 7100B (Brush Formulation) when used in immersion service.
3. Below are listed a few curing schedules that may be used for time and work planning. Prior to raising the metal to the force curing temperature, it is necessary that an air dry time of 2 to 5 hours at temperatures from 70°F to 100°F be allowed. After the air dry period has elapsed, the temperature should be raised approximately 30°F each 30 minutes until the desired force curing temperatures are reached.

METAL TEMPERATURE °F	°C	CURING TIME	METAL TEMPERATURE °F	°C	CURING TIME
130	54.4	18 Hours	170	76.6	3½ Hours
140	60.0	10 Hours	180	82.2	2½ Hours
150	65.5	6 Hours	190	87.7	2 Hours
160	71.1	4½ Hours	200	93.3	1½ Hours

4. Final cure may be checked by exposing coated surface to MIBK for ten minutes. If no dissolving and only minor softening of film occurs, the curing can be considered complete. The film should reharden after exposure.

SURFACE PREPARATION

STEEL

High Temperature & Immersion Service (A & B Zones as described under ZONE OF USAGE.)

1. All sharp edges shall be ground to produce a radius and all imperfections, such as, skip welds, delaminations, scabs, slivers and slag shall be corrected prior to abrasive blasting. All skip welds shall be welded solid.
2. Degrease surface prior to sandblasting. Organic solvents, alkaline solutions, steam, hot water with detergents or other systems that will completely remove dirt, oil, grease, etc. may be used. Prebaking of old tanks is required.
3. The surface shall be blasted to an SSPC-SP5 or NACE No. 1 white metal surface using a Venturi blast nozzle supplied with 80 to 100 psi. An anchor pattern or "tooth" in the metal shall correspond to approximately 20 to 25% of the total film thickness of the coating.
4. Contaminated grit shall not be used for the finish work.
5. The blasting media used shall be a natural abrasive, or steel grit or slag grit (similar or equal to BLACK BEAUTY®). These abrasives shall be sharp with a hard-cutting surface, properly graded, dry and of best quality. The media shall be of proper size to obtain the specified anchor pattern and shall be free of objectionable contaminants.
6. The anchor pattern shall be sharp and no evidence of a polished surface is allowed.
7. Remove all traces of grit and dust with a vacuum cleaner or by brushing. Care must be taken to avoid contaminating the surface with fingerprints or from detrimental material on the workers' clothes.
8. The surface temperature shall be maintained at a minimum of 5° above the dew point to prevent oxidation of the surface. The coating shall be applied within the same day that the surface has been prepared.

Service in Corrosive Atmospheres (B, C & D Zones as described under ZONE OF USAGE.)

1. Degrease as described in Item 2 under A & B Zones.
2. Remove all loose mill scale, rust scale, and old paint scale by one of the following methods:
   a. Near White Metal Blast Cleaning: (B Zone) SSPC-SP10 or NACE No. 2.
   b. Commercial Blast Cleaning; (C Zone) SSPC-SP6 or NACE No. 3.
   c. Brush-Off Blast Cleaning; (C & D Zones) SSPC-SP7 or NACE No. 4.
   d. Power Tool Cleaning; (D Zone) SSPC-SP3.

When utilized, inhibitive primer should be applied as soon as possible after surface preparation.

D Zone application surface preparation as in above Paragraph 2(d) must result in a relatively rough surface. If the steel is new and this type of surface preparation does not leave a reasonably rough surface on the steel, then the heavy film system is not recommended.

NOTE: The above specification numbers are from the Steel Structures Painting Council Surface Preparation Specifications, 4400 Fifth Ave., Pittsburgh, PA 15213 and National Association of Corrosion Engineers, P.O. Box 218340, Houston, TX 77218.

CONCRETE

A ZONE: All concrete surfaces require whip blasting for immersion service. Fully cured concrete must be blasted to provide a hard, firm, clean and neutral surface for coating. All concrete surfaces must be filled and sealed with PLASITE 9028M1 or PLASITE 9028M2, applied in accordance with PLASITE Bulletin 9028. All surface imperfections, "bug holes", etc. must be completely repaired before application of PLASITE 7100. PLASITE 9028M1 and 9028M2 are not recommended for food service.

B ZONE: Severity of expected service will dictate minimum concrete surface preparation. Severe service (strong fumes, spillage, etc.) will probably require A Zone surface preparation and PLASITE 9028M1 or PLASITE 9028M2 filling and sealing before application of PLASITE 7100.

GALVANIZED SURFACE

The surface shall be clean and grease free and properly etched with a standard solution such as GALVAPREP® 5 (as produced by Parker & Amchem, Madison Heights, MI, telephone 800/521-1355) or a phosphating solution. After the surface is properly etched, it should be thoroughly rinsed with water and thoroughly dried prior to coating application. No inhibitive primer is required providing the galvanized surface is continuous.

ALUMINUM

Surface shall be clean and grease free with a blast produced anchor pattern or "tooth" as described earlier under "STEEL". In addition, the blasted surface shall be given a chemical treatment such as ALODINE® 1200S as produced by Parker & Amchem, Madison Heights, MI or IRIDITE® 14-2 as produced by Allied-Kelite Division of the Witco Corporation, Des Plaines, IL. For immersion, blasting with sharp grit followed by the chemical surface treatment is required.

NOTE: On metallic surfaces prepared only by chemical etching the total coating film thickness applied should be restricted to only half the film normally applied to blasted surfaces. This reduced film thickness should be considered during selection of the coating for the service and the type of surface preparation performed.

WOOD, TRANSITE AND SIMILAR SURFACES

Normally these materials need no surface treatment provided they are free of grease, oil and dirt and are dry. It is generally recommended that the first coat be diluted one part of recommended PLASITE Thinner to one part of material and brush applied.

EQUIPMENT

SPRAY APPLICATION

1. All spray equipment should be thoroughly cleaned and the hose, in particular, should be free of old paint film and other contaminants.
2. Use standard production-type spray guns:

GUN	FLUID	AIR
DeVilbiss JGA-502	E	704
Binks #18	66-SS	63-PB
Graco P800	04	02

3. When airless spray equipment is used the recommended liquid pressure is 1500-1800 psi with tip size from .015″ to .021″. Thinning requirements are more than for conventional spray.

BRUSH APPLICATION

A high quality brush should be used.

READ THIS NOTICE!
SAFETY AND MISCELLANEOUS EQUIPMENT

1. For tank lining work, it is recommended that the operator provide himself with clean coveralls and rubber soled shoes and observe good personal hygiene. Certain personnel may be sensitive to various types of resins which may cause dermatitis.
2. THE SOLVENT IN THIS COATING IS FLAMMABLE AND CARE AS DEMANDED BY GOOD PRACTICE, OSHA, STATE AND LOCAL SAFETY CODES, ETC. MUST BE FOLLOWED CLOSELY. Keep away from heat, sparks, and open flame and use necessary safety equipment, such as, air mask, explosion-proof electrical equipment, non-sparking tools and ladders, etc. Avoid contact with skin and breathing of vapor or spray mist. When working in tanks, rooms, and other enclosed spaces, adequate ventilation must be provided. Refer to PLASITE Bulletin PA-3. Keep out of the reach of children.

MIXING

The catalyst is in a separate container and measured for the coating unit supplied. Thoroughly mix the pigments. After the pigment and liquid is thoroughly mixed, add the measured liquid catalyst slowly and mix completely with the coating. The coating should stand approximately 30 minutes after the catalyst has been thoroughly mixed.

APPLICATION PROCEDURE

SPRAY GUN

1. Air supply shall be uncontaminated. Adjust air pressure to approximately 50 lbs. at the gun and provide 5 to 10 lbs. of pot pressure. Adjust spray gun by first opening liquid valve and then adjusting air valve to give an 8″ to 12″ wide spray pattern with best possible atomization.
2. Apply a "mist" bonding pass.
3. Allow to dry approximately one minute but not long enough to allow film to completely dry.
4. Apply crisscross multi-passes, moving gun at fairly rapid rate, maintaining a wet appearing film. Observe the coating surface and, when it appears to be flowing together, you will have an average 4 to 5 mils wet film. By allowing the solvents to flash-off for a few minutes, several more fast multi-passes may be applied until you have a film thickness of approximately 5 to 7 mils (approximately 10 to 12 wet mils).
5. Overcoat time: This will vary both with temperature and ventilation. Probably will require from 8 to 12 hours at 70°F for enclosed spaces. Less time required for exteriors. Remove all overspray by dry brushing or scraping if required.
6. By repeating Steps 2 thru 4, a homogeneous film of 12 to 15 mils is obtained.
7. Equipment must be thoroughly cleaned immediately after use with PLASITE Thinner to prevent the setting of the coating.

NOTE: All welds, pits and rough metal areas should be coated by brush prior to spray application.

BRUSH APPLICATION

1. Apply a very light crisscross brush coat.
2. Allow to dry approximately 5 minutes.
3. Apply a heavy coat using crisscross brush pattern. "Flow" the coating on rather than try to "Brush out".
4. Allow to dry tack-free.
5. Repeat Steps 3 and 4 until sufficient film thickness is obtained. Normally a film thickness of 2½ to 3 mils can be obtained per coat by this method.

INSPECTION

Degree of surface preparation shall conform to appropriate specification as outlined in Surface Preparation section.
Film thickness of each coat and total dry film thickness of coating system shall be determined with a non-destructive magnetic gauge properly calibrated.
Refer to PLASITE Bulletin PA-3 for inspection requirements.

METRIC COMPARISONS

1 mil = .001″ = 25.4 microns

1 U.S. gallon = 3.785 liters

1 sq. ft. x 0.0929 = sq. meters

$$°C = \frac{5\,(°F - 32)}{9}$$

R:10/91
7100-4

We guarantee our product to be free of defects in material and workmanship and [illegible] with our company quality control standards. All data, statements [illegible] made herein are based upon information we believe to be reliable, but are made without any representation or guarantee or warranty of accuracy and are made with reservation of all patent rights. Our products are sold on the condition that the user himself will evaluate the [illegible] as well as our recommendations, to determine their suitability for his own purpose before adoption. Any statements regarding the use of our products or processes are not to be construed as recommendations for their use in violation of any patent rights or in violation of any [illegible] or regulations. Liability under any condition shall be limited to replacement of material only. No liability is assumed or implied, for injury to personnel, labor costs, product loss or any other expenses incidental to the structure or operation of the plant and equipment where the coating is applied.

PLASITE ®

TECHNICAL BULLETIN

7100-ACP
March 1984
(Replaces November 1980)

PLASITE 7100-AC HEAVY DUTY PRIMER - HI-RESISTANT ANTI-CORROSIVE PRIMER

TYPE: A cross-linked epoxy-phenolic, amine cured, combined with the proper modifying agents and Strontium Chromate inhibitive pigmentation.

INTENDED USE: Primarily as a combination inhibitive and high chemical resistant metal primer. It is an established fact that a paint or coating system's chemical resistance is no better than the material next to the substrate. PLASITE No. 7100-AC Primer was designed to be in combination with coatings of the high chemical resistant type.

FOR INDUSTRIAL USE ONLY!

CHEMICAL RESISTANCE: Excellent chemical resistance to spills and fumes of a wide range of acids, alkalies and solvents.

TEMPERATURE RESISTANCE: Dry temperature basis is 400°F for short periods; 350°F continuous.

SURFACE PREPARATION: Steel surfaces may be prepared by blasting or power tools as required by ZONE OF USAGE and SURFACE PREPARATION on Page 2.

APPLICATION: PLASITE 7100-AC Primer as formulated can be applied by standard production spray equipment or by brush and roller. Refer to Page 2 for details on application.

COLORS: Standard primer color is Moss Green.

FILM THICKNESS PER COAT: A 1½ to 3 mil DFT may be applied in one coat by either roller, spray or brush. A 2 mil minimum DFT is normally required.

COVERAGE: 625 mil ft.^{2}/gallon ± 4% (theoretical). 250 to 166 ft.^{2}/gallon will produce the 2 to 3 mil DFT recommended for use under a chemical resistance top coat for Zone B applications (20% loss included). 333 to 250 ft.^{2}/gallon will produce the 1.5 to 2 mil DFT required for use under a chemical resistant top coat for Zones C and D applications (20% loss included).

DRYING TIME: At 70°F the film will normally be tack free in 3 to 4 hours and may be overcoated by spray application at this time. If the top coat is to be applied by brush, then it is recommended that the primer dry for at least 8 hours.

CURING TIME: 5 days at 90°F; 7 days at 70°F. This coating should not be applied when air temperature or temperature of surface to be coated is below 50°F. Within 24 hours after coating is applied a minimum substrate temperature of 70°F is required for proper polymerization.

PHYSICAL SPECIFICATIONS

SOLIDS: 59 ± 2% by weight; 39 ± 2% by volume.
POT LIFE: Approximately 24 hours at 70°F.
SHELF LIFE: 24 months minimum at 70°F. Material in stock should be turned upside down every 3 months.
SPRAY VISCOSITY: At 70°F, 20 ± 7 seconds, Ford Cup #4.
SHIPPING WT.: Approximately 12 lbs./gallon.

VOLATILE ORGANIC COMPOUNDS CONTENT

	COATING AS SUPPLIED (ASTM METHOD D2369)		THINNED 10% BY VOLUME WITH PLASITE 71 THINNER	
COLOR	Lbs./Gal.	Grams/Liter	*Lbs./Gal.	*Grams/Liter
Moss Green	4.1 ±2%	491 ±2%	4.34 ±2%	520 ±2%

NOTE: VOC content varies between colors. Contact PLASITE Technical Service Department for VOC of specific colors.
*Determined theoretically by usiung ASTM Method test results.

ZONE OF USAGE

B ZONE: Interior process areas where structural steel, floors, equipment, ducts and surfaces are subject to attack by strong fumes, occasional spills and splashes at intermediate temperatures. Sandblasting to near white metal preferred for long life followed by 2 to 3 mils DFT PLASITE 7100-AC with topcoat of appropriate PLASITE finish coat.

C ZONE: Interior and exterior areas of surfaces subject to fumes of fairly high concentration at ambient temperatures. Commercial blast surface preparation combined with PLASITE 7100-AC Primer and appropriate PLASITE high resistant finish coat.

D ZONE: Process plant exteriors subject to chemical atmosphere and weathering. Good power tool cleaning or brush-off blast cleaning with the use of PLASITE 7100-AC Primer and appropriate PLASITE high resistant finish coat.

THINNERS

PLASITE 7100-AC Primer normally may be applied by brush as received. PLASITE 71 Thinner recommended to adjust spray viscosity. The amount required will vary depending on air and surface temperature and application equipment. Normal spray application conditions will require addition of approximately 10 to 20% PLASITE 71 Thinner by volume. Airless spray equipment and above normal temperatures require additional thinning.
It is recommended that the amount of thinner included on each order amount to approximately 20% of the coating order.

R:10/91
7100-ACP/1

WISCONSIN PROTECTIVE COATINGS CORP.
614 Elizabeth Street
P.O. Box 8147
Green Bay, WI 54308-8147
414-437-6561

Represented by:

SURFACE PREPARATION

STEEL

Service in corrosive atmosphere (B, C & D Zones as described under ZONE OF USAGE).

1. Degrease surface prior to cleaning. Organic solvents, alkaline solutions, steam, hot water with detergents or other systems that will completely remove dirt, oil, grease, may be used.
2. Remove all loose mill scale, rust scale, and old paint scale by one of the following methods, listed in order of preference:
   a. Near white metal blast cleaning - (B Zone) SSPC-SP10 or NACE No. 2.
   b. Commercial blast cleaning - (C Zone) SSPC-SP6 or NACE No. 3.
   c. Brush-off blast cleaning - (D Zone) SSPC-SP7 or NACE No. 4.
   d. Power tool cleaning - (D Zone) SSPC-SP3.
3. PLASITE 7100-AC Primer should be applied as soon as possible after surface is prepared.

D Zone applications surface preparation as in above paragraph 2(d) must result in a relatively rough surface. If the steel is new and this type of surface preparation does not leave a reasonably rough surface on the steel a heavy film system is not recommended.

NOTE: The above specification numbers are from Steel Structure Painting Council Surface Preparation Specifications, 4400 Fifth Ave., Pittsburgh, PA 15213 and National Association of Corrosion Engineers, P.O. Box 218340, Houston, TX 77218.

EQUIPMENT

SPRAY APPLICATION

1. All spray equipment should be thoroughly cleaned and the hose, in particular, should be free of old paint film and other contaminants.
2. Use standard production-type spray guns:

GUN	FLUID	AIR
DeVilbiss JGA-502	E	704
Binks #18	66-SS	63-PB
Graco P800	04	02

3. When airless spray equipment is used the recommended liquid pressure is 1500 to 1800 psi with tip size from .015" to .021". Thinning requirements are more than for conventional spray.

BRUSH APPLICATION

A high quality brush should be used.

READ THIS NOTICE!
SAFETY AND MISCELLANEOUS EQUIPMENT

1. For tank lining work, it is recommended that the operator provide himself with clean coveralls and rubber soled shoes and observe good personal hygiene. Certain personnel may be sensitive to various types of resins which may cause dermatitis.
2. THE SOLVENT IN THIS COATING IS FLAMMABLE AND CARE AS DEMANDED BY GOOD PRACTICE, OSHA, STATE AND LOCAL SAFETY CODES, ETC. MUST BE FOLLOWED CLOSELY. Keep away from heat, sparks, and open flame and use necessary safety equipment, such as, air mask, explosion-proof electrical equipment, non-sparking tools and ladders, etc. Avoid contact with skin and breathing of vapor or spray mist. When working in tanks, rooms, and other enclosed spaces adequate ventilation must be provided. Refer to PLASITE Bulletin PA-3. Keep out of the reach of children.

MIXING

The catalyst is in a separate container and measured for the coating unit supplied. Thoroughly mix the pigments. After the pigment and liquid is thoroughly mixed, add the measured liquid catalyst slowly and mix completely with the coating. The coating should stand approximately 30 minutes after the catalyst has been thoroughly mixed before using.

APPLICATION PROCEDURE

SPRAY GUN

1. Air supply shall be uncontaminated. Adjust air pressure to approximately 50 lbs. at the gun and provide 5 to 10 lbs. of pot pressure. Adjust spray gun by first opening liquid valve and then adjusting air valve to give an 8" to 12" wide spray pattern with best possible atomization.
2. Apply crisscross, multi-passes, moving gun at fairly rapid rate maintaining a wet appearing film. Two to three passes should easily produce a 2 to 3 mil film.
3. Equipment must be thoroughly cleaned immediately after use with PLASITE thinner to prevent the hardening of the primer in the equipment.

NOTE: All welds, pits and rough metal areas should be brush-applied.

BRUSH APPLICATION

1. Apply a very light crisscross brush coat.
2. Allow to dry for approximately 5 minutes.
3. Apply a heavy coat using crisscross brush pattern. "Flow" the coating on rather than "brushing out."

This bulletin provides standard information on the coating and application procedure. Since varying conditions may not be covered, consult your local sales representative or PLASITE Technical Service Department for further information.

METRIC COMPARISONS

1 mil = .001" = 25.4 microns

1 U.S. gallon = 3.785 liters

1 sq. ft. x 0.0929 = sq. meters

$$°C = \frac{5\,(°F - 32)}{9}$$

R:10/91
7100-ACP/2

We guarantee our product to be free of defects in material and workmanship and to be in accordance with our company quality control standards. All data, statements and [illegible] made herein are based upon information we believe to be reliable, but are made without any representation or guarantee or warranty of accuracy and are made with reserv[illegible] rights. Our products are sold on the condition that the user himself will evaluate them, as well as our recommendations, to determine their suitability for his own purpose before [illegible] statements regarding the use of our products or processes are not to be construed as recommendations for their use in violation of any patent rights or in violation of any [illegible] regulations. Liability under any condition shall be limited to replacement of material only. No liability is assumed or implied, for injury to personnel, labor costs, product [illegible] expenses incidental to the structure or operation of the plant and equipment where this coating is applied.

****

MATERIAL SAFETY DATA SHEET

FOR COATINGS , RESINS AND RELATED MATERIALS

DATE OF PREPARATION- 5/12/88

MANUFACTURER'S NAME : WISCONSIN PROTECTIVE COATINGS
ADDRESS : 614 ELIZABETH STREET
ADDRESS : P.O. BOX 216
CITY,STATE : GREEN BAY,WI 54305

EMERGENCY TELEPHONE NO. DAY: (414) 437-6561NIGHT: (800) 424-9300
INFORMATION TELEPHONE NO. DAY: (414) 437-6561NIGHT:

****

SECTION I -- PRODUCT IDENTIFICATION

MANUFACTURER'S CODE IDENTIFICATION: 7122H310H-02 LAST MOD. DATE : 12/23/86
PRODUCT CLASS: HI-RESISTANT EPOXY-PHENOLIC AMINE COATING
TRADE NAME: **PLASITE 7122-H LIGHT GRAY**

REF# 7122H310A-01 7122H000B-01

****

SECTION II HAZARDOUS INGREDIENTS

----- INGREDIENT ----- ERIAL DESCRIPTION	CAS#	% BY WEIGHT	TLV MG/M3	PEL MG/M3	OTHER
M YL ETHYL KETONE	*78-93-3	0%-30%	590.00	590.00	
METHYL ISO-BUTYL KETONE	*108-10-1	0%-30%	205.00	410.00	
TOLUENE	*108-88-3	0%-30%	375.00	755.00	
ISOBUTYL ACETATE	*110-19-0	0%-30%	700.00	700.00	
ETHYL ALCOHOL	*64-17-5	0%-30%	1900.00	1900.00	
TITANIUM DIOXIDE	*13463-67-7	0%-30%	10.00	15.00	
SILICA	*7631-86-9	0%-30%	10.00	N/A	
KAOLIN	*1332-58-7	0%-30%	10.00	15.00	
POLYAMINE	*##	0%-30%	4.00	N/A	
EPOXY RESIN	*##	30%-70%	N/A	N/A	

MANUFACTURER'S CODE: 7122H310H-02 DATE OF PREPARATION- 5/12/88

- THIS RAW MATERIAL IS CONSIDERED A TRADE SECRET. THE NECESSARY INFORMATION PERTAINING TO HAZARDS,CLEAN UP PROCEDURES,PHYSICAL AND CHEMICAL CHARACTERISTICS HAVE BEEN PROVIDED WITHIN.

IF THE MATERIAL DESCRIPTION IS FOLLOWED BY "@", THEN THE TLV/PEL IS A CEILING VALUE.

SECTION III PHYSICAL DATA

BOILING RANGE	HIGH 244.0 DF	LOW 173.0 DF	
VAPOR PRESSURE	70.00 MMHG @68DF		
VAPOR DENSITY	-N/A		
EVAPORATION RATE	FASTER THAN ETHER		
THEORETICAL WEIGHT PER GALLON	10.6	+/- .2	
THEORETICAL % VOLATILE BY VOLUME	49.33	+/- 4%	
THEORETICAL % VOLATILE BY WEIGHT	31.70	+/- 4%	

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY CLASSIFICATION OSHA-CLASS IB DOT- FLAMMABLE LIQUID
LOWEST FLASHPOINT T.C.C. 24.0 DF LOWER EXPLOSION LEVEL (LEL) 1.2

EXTINGUISHING MEDIA: Foam, Carbon dioxide, Dry Chemical, Water Fog.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Liquid is flammable. Vapors in correct concentration can explode if exposed to sparks, flame, hot surfaces, electric sparks or static charge. Sealed containers may build up pressure and may explode if exposed to heat. Water may be used to cool containers. Use explosion-proof lighting only.
SPECIAL FIREFIGHTING PROCEDURES: Water may not be effective. Use self-contained breathing apparatus and full protective clothing. Decomposition products from burning are not fully known but would be a health hazard. Symptoms may not be immediately apparent. Obtain medical attention.

SECTION V -- HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE: ACUTE: Irritation to eyes, nose, and throat in high vapor concentrations. Liquid may cause chemical burn in eye; damage irreversible; may cause chemical burn on skin. CHRONIC: Liquid may cause skin sensitization. Reports associated repeated prolonged occupational overexposure to solvents with permanent brain and nervous system damage.
MEDICAL CONDITIONS PRONE TO AGGRAVATION BY EXPOSURE: Asthmatic-type conditions, other chronic respiratory diseases or skin sensitization.
PRIMARY ROUTE OF ENTRY: Inhalation
EMERGENCY AND FIRST AID PROCEDURES: INHALATION: Remove to fresh air. Restore breathing. Treat symptomatically.Consult a physician. SPLASH (EYES) Flush with water for at least 15 minutes. Take to a physician. SPLASH (SKIN): Wash with soap and water. Remove contaminated clothing. Consult a physician. INGESTION: Drink water to dilute. Do not induce vomiting. Consult poison control center or physician immediately. Treat symptomatically.

MANUFACTURER'S CODE: 7122H310H-02 DATE OF PREPARATION- 5/12/88

SECTION VI -- REACTIVITY DATA

STABILITY: Stable
HAZARDOUS POLYMERIZATION: Will not occur
HAZARDOUS DECOMPOSTION PRODUCTS: Incomplete combustion produces carbon
. monoxide and other toxic gases.
CONDITIONS TO AVOID: High temperature or heat. Inadvertent over cataly-
. zation.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizing agents or mineral
. acids.

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Remove any
. possible source of ignition. No smoking. Ventilate enclosed spaces.
. Recover free liquid. Absorb with dry, inert material. Avoid breathing
. vapors.
WASTE DISPOSAL: Run-off to waterway creates fire hazard. Dispose of in
. accordance with federal, state, and local regulations.

SECTION VIII-- SPECIAL PROTECTION INFORMATION

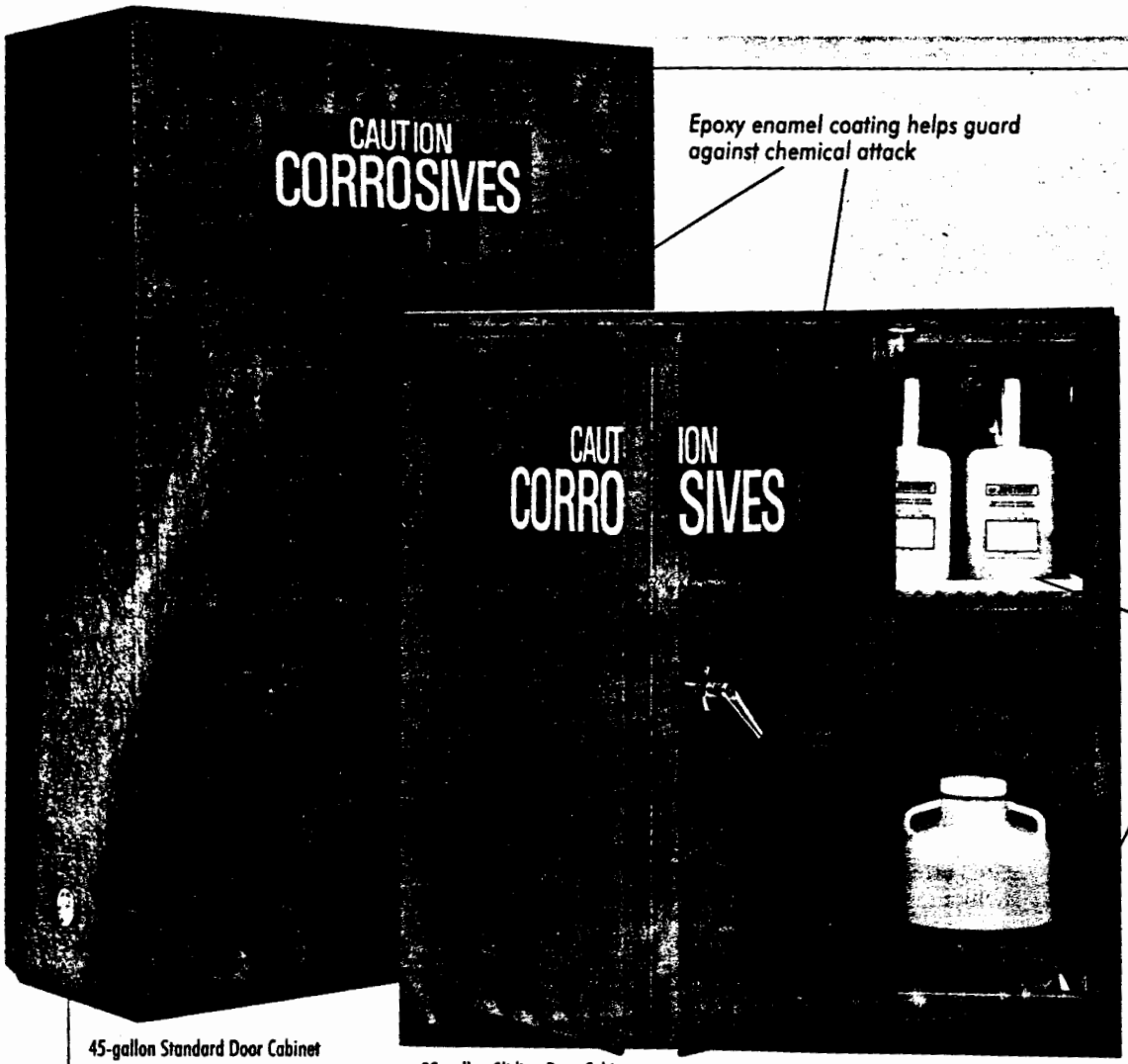
RESPIRATORY PROTECTION: In confined areas use NIOSH/MSHA approved air-
. supplied mask when spraying. In areas with restricted ventilation an
. organic-vapor and dust respirator may be sufficient.
VENTILATION: Use only with adequate ventilation. Use NIOSH/MSHA approved
. explosion-proof lighting and ventilation equipment. No smoking or open
. lights. Local Exhaust (When applying coating): Face Velocity >60FPM.
PROTECTIVE GLOVES: Neoprene or other solvent resistant material.
EYE PROTECTION: Chemical goggles or face splash shield.
OTHER PROTECTIVE EQUIPMENT: Use NIOSH/MSHA approved explosion-proof light-
. ing. Clean coveralls and rubber soled shoes.
HYGIENIC PRACTICES: Observe good personal hygiene. Clean material off hands
. before eating, using toliet facilities, or smoking. No smoking while
. using or while containers are open.

SECTION IX-- SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Keep containers closed.
. Keep away from heat and open flame. Store in a NO SMOKING area.
OTHER PRECAUTIONS: Avoid prolonged or repeated breathing of vapors. Avoid
. prolonged contact with skin. Avoid breathing dust from sanding, blasting,
. or abrading the dry coating.
.
. DF= Degrees Fahrenheit
. N/A= Not Applicable

APPENDIX D

Manufacturer's Information on Waste Containers and Containment Units



Epoxy enamel coating helps guard against chemical attack

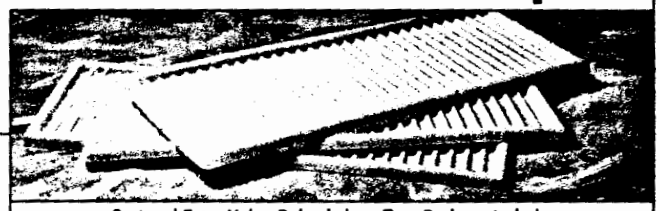
•Fusible link closes door automatically in case of fire

Polyethylene trays contain small spills and protect shelves and well from corrosion

EXTRA value

45-gallon Standard Door Cabinet

30-gallon Sliding Door Cabinet



Optional Extra Value Polyethylene Tray Package includes two shelf trays and one bottom tray for 30- or 45-gallon cabinets.

Eagle® Acid Storage Cabinets

Now Offering Our Extra Value Polyethylene Tray Package—Save More Than $50.00!

Tough epoxy enamel coating on the inside and outside of cabinet protects against chemical attack so cabinet lasts longer. Available as a ***Standard Two-Door Cabinet*** (manual door operation), or as a ***Sliding Self-Closing Door Cabinet*** with a fusible link that automatically closes the door at 165°F. Choose from 30-, 45- or 60-gallon storage capacities.

Specifications: Double-wall 18-gauge steel frame. Features a 1½" airspace between walls, upper and lower vents, a three-point latch with keylock, and a 2" raised, leakproof sill. For additional protection, each cabinet includes high-density polyethylene trays for each shelf and for the bottom. Each tray resists rust and corrosion while containing up to one gallon of spill. Locking tabs secure trays on shelves. Additional trays available separately. ***Extra Value Tray Package*** includes two shelf trays and one bottom tray for 30- or 45-gallon cabinets.

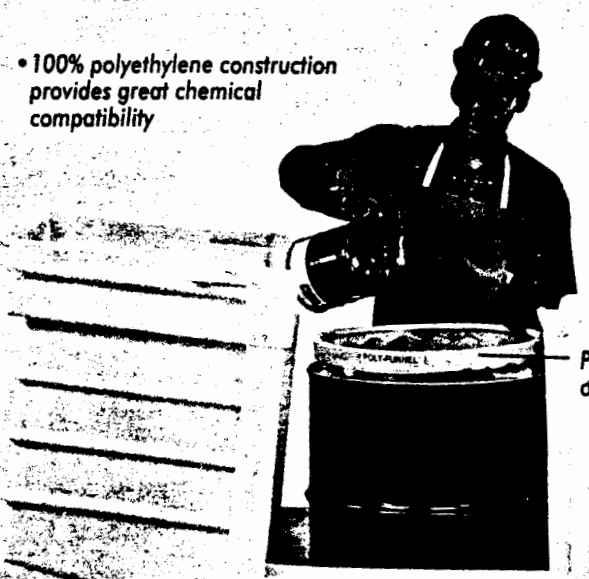
Note: Not suggested for use with nitric and sulfuric acids.

Acid Storage Cabinets

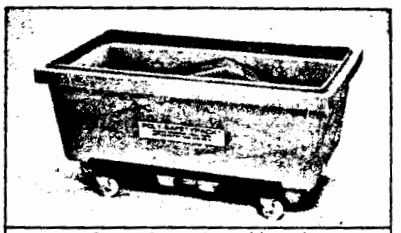
No.	Capacity (gal.)	Door Style	No. of Shelves	O.D. (in.) H	W	D	Shipping Wt. (lbs.)	Each 1	Each 2
YB-2150	30	Standard	1	44	43	18	265	506.15	455.55
YB-2150-3	30	Sliding	1	44	43	18	265	527.65	474.90
YB-2151	45	Standard	2	65	43	18	334	591.15	532.35
YB-2151-2	45	Sliding	2	65	43	18	367	655.20	621.60
YB-10837	60	Standard	2	65	31	31	380	843.45	759.15
YB-10836	60	Sliding	2	65	31	31	380	912.85	821.60

Additional Polyethylene Trays and Metal Shelves

No.	Description	Each 1	Each 2
YB-23531	Extra Value Tray Package (30 or 45 gal.)	58.60	52.80
YB-7905	Bottom Tray (30 or 45 gal.)	40.05	36.05
YB-7906	Shelf Tray (30 or 45 gal.)	40.05	36.05
YB-10838	Bottom Tray (60 gal.)	51.45	46.40
YB-10839	Shelf Tray (60 gal.)	51.45	46.40
YB-7907	Metal Shelf (30 or 45 gal.)	42.30	38.10
YB-10840	Metal Shelf (60 gal.)	72.90	65.65



• *100% polyethylene construction provides great chemical compatibility*



Caster/Frame Assembly and Poly-Safetypack™ Base available separately.

Poly-Funnel™ sold separately on page 408

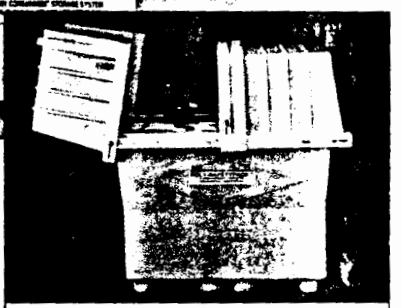
Poly-Safetypack™ and Poly-Safetypack™ Plus Secondary Containment Systems

Large storage facilities hold two 55-gallon drums. Protect your drums from weather while keeping drips and leaks contained.

Specifications: 100% polyethylene construction resists chemicals and adverse conditions. 6" supports enable safe handling by forklift or pallet jack. Includes removable polyethylene grating, drain fitting and security lock. Available with or without lids. ***Poly-Safetypack*** has a 135-gallon sump capacity. Hinged two-part cover keeps your contents dry. ***Poly-Safetypack Plus*** has a 240-gallon sump capacity. Hinged lids can be closed with pumps in place—no need to remove pumps for storage. Optional ***Caster/Frame Assembly*** offers easy mobility and fits both models.

Compliance: EPA Container Storage Regulation 40 CFR 264.175 and Uniform Fire Code Article 80.

Please Specify Color: GR (gray), Y (yellow).



Poly-Safetypack™ Plus allows pumps to remain in drum during storage.

No.	Description	O.D. (in.) H x W x L	Each
YB-11243	Poly-Safetypack with Lids	46¾ x 33¾ x 60¼	723.75
YB-11243-2	Poly-Safetypack, Base Only	27 x 33½ x 58½	376.80
YB-11243-3	Caster/Frame Assembly	– x – x –	289.10
YB-23377	Poly-Safetypack Plus with Lids	64¾ x 33¾ x 60¼	854.70

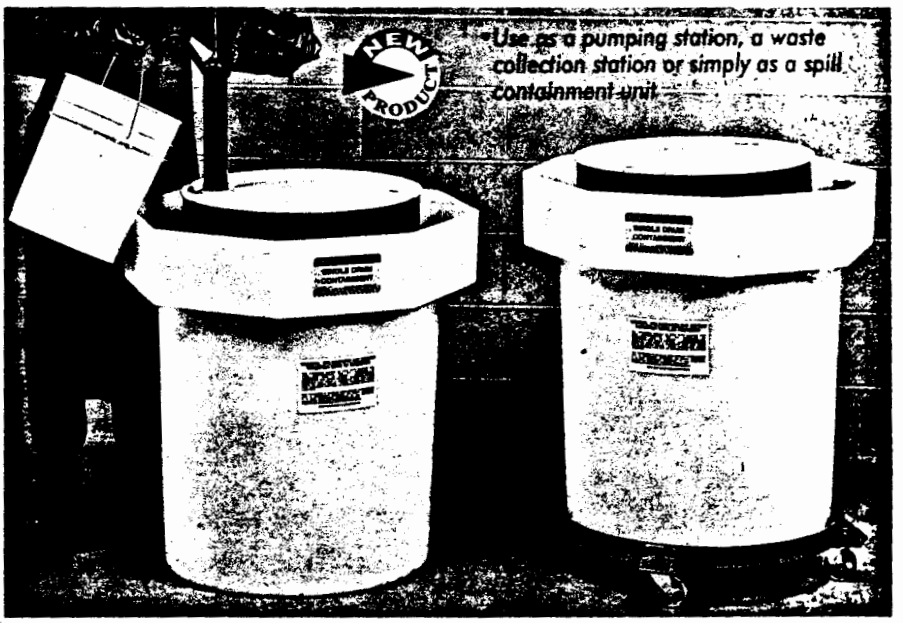
Eagle® Single-Drum Containment Unit

upports the entire weight of the drum dur-ng transport, making this an ideal collection r dispensing center. To move, use *No. 2132 Drum Dolly* or position forklift blades eneath the octagonal lip edge, and raise.

pecifications: 85-gallon container features eavy-duty polyethylene construction for trength and chemical resistance. Tough, urable, and ready for years of service. nique design provides extra room at the p (32" OD) to make inserting a drum a mple operation. Body diameter is a stan-rd 25½". Overall height: 34". Empty units st together for maximum use of space.

mpliance: EPA requirement for secondary ll containment of hazardous materials.

	Description	Each
-25726	Containment Unit	150.90
-22132	Drum Dolly	75.50



Use as a pumping station, a waste collection station or simply as a spill containment unit

ks and spills.
smaller drums
ged polyethyl
rust or corr
e between dru
7" dia.
requirements.

	Each
1	

ns Meet P.O.P. Requirem

ar for HM-181 Compliance

Cap. (gal.)	DOT Reg.	Gauge Body/Top/Bottom	Type	Wt. (lbs.)	Unlined No.	UN Marking	Each 1	Each 10	Each 20	Lined No.	UN Marking	Each 1	Each 10	Each 20
	17C	16/16/16	Open	55	YB-2707	1A2/Y1.2/150	61.00	54.90	49.45	YB-14669	1A2/Y1.2/150	62.70	56.45	50.80
	17H	18/16/18	Open	55	YB-4389†	1A2/Y1.5/150	64.95	58.50	52.65	YB-14670	1A2/Y1.2/150	65.30	58.80	52.90
	17E	20/18/18	Closed	50	YB-4390†	1A1/Y1.8/300	52.40	47.20	42.45	YB-14671	1A1/Y1.4/200	52.90	47.65	42.85
	17H	18/16/18	Open	35	YB-4391†	1A2/Y1.2/150	55.55	50.00	45.00	YB-14672	1A2/Y115/S	56.35	50.75	45.65
	17E	20/20/20	Closed	25	YB-4392†	1A1/Y1.4/300	47.55	42.80	38.55	YB-14673	1A1/X1.3/250	48.25	43.45	39.10
	17C	18/18/18	Open	35	YB-4393	1A2/Y1.2/100	50.45	45.45	40.90	YB-14674	1A2/Y1.2/100	51.90	46.75	42.05
	17C	18/18/18	Open	20	YB-4394	1A2/Y90/S	44.20	39.80	35.80	YB-14675	1A2/Y90/S	47.20	42.50	38.25
	17E	20/20/20	Closed	18	YB-4401†	1A1/Y1.5/300	35.40	31.90	28.70	YB-14676	1A1/X1.2/300	36.20	32.60	29.35
	17C	20/20/20	Open	12	YB-4395*	1A2/Y42/S	42.85	38.60	34.75	–	–	–	–	–
	17C	20/20/20	Open	12	YB-4402	1A2/Y42/S	40.55	36.50	32.85	–	–	–	–	–

*Includes 2" plug in top head. †Available in Blue, Black or Gray.

TRUPACT II STANDARD WASTE CONTAINER

APPROVED BY THE DOE FOR USE WITH THE WASTE ISOLATION PILOT PROJECT

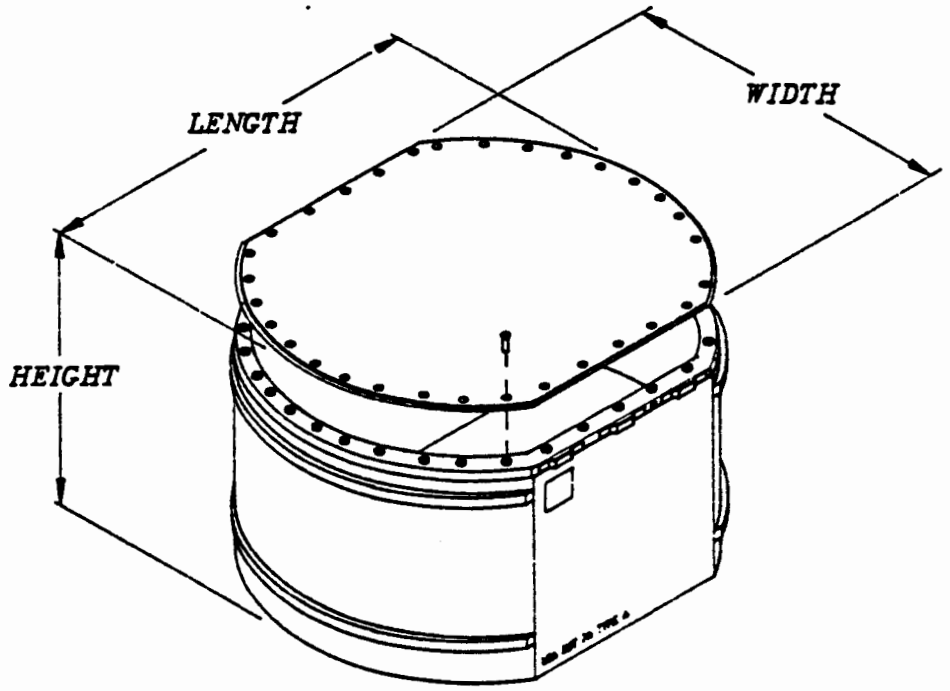
DIMENSIONS (INCHES)	INTERIOR	EXTERIOR
HEIGHT	36"	37"
WIDTH	52"	54 1/4"
LENGTH	68 11/16"	71"

DESCRIPTION

CLASSIFICATION	LSA WASTE CONTAINER
PACKAGE TYPE	CFR SPECIFICATION 7A TYPE A
CAPACITY	72 CUBIC FEET
MATERIAL	ASTM A-569 LOW CARBON HOT ROLLED STEEL
GROSS WEIGHT (EMPTY)	748 POUNDS
PAYLOAD	4,000 POUNDS
MAX. LOADED WEIGHT	4,748 POUNDS

ADDITIONAL INFORMATION

FULLY TESTED AND CERTIFIED FOR ALL CONTENT FORMS 1 THRU 5.
BOLTED CLOSURE ALLOWS QUICK AND EASY SECUREMENT OF THE LID.
COMPLETELY COMPATIBLE WITH WIPP TRUPACT OVERPACK TRANSPORT CONTAINERS.
OPTIONAL SHIELDING AVAILABLE TO MEET USER REQUIREMENTS.
FINAL PROTECTIVE FINISH TO MEET USER REQUIREMENTS.
OPTIONAL WELDED LID UNIT AVAILABLE.



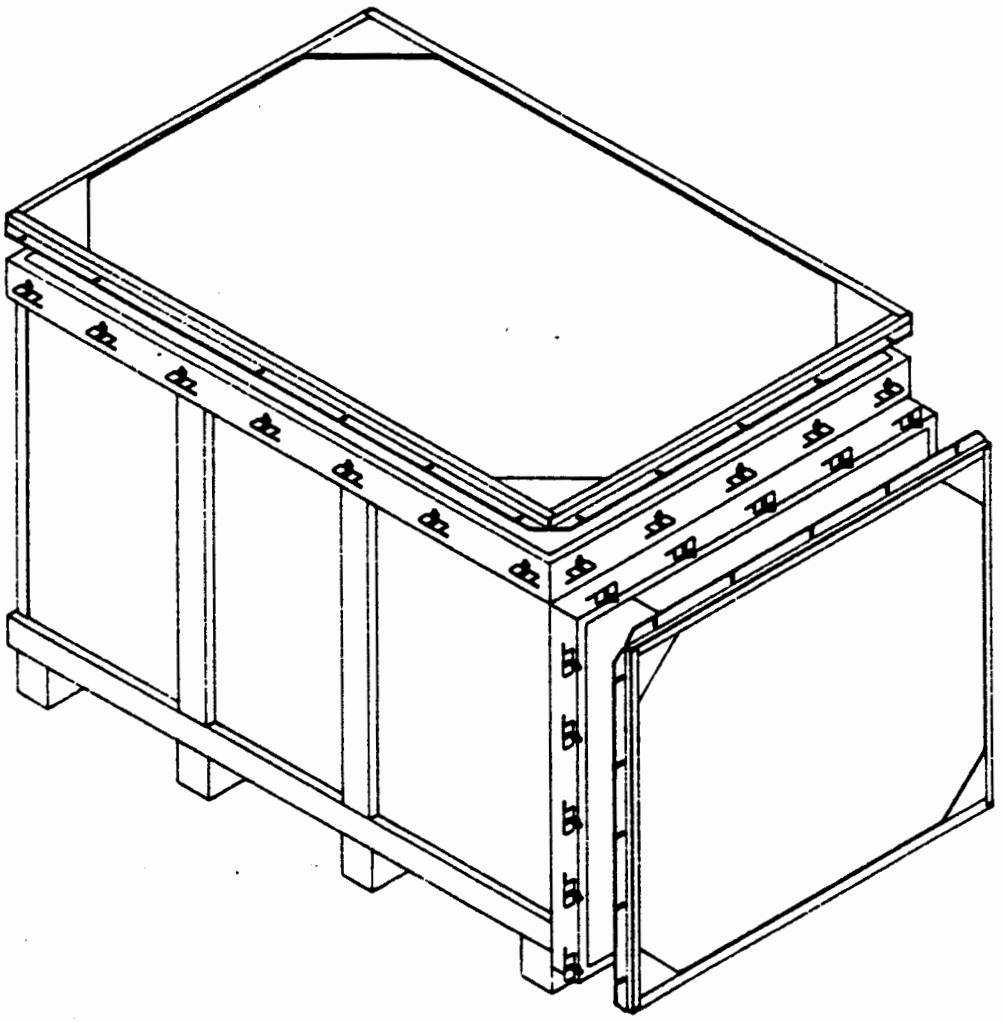
U.S. PATENT NUMBERS 4371092 AND 4426927

CONTAINER PRODUCTS CORPORATION

CONTAINER PRODUCTS CORPORATION
P.O. BOX 3767 112 NORTH COLLEGE ROAD
WILMINGTON, NORTH CAROLINA 28405
(919)392-6100 FAX (919)392-6778

MULTI-AXIS ACCESS TYPE A AND STRONG-TIGHT CONTAINERS

MULTI-ACCESS CONTAINERS, UNITS WHICH CAN BE LOADED AND UNLOADED FROM THE TOP AS WELL AS THE SIDE AND/OR END, DESIGNED TO YOUR SPECIFIC NEEDS ARE AVAILABLE AND ARE DESIGNED TO COMPLY WITH LSA, TYPE A AND-OR IAEA SPECIFICATIONS. UNITS CAN BE MANUFACTURED FROM AS SMALL AS 1 CUBIC FOOT TO IN EXCESS OF 3,000 CUBIC FEET WITH PAYLOAD CAPACITIES IN EXCESS OF 40 TONS.



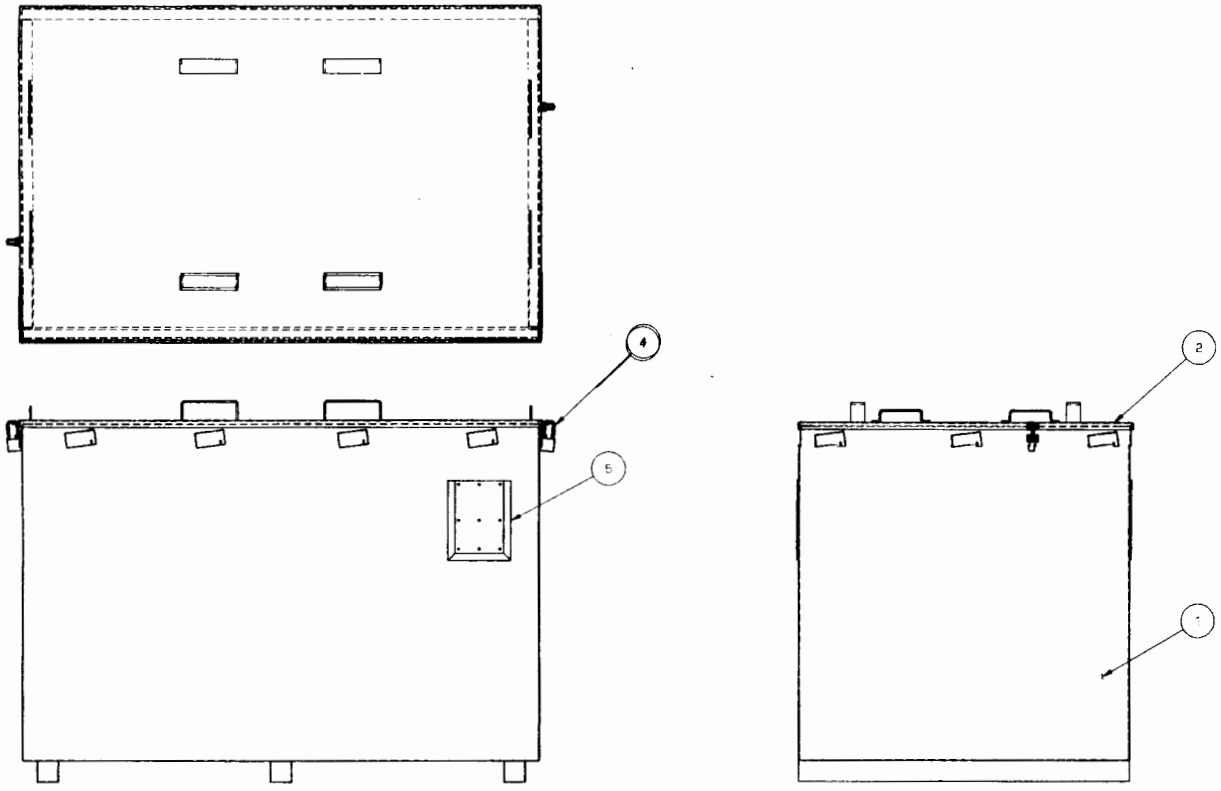
U.S. PATENT NUMBERS 4371092 AND 4426927

CONTAINER PRODUCTS CORPORATION

CONTAINER PRODUCTS CORPORATION
P.O. BOX 3767 112 NORTH COLLEGE ROAD
WILMINGTON, NORTH CAROLINA 28405
(919)392-6100 FAX (919)392-6778

BILL OF MATERIAL

ITEM NUMBER	REQUIRED PER U.O.	SUFFIX NUMBER	DESCRIPTION
1	1	----	BODY ASSEMBLY: GREGORY ENVIRONMENTAL SYSTEMS, L.P. DRAWING NUMBER GES-H-003-1
2	1	----	LID ASSEMBLY: GREGORY ENVIRONMENTAL SYSTEMS, L.P. DRAWING NUMBER GES-H-003-1
3	4	D2	STAPLE PLATE: WROUGHT STEEL, STAPLE PLATES STANDARD TYPE MCMASTER-CARR CATALOG #1724A4 OR EQUAL
4	2	----	COMBINATION PADLOCK: SUPPLIED BY USER
5	2	D2	CARDHOLDER: 18 GA (.0598) ASTM A 569 PER DETAIL



REVISION LETTER	CLASS REQUIRED	REVISIONS	DATE	FACILITY	ENG O.A.	DRAWN	CHECKED	RELEASED
B	CLB	REPLACED CARDHOLDER WITH ONE OF TRICKER MATERIAL	9-23-94	-----	CLB	G.A.V.	L.A.D.	CLB
A	CLB	REPLACED CARD HOLDER FROM SIDE OF BOX TO FRONT ALSO REPLACED CARD HOLDER ON SIDE OF BOX	3-21-94	-----	CLB	G.A.V.	L.A.T.	CLB
----	CLB	ORIGINAL ISSUE	---	---	---	---	---	---

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

AUTOCAD FILE NAME
3079D01B

	SIGNATURE	DATE	GROUP
ORIGINATED	L.A. TRUJILLO	2-24-94	NMT-2
DESIGNED	G.A. VALDEZ	2-18-94	ESA-4
DRAWN	G.A. VALDEZ	2-18-94	ESA-4
CHECKED	F. MARTINEZ	2-24-94	ESA-4
ENG O.A.	F. MARTINEZ	2-24-94	ESA-4
PROJ ENG	L.A. TRUJILLO	2-24-94	NMT-2
RELEASED	CLB	2/24/94	ESA-4

CLASSIFICATION OF DRAWING: UNCL
PART: UNCL
TITLE BLOCK: UNCL

TITLE: ASSEMBLY
WASTE BOX
MODIFICATION

TA-55

TOLERANCE - (UNLESS OTHERWISE NOTED)
X = ± N/A X.XX = ± N/A ANGULAR = ± N/A
X.X = ± N/A X.XXX = ± N/A FINISH - N/A

SCALE	TOTAL SHEETS	DRAWING NO.	SHEET SIZE NO.
1/8	3	26Y-203079	D 01

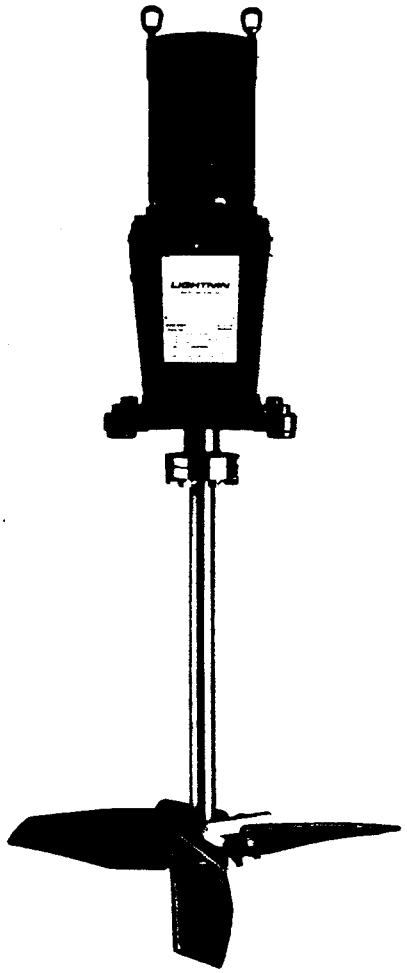
SCRIPT SIGNATURES ARE PRESENT IN THE SIGNATURE BLOCKS ON THE MICROFILMED COPY OF THIS DRAWING'S ORIGINAL ISSUE AND ON ALL SUBSEQUENT REVISIONS.

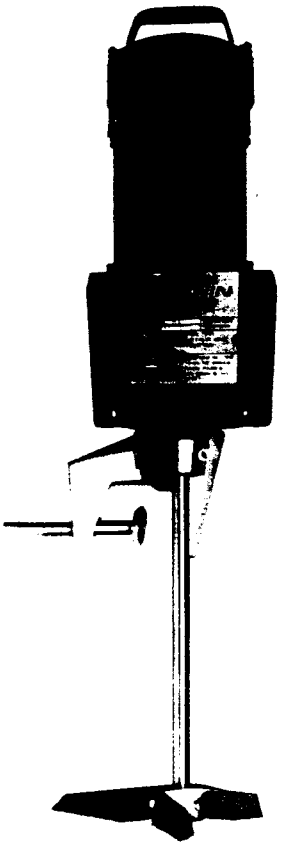
APPENDIX E

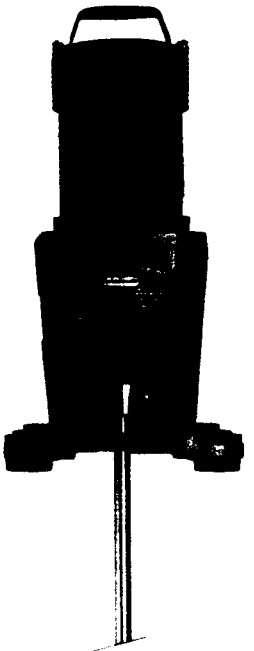
Manufacturer's Information on Fixed-Mount Mixers

Value

Portable, Fixed Mount and Inliner® Mixers







A UNIT OF GENERAL SIGNAL GS
LIGHTNIN

Mike Byrnes

(303) 757-4981
Tlx: 45-724

D.W. DAIGLER COMPANY
5777 E. Evans Avenue-Suite 4
Denver, Colorado 80222

A UNIT OF GENERAL SIGNAL GS

LIGHTNIN

Catalog B-610

Lightnin heavy duty, high flow mixers

XJ Series

CLAMP MOUNT

EASY POSITIONING.
The handle helps you aim the mixer for best results, move it on or off the tank.

BUILT-IN DAMPENER.
Pad between housing ball and clamp socket minimizes vibration.

EASY SET-UP.

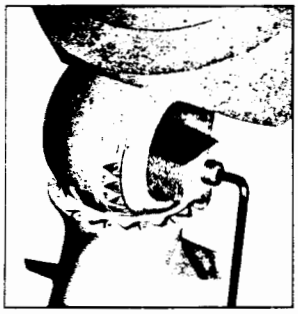


Figure 20.
Standard clamp securely mounts to tank rim or other support. Mixer adjusts 90° vertically, 360° horizontally for optimal positioning and re-positioning. Indexed ball and socket let you repeat settings exactly.

ONE WRENCH.
Comes with mixer and fits both clamp and chuck. Stores conveniently in the hollow clamp screw.

CUP MOUNT OPTION.

Figure 21.
Lets you permanently mount mixer, yet retain vertical and horizontal movement with indexing feature.

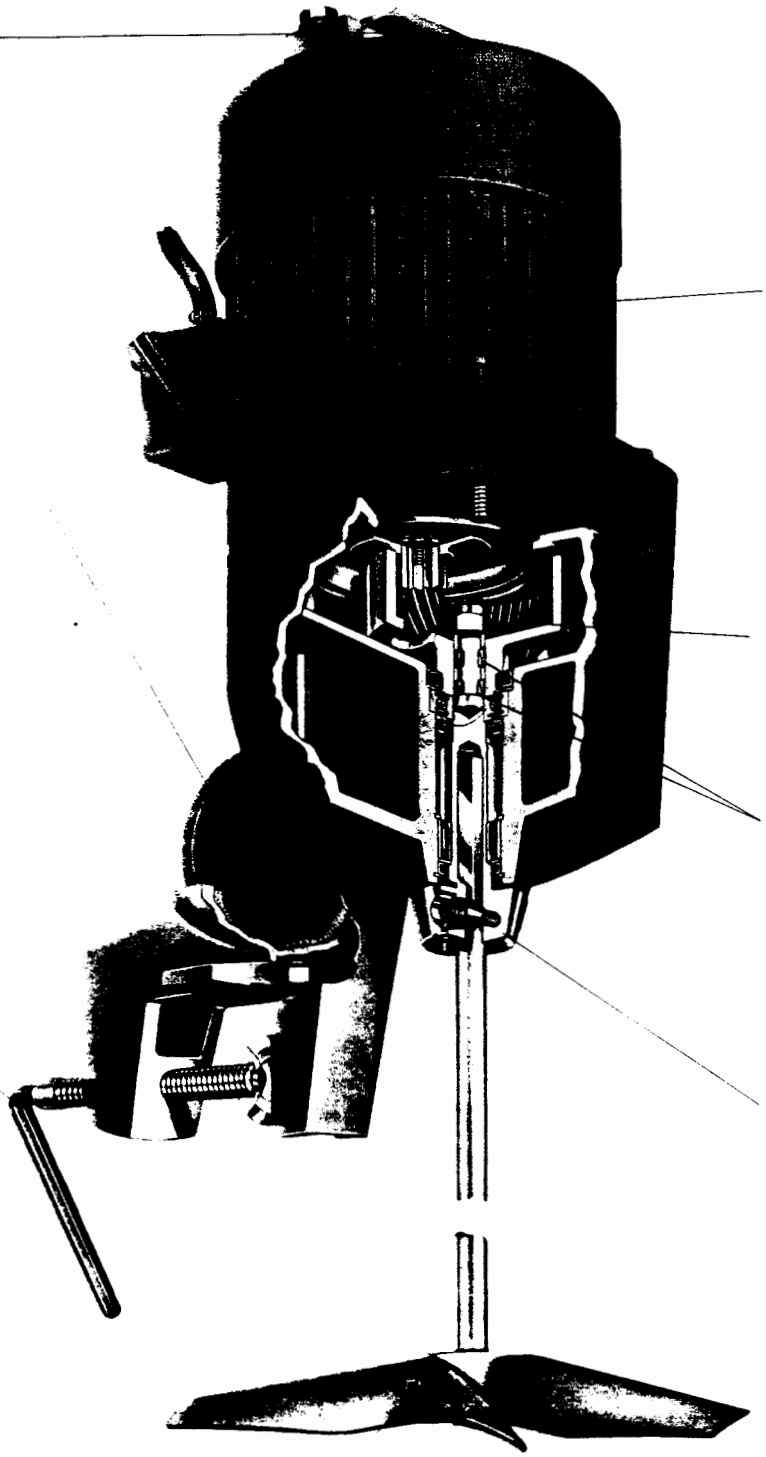


Figure 22.

A310 HIGH EFFICIENCY IMPELLER

PROTECTION AGAINST DUST, FUMES AND MOISTURE.
Standard DURA-MIX motor is totally enclosed or explosion-proof. See page 24.

HIGH TORQUE.
Single reduction, internal helical gears are exceptionally compact and quiet and can handle high loading.

GRIP SPRINGS.
These provide a keyless friction clutch to protect the gears against shock loads.

POSITIVE CHUCK.
A twist of the wrench forces chuck to grip the flat on the mixer shaft. The flat is tapered to prevent the shaft from dropping out unless intentionally released. Chuck also acts as a slinger baffle to keep splash away from the drive shaft seal and bearing. Optional rigid shaft coupling also available for extra long shafts, severe operating conditions.

LIFETIME LUBRICATED.
Shaft, motor bearings and gears are lifetime lubricated for non-stop service. No need to change lubricant

Our most popular portables

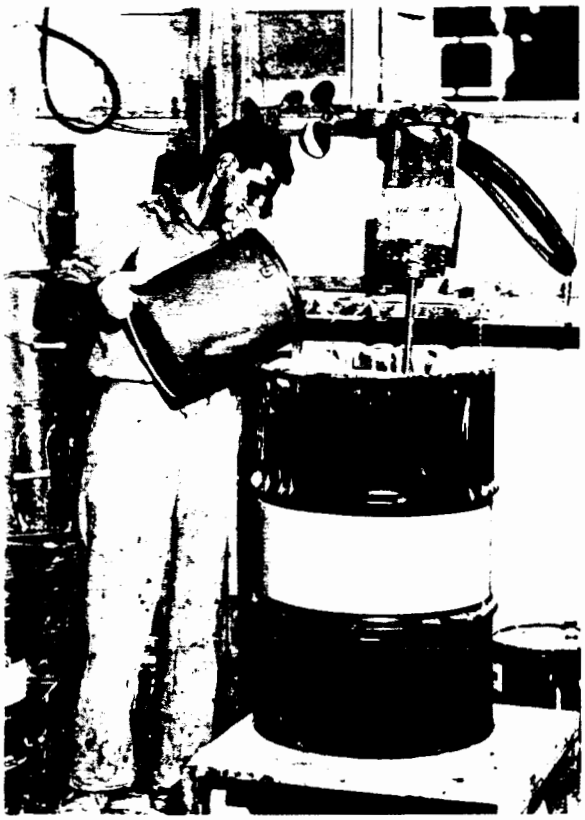


Figure 23.
For mixing ceramic slips and plaster, for preparing sand for foundry cores and molds, for all manner of slurry and high viscosity mixing.

Tens of thousands of these green Lightnin mixers are at work, delivering guaranteed results around the world. Many are original units, first built in 1960.

Gear drive, high flow Lightnin mixers with A310 Impellers produce a powerful action which sweeps the tank bottom and produces rapid top to bottom turnover.

For more jobs than not, the result is lower cost and less horsepower to do the job.

HIGH VISCOSITY.

The high torque delivered by internal gearing is essential for mixing heavy liquids like mayonnaise and molasses and fluids in the 15,000 to 100,000 centipoise range.

Figure 24.
High flow units mix soup and spaghetti sauce, cake and cookie batter, relish and catsup, and the list goes on and on.

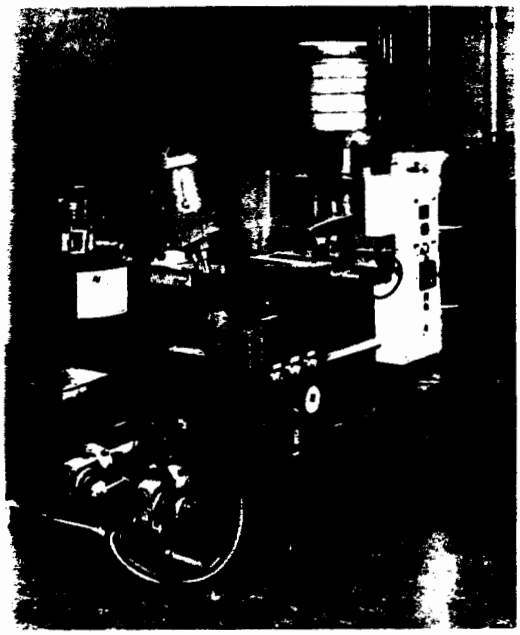


Figure 25.
Manufacturers make Lightnin gear drives a part of packaged unit processes, as in this polymer make-up system.

CLAMP MOUNT

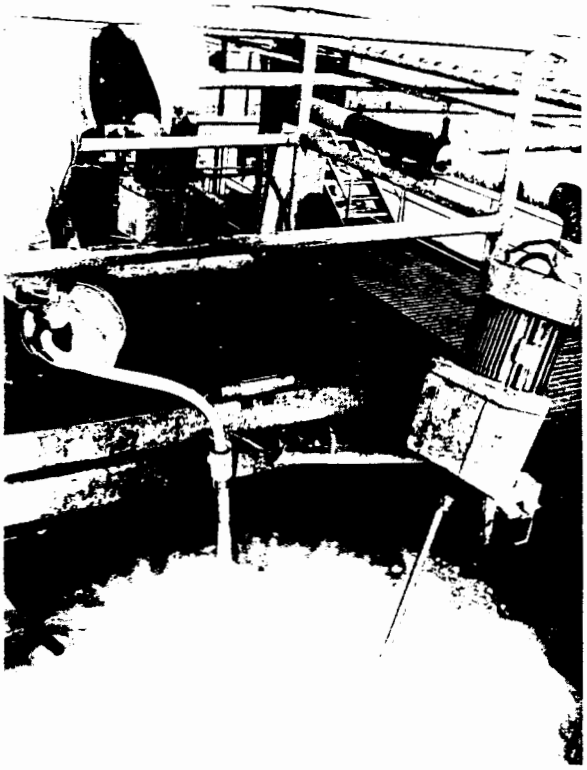


Figure 26.
High flow mixers provide non-stop services in the slurries of mineral processing and other industries.

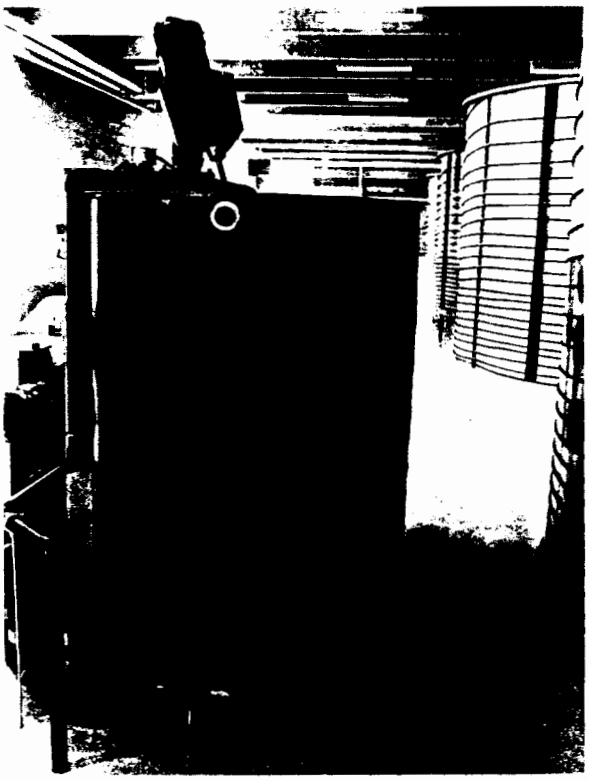


Figure 27.
You'll find Lightnin portables making up solutions as diverse as auto wax and chemicals for wastewater treatment.

LARGE BATCHES.

The high torque is very effective in handling low-viscosity fluids in large batches that are beyond the range of direct drive units. Soft drink bottlers, for example, use Lightnin mixers widely for making up syrup in batches ranging from 300 to 6000 gallons.

FOUNDRIES.

These heavy-duty workhorses prepare sand for cores and molds. They mix various washes. They assist circulation of fluids in metal quenching. You'll even find them working in molten metal to help fluxes remove impurities.

DAIRIES.

Lightnin high flow portables prevent rising of cream in storage tanks. They maintain circulation in pasteurizers. They achieve uniformity in ice cream mix and chocolate drinks, and do all manner of other work in the dairy. Your Lightnin sales representative has a selection table covering both high flow and high shear mixers, especially for dairies. Call for a specification for your tank, your volume and your process.

HIGH TEMPERATURES.

You'll find Lightnin mixers at work in molten metal and in tanks for quenching and heat-treating metal as well as in other high temperature applications.

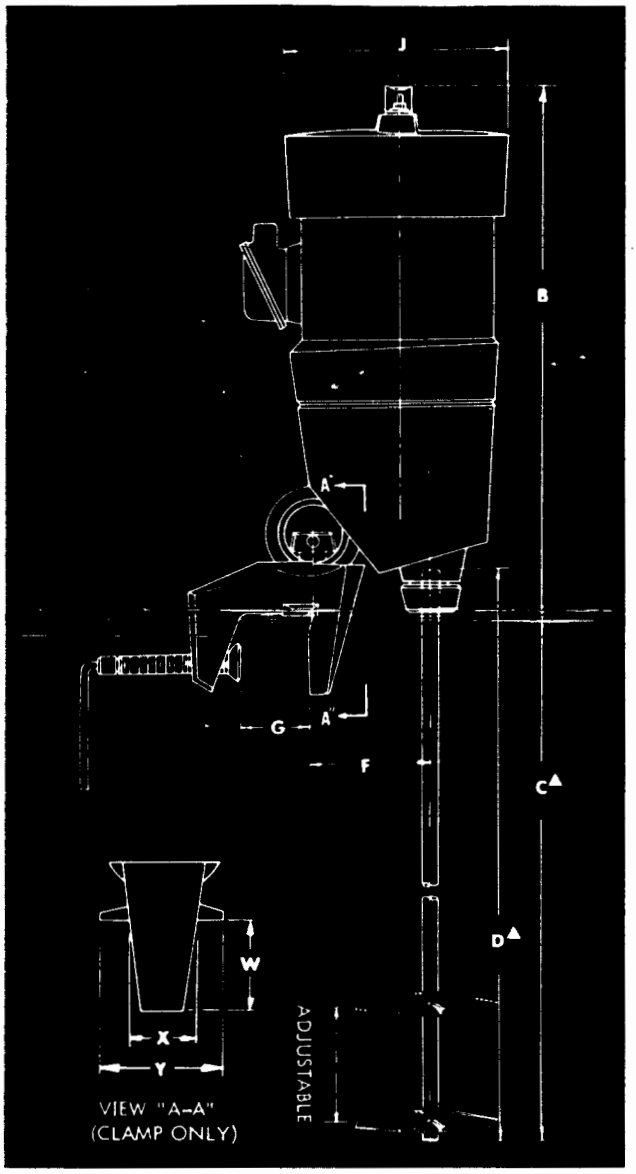
A variety of modifications is available to suit operating temperatures in the tank, and around the mixer motor and housing.

Among them are special grease and bearings, special coupling construction, oversize shafts with impeller welded on, as well as special motor insulation and housing materials.

Call your Lightnin representative for specific recommendations to suit your application.

Figure 28.
Gear drive portables deliver high flow, high pumping action in wash and treatment tanks for metal parts.

Standard materials and equipment



XJ Series

Mixer Housing — Aluminum*

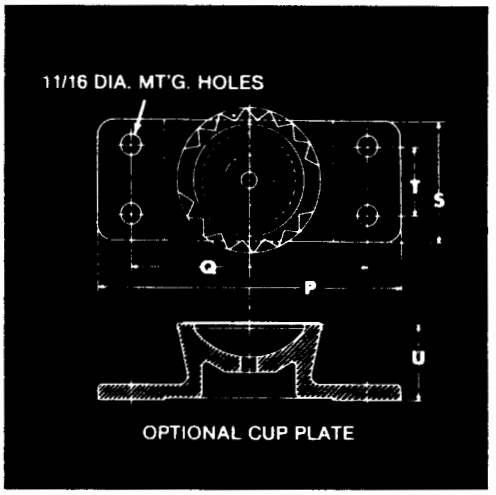
Chuck or Rigid Coupling — Electroless nickel plated steel or Type 316 stainless steel*

Clamp — Aluminum*

Shaft and Impellers — Steel, Type 304 and 316 stainless. Also available in any wrought commercial alloys and with coverings of such materials as rubber, PVC, polymers and fluorocarbons.

Paint — Styrenated alkyd enamel, 400 hours minimum salt spray resistance. Electroless nickel plated finish optional.

*Other materials available



HEAVY DUTY, HIGH FLOW GEAR DRIVES

Model	HP	[illegible]	B	C▲	D▲	F	G	J	P	Q	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
XJ30	.30	65	21⅝	32⅛	36	5	3	8½	9	7	3½	2	2¼	3⅛	2⅞	5 7/16
XJ45	.43	70														
XJ68	.65	86	22¾	43⅛	48	5½	3¾	8½	10	8½	3⅝	2	2 7/16	3½	2⅞	5¾
XJ87	.87	94														
XJ117	1.17	100														
XJ174	1.74	125	27¼	55⅜	60	6½	3¾	10⅞	10	8½	4	2½	2 15/16	4 3/16	3¼	6⅞
XJ250	2.30	135	28													

▲Dimensions C and D reflect standard lengths provided unless otherwise specified.
All dimensions in inches

Lightnin fixed-mounts for open tanks

XJQ & XDQ Series

FIXED MOUNT

DRIVES TO MATCH THE WORK.

Gear drive. For high viscosity mixing. For low viscosity work with large batches or where high flow with low shear is desirable. Single reduction helical gears are exceptionally compact, quiet running and carry high loads.

DIRECT DRIVE.

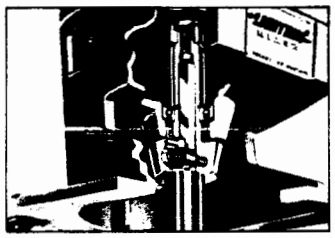


Figure 29.
For small batches or wherever high fluid motion and high shear are needed. Motor and shaft are coupled directly with pilot and keyway for accurate alignment and positive connection.

INTEGRAL ALIGNMENT.

One-piece housing and mixer support assures exact alignment, great mechanical strength.

VIBRATION DAMPENER.

Shock mounts protect drive against high fluid forces to prolong mixer life.

OPTIONAL RISERS.

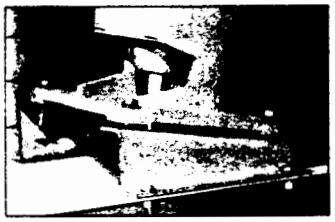


Figure 30.
Spacers give the correct angular, off-center mixer position for most applications, achieving optimum mixing without need for tank baffles.

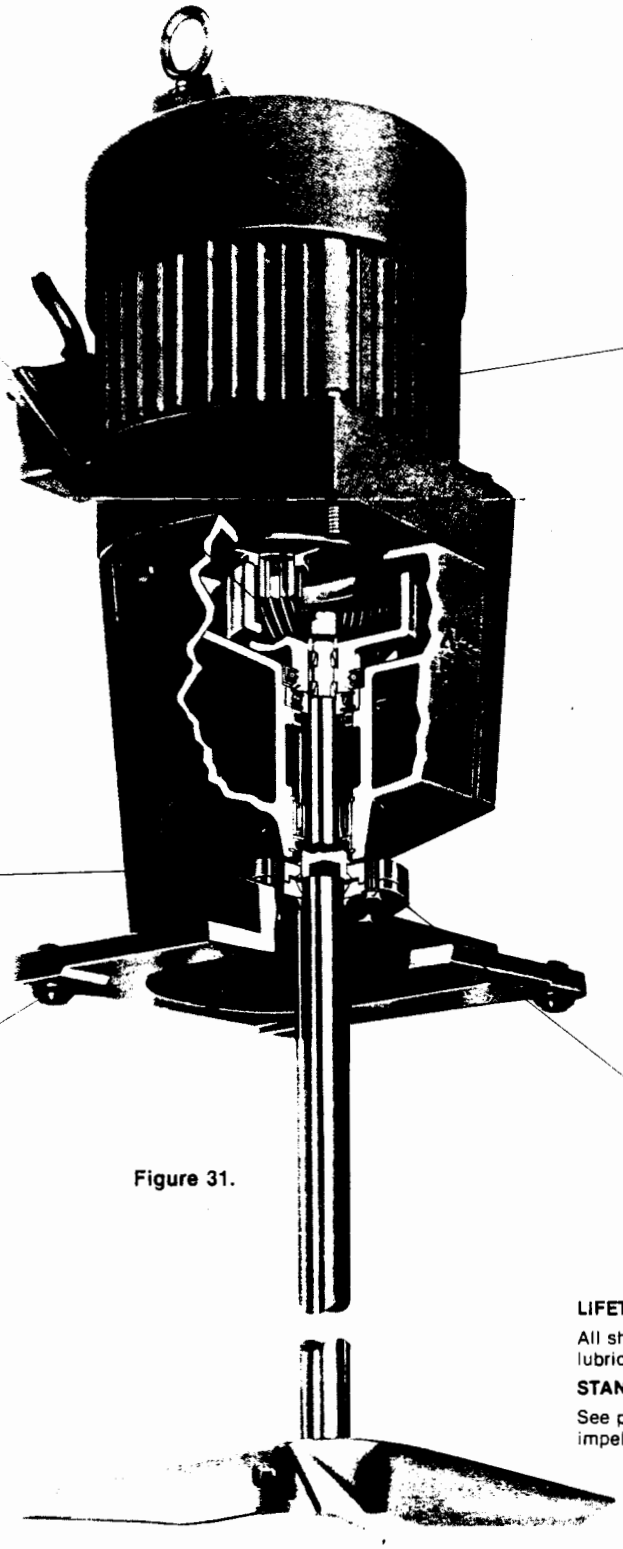


Figure 31.

PROTECTION AGAINST DUST, FUMES AND MOISTURE.

Standard DURA-MIX motor is totally enclosed or explosion-proof. See page 24.

POSITIVE CHUCK.

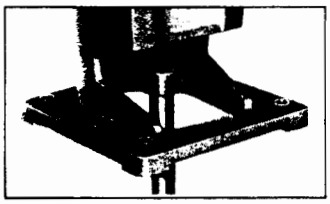


Figure 32.
Same as on clamp mount portables. Exclusive Lightnin reverse tapered flat assures that shaft cannot drop out unless intentionally released.

Rigid coupling. Adds stability for long shafts. Shaft comes with coupling welded on.

LIFETIME LUBRICATED.

All shaft, motor bearings and gears are lifetime lubricated. No need to change lubricant.

STANDARD A310 IMPELLER.

See page 25 for optional special purpose impellers.

Figure 33. In wastewater treatment, direct driven fixed mounts provide rapid chemical dispersion and dissolving, while gear drives with their low shear aid in polymer make-up and flocculation.

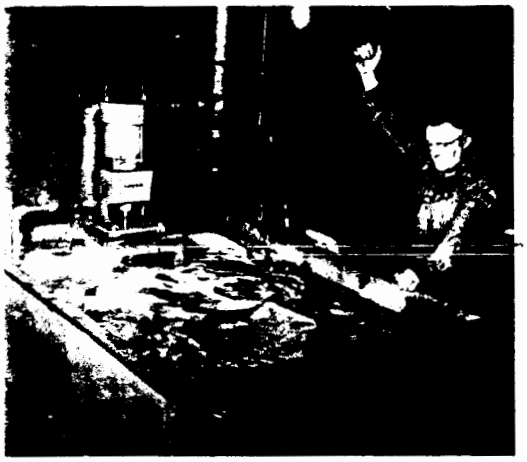


Figure 34. Gear driven fixed mounts deliver high flow for uniform quenching and to aid cleaning of metal parts.

HIGH CAPACITY MIXERS.

For large tanks and continuous processes, fixed mounted mixers provide extra long shafts and the stability of permanent installation.

Gear drives deliver high flow with low shear, and are preferred, for example, in such applications as food processing and milk pasteurization and storage. Direct drives provide high fluid motion and shear for such work as dissolving sugar and dispersing paint pigment.

Fixed mounts offer most of the same features as standard portables, and then some. Because of the wider options, you are invited to call your Lightnin sales engineer early to assure an optimum match of the mixer to the work.

Mixer Housing — Aluminum*

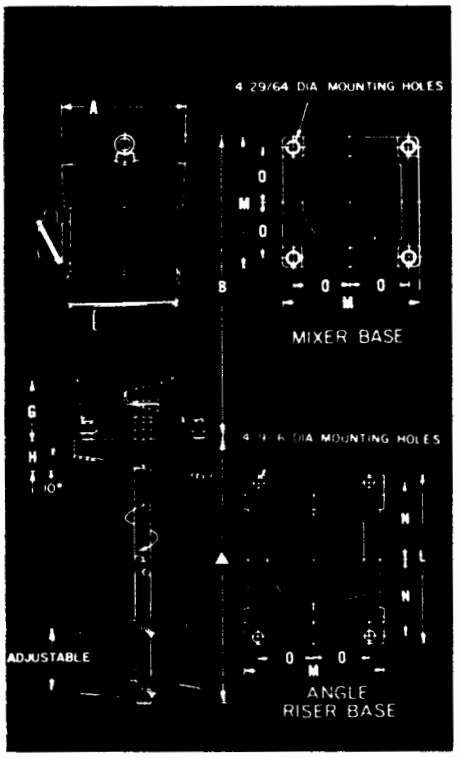
Chuck or Rigid Coupling — Electroless nickel plated steel or Type 316 stainless steel*

Shaft and Impellers — Steel, Type 304 and 316 stainless. Also available in any wrought commercial alloys and with coverings of such materials as rubber, PVC, polymers and fluorocarbons.

Paint — Styrenated alkyd enamel, 400 hours minimum salt spray resistance.

*Other materials available

FIXED MOUNT



HIGH FLOW, GEAR DRIVEN FIXED MOUNTS FOR OPEN TANKS

.30	63	8½	24⅜	6⅛	2¼	12¼	10	5⅜	4	10	4
.43	66	8½	24⅜	6⅛	2¼	12¼	10	5⅜	4	10	4
.65	69	8½	25⅜	6¾	2¼	13¼	11	5⅞	4½	11	4½
.87	83	8½	25⅜	6¾	2¼	13¼	11	5⅞	4½	11	4½
1.17	89	8½	25⅜	6¾	2¼	13¼	11	5⅞	4½	11	4½
1.74	155	10⅞	28⅞	6½	3	16¾	13½	7⅝	5½	13	5½
2.30	204	10⅞	29⅞	6½	3	16¾	13½	7⅝	5½	13	5½
3.50	225	10⅞	30½	6½	3	16¾	13½	7⅝	5½	13	5½

HIGH SHEAR, DIRECT DRIVEN FIXED MOUNTS FOR OPEN TANKS

.30	51	8½	22⅜	6¼	2¼	12¼	10	5⅜	4	10	4
.43	56	8½	22⅜	6¼	2¼	12¼	10	5⅜	4	10	4
.87	60	8½	22⅜	6¼	2¼	12¼	10	5⅜	4	10	4
1.17	70	8½	22⅜	6¼	2¼	12¼	10	5⅜	4	10	4
1.74	135	10⅞	24¾	6½	3	16¾	13½	7⅝	5½	13	5½
2.30	140	10⅞	25¾	6½	3	16¾	13½	7⅝	5½	13	5½
3.50	155	10⅞	26⅜	6½	3	16¾	13½	7⅝	5½	13	5½

▲Length of shaft depends upon the mixer you choose.

All dimensions in inches

Lightnin fixed mounts for closed tanks

XJC & XJDS Series

FIXED MOUNT

LIFETIME LUBRICATED.

All shaft, motor bearings, and gears are lifetime lubricated. No need to change lubricant.

MOTORS AND DRIVES TO MATCH THE WORK.

Drive can be through single reduction helical gears as shown. Or it can be direct. Drive design and motors are the same proven performers used on other fixed mounts and standard portables.

POSITIVE CHUCK.

Grip bears against tapered flat on mixer shaft. Unless intentionally released, shaft cannot drop out.

REMOVABLE COUPLING.

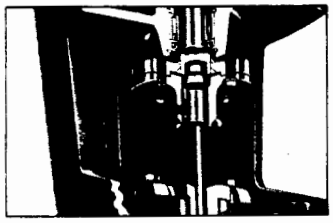


Figure 35.
Adds stability for long overhung shafts. Flange is rabbetted and keyed to assure positive alignment.

STANDARD OR SPECIAL FLANGES.

Standard ASA 150# series flanges are supplied in solid steel or in steel faced with 304 or 316 stainless for corrosion resistance. Other materials and special flanges can be furnished on request to mate with larger openings, or adaptors provided to fit smaller openings.

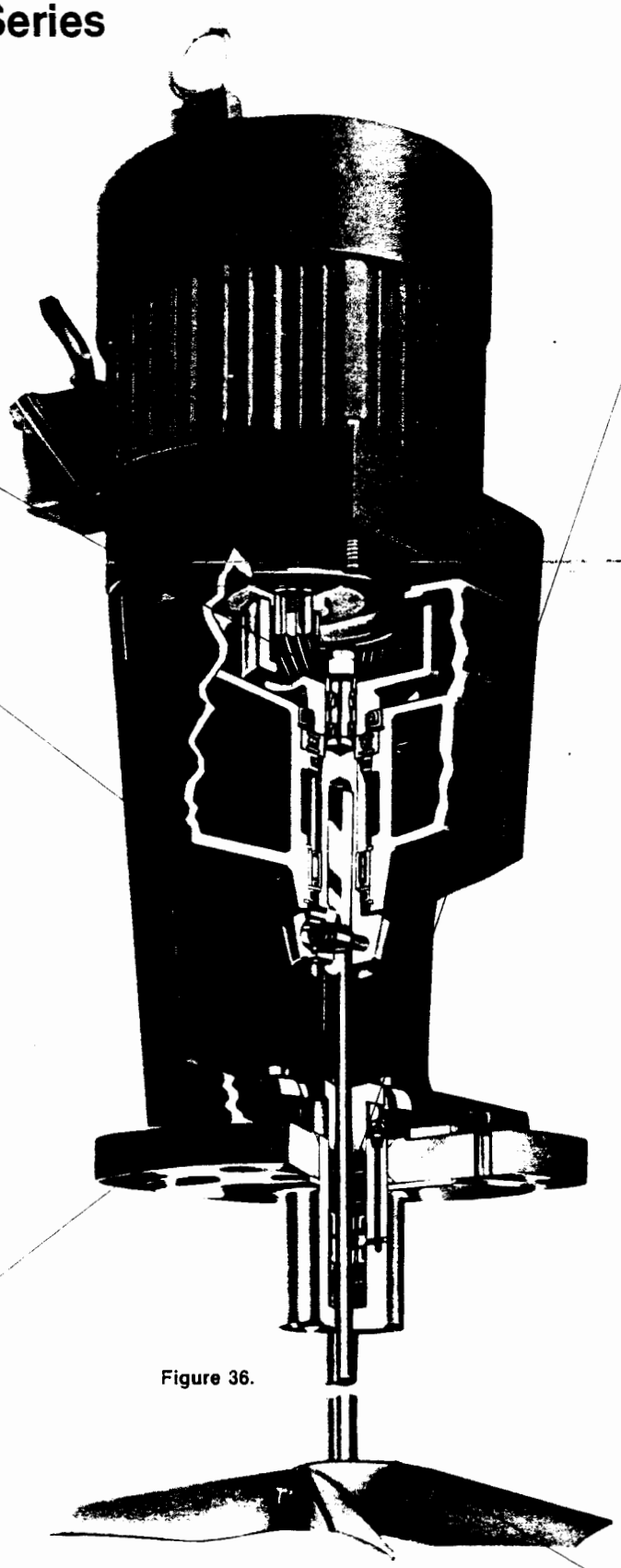


Figure 36.

SEAL OR STUFFING BOXES TO MATCH THE PROCESS.

Standard 150 psig stuffing box. Uses 7 rings of die-molded packing with separators, a lubricant distributing bronze* lantern ring, grease fitting, and adjustable bronze* packing gland. Where needed, we can adapt for pressures to 300 psig. Cooling or heating jacket, lubricant trap and leak detector available as accessories.

*Other materials available to suit process.

OPTIONAL 25 PSIG STUFFING BOX.

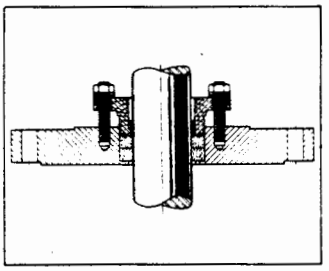


Figure 37.
A simpler design for lower pressures. Uses 2 rings of die-molded packing and a packing gland.

MECHANICAL SEAL.

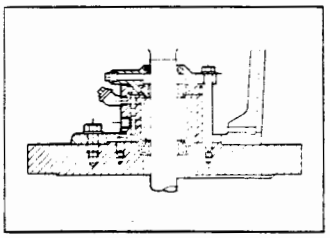


Figure 38.
Provides most positive sealing. Minimizes maintenance.

HIGH EFFICIENCY A310 IMPELLER.

See page 25 for optional, special purpose impellers.

MATCHED TO YOUR TANK.

The tank and the process determine the mixer, and your Lightnin representative has all the ways to match our mixer to your pressurized vessel.

After all, we guarantee process results, so we'll make sure we specify the optimum fixed mount for your tank. Call us early.

HIGH FLOW, GEAR DRIVEN FIXED MOUNTS FOR CLOSED TANKS

Stuffing Box Model	Mechanical Seal Model	HP	Max. Wt. Lbs.	A Max.	B Max.	H	J Std. Mtg. Flange ASA**
XJC30	XJDS30	.30	105	8½	27¾	9½	5
XJC43	XJDS43	.43	120	8½	27¾	9½	5
XJC65	XJDS65	.65	170	8½	28¾	10⅛	6
XJC87	XJDS87	.87	180	8½	28¾	10⅛	6
XJC117	XJDS117	1.17	190	8½	28¾	10⅛	6
XJC174	XJDS174	1.74	215	10⅞	32⅞	10¼	8
XJC230	XJDS230	2.30	225	10⅞	33⅞	10¼	8
XJC350	XJDS350	3.50	235	10⅞	34⅝	10¼	8

HIGH SHEAR, DIRECT DRIVE FIXED MOUNTS FOR CLOSED TANKS

Stuffing Box Model	Mechanical Seal Model	HP	Max. Wt. Lbs.	A Max.	B Max.	H	J Std. Mtg. Flange ASA**
XDC30	XDDS30	.30	102	8½	26	9¾	5
XDC43	XDDS43	.43	120	8½	26	9¾	5
XDC87	XDDS87	.87	130	8½	26	9¾	5
XDC117	XDDS117	1.17	135	8½	26	9¾	5
XDC174	XDDS174	1.74	180	10⅞	28½	10¼	8
XDC230	XDDS230	2.30	186	10⅞	29½	10¼	8
XDC350	XDDS350	3.50	216	10⅞	30¼	10¼	8

▲Length of shaft depends upon the mixer you choose.

**150# flange drilling. Bolt holes straddle centerline. Special flanges available.

All dimensions are in inches

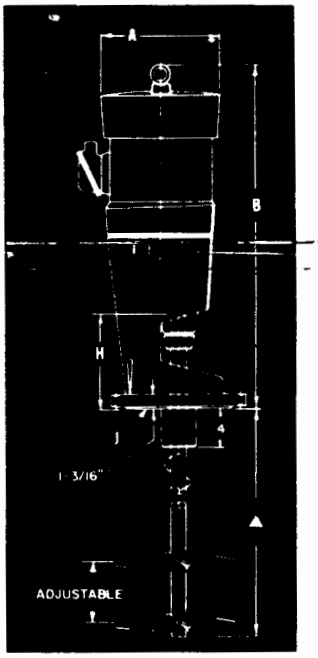
Mixer Housing — Aluminum*

Chuck or Rigid Coupling — Electroless nickel plated steel or Type 316 stainless steel*

Shaft and Impellers — Steel, Type 304 and 316 stainless. Also available in any wrought commercial alloys and with coverings of such materials as rubber, PVC, polymers and fluorocarbons.

Paint — Styrenated alkyd enamel, 400 hours minimum salt spray resistance.

*Other materials available



FIXED MOUNT

Figure 39.
Fixed mounts with stuffing boxes find wide use on the closed tanks of pharmaceutical processing.

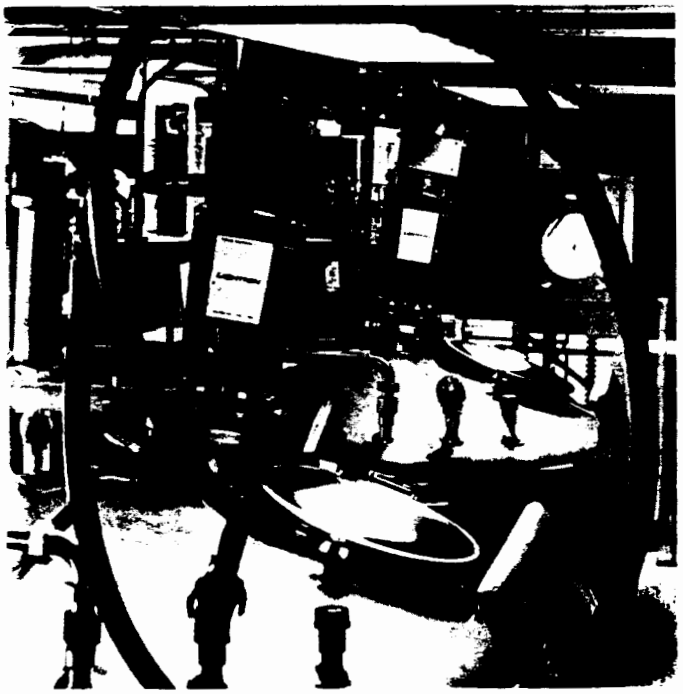
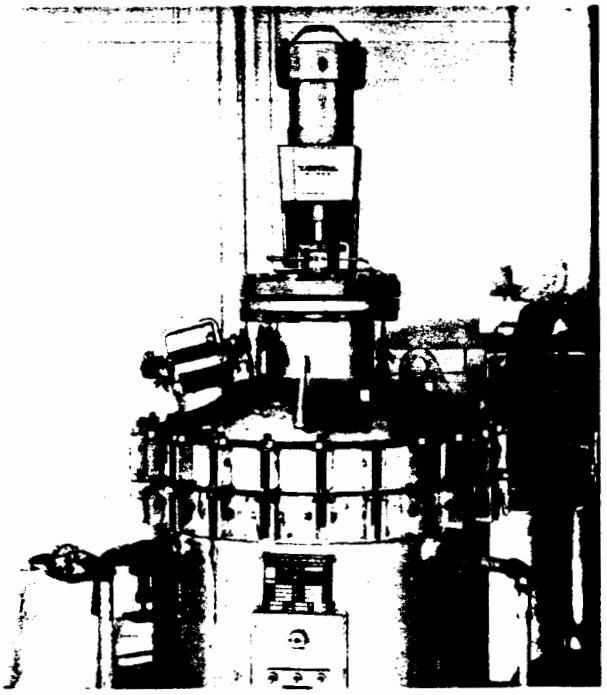


Figure 40.
For gas-liquid contacting, Lightnin fixed-mount, mechanical seal mixers can be adapted for pressures as high as 500 psig.



APPENDIX F

Contract Between the U.S. Department of Energy and the Incorporated County of Los Alamos

AWARD/CONTRACT

1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 C.F.R. 350)

RATING

PAGE OF PAGES: See Block 16

2. CONTRACT (Proc. Inst. Ident.) NO.: DE-AC32-93AL64100

3. EFFECTIVE DATE: DEC 01 1992

4. REQUISITION/PURCHASE REQUEST/PROJECT NO.: 32-93AL64100.000

5. ISSUED BY (CODE):
U.S. Department of Energy
Alamos Area Office
Los Alamos, NM, 87544

6. ADMINISTERED BY (If other than Item 5) (CODE):

7. NAME AND ADDRESS OF CONTRACTOR (No., street, city, county, State and ZIP Code)
Incorporated County of Los Alamos
P.O. Box 30
Los Alamos, New Mexico 87544

CODE | FACILITY CODE

8. DELIVERY: See Section F
☐ FOB ORIGIN ☒ OTHER (See below)

9. DISCOUNT FOR PROMPT PAYMENT

10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN: See Block 12 (ITEM)

11. SHIP TO/MARK FOR (CODE): See Section F

12. PAYMENT WILL BE MADE BY (CODE):
U.S. Department of Energy
Financial Management Division
P.O. Box 5400-Albuquerque, NM, 87115

13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION:
☐ 10 U.S.C. 2304(c)( ) ☒ 41 U.S.C. 253(c)(1)

14. ACCOUNTING AND APPROPRIATION DATA

B&R Code:	Appropration:	Funds Obligated:
CB0103041	89 X 0240	$3,675,395

15A. ITEM NO.	15B. SUPPLIES/SERVICES	15C. QUANTITY	15D. UNIT	15E. UNIT PRICE	15F. AMOUNT
	(See Continuation Pages)				

15G. TOTAL AMOUNT OF CONTRACT ▶ $

16. TABLE OF CONTENTS

(✓)	SEC.	DESCRIPTION	PAGE(S)
		PART I — THE SCHEDULE	
	A	SOLICITATION/CONTRACT FORM	1
	B	SUPPLIES OR SERVICES AND PRICES/COSTS	1–4
	C	DESCRIPTION/SPECS./WORK STATEMENT	4
	D	PACKAGING AND MARKING	4–5
	E	INSPECTION AND ACCEPTANCE	5
	F	DELIVERIES OR PERFORMANCE	5
	G	CONTRACT ADMINISTRATION DATA	6–8
	H	SPECIAL CONTRACT REQUIREMENTS	8–31
		PART II — CONTRACT CLAUSES	
	I	CONTRACT CLAUSES	1–125
		PART III — LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACH.	
	J	LIST OF ATTACHMENTS	1
		PART IV — REPRESENTATIONS AND INSTRUCTIONS	
	K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
	L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
	M	EVALUATION FACTORS FOR AWARD	

CONTRACTING OFFICER WILL COMPLETE ITEM 17 OR 18 AS APPLICABLE

17. ☒ CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return 3 copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.)

18. ☐ AWARD (Contractor is not required to sign this document.) Your offer on Solicitation Number _____ including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your offer, and (b) this award/contract. No further contractual document is necessary.

17A. NAME AND TITLE OF SIGNER (Type or print): ACE F. WALTERS, COUNCIL CHAIRMAN

20A. NAME OF CONTRACTING OFFICER: Jerry L. Bellows, Area Manager, Contract Mgmt. Mgr

17B. NAME OF CONTRACTOR: Walter F. Walters (Signature of person authorized to sign)

19C. DATE SIGNED: 11/24/92

20B. UNITED STATES OF AMERICA BY Jerry L. Bellows (Signature of Contracting Officer)

20C. DATE: 11-

SN 7540-01-152-8069
PREVIOUS EDITION UNUSABLE

26-107

STANDARD FORM
Prescribed by GSA
FAR (48 CFR)

PART I
THE SCHEDULE

SECTION A - AWARD/CONTRACT (STANDARD FORM 26 - COVER)

SECTION B - SUPPLIES OR SERVICES AND PRICES/COSTS

B.01 BACKGROUND AND PURPOSE OF THE CONTRACT

DOE is authorized pursuant to the Department of Energy Organization Act (Public Law 95-91) and other applicable law, including the Atomic Energy Act of 1954, as amended, to provide or otherwise arrange for fire suppression and related facilities and services at project sites where such facilities and services are not available. As permitted by this authority, DOE and the County entered into Contract No. DE-AC04-88AL44118 which was changed in Contract Modification No. M011 to Contract No. DE-AC32-88AL44118. Under Contract No. DE-AC32-88AL44118 the County operated the DOE-owned fire department serving the County of Los Alamos, the DOE's Los Alamos National Laboratory and other property and facilities of DOE, as well as persons and property, within and outside the County.

DOE and the County have now determined that it is to their ıtual benefit for the County to continue operating the ɔOE-owned fire department. The County has the authority to and is willing to perform the services specified in this contract.

Since the transfer of the Atomic Energy Commission-owned community to the County in the 1960's, the Government has made annual assistance payments to the County pursuant to the provisions of the Atomic Energy Community Act of 1955, as amended (Public Law 84-221). During this period, it has been the goal of the Government and the County to work towards making the County self-sufficient. One step in achieving this goal has been a concentrated effort in recent years to obtain Congressional approval for a buy-out in the form of a one-time lump-sum payment which would liquidate all remaining obligations of the Government to the County. Another step toward self-sufficiency was the transfer of responsibility for providing fire suppression and related services to the County by means of DOE Contract No. DE-AC32-88AL44118. This contract represents a further step in that process by requiring the County to begin paying the cost of services for the community.

B.02 ITEMS BEING ACQUIRED

The Contractor shall furnish all personnel, equipment, materials, supplies, and services (except as may be expressly set forth in this contract as furnished by the Government) and otherwise do all things necessary for, or incident to, performing and providing the services in strict accordance with all terms and conditions of this contract.

B.03 ESTIMATED COST

The total net estimated cost for this five-year contract is $39,862,355.00, broken down as follows:

	Estimated Costs	Less: County Share (Fixed)	Plus: Management Allowance (Fixed)	Net Estimated Costs
1st Year	$7,350,790	$ 0	$ 0	$ 7,350,790
2nd Year	7,568,368	0	0	7,568,368
3rd Year	7,895,868	118,800	40,600	7,817,668
4th Year	8,299,374	237,600	81,200	8,142,974
5th Year	8,738,687	356,400	121,800	8,504,087
			Total Net Estimated Costs	$39,383,887

The estimated cost for each year shall not be exceeded without prior Contracting Officer approval. No fee shall be paid to the Contractor under this contract; however, a management allowance as described in Paragraph B.05, Management Allowance, shall be paid to the County.

DOE shall reimburse the Contractor for providing the services described herein to the areas identified in Attachment D, "Los Alamos Fire Department Service Area," and to other areas outside the County to the extent provided for in this Contract. The County shall be responsible for all costs of providing these services to any residential, commercial and industrial areas outside of the Municipal Development Area developed after July 28, 1989.

B.04 COUNTY'S SHARE OF COST

The County agrees to assume the cost of community fire protection based on a formula which multiplies the ratio of the 1988 appraised value of the property in the County to the combined appraised value of County and Laboratory property by Contract No. DE-AC32-88AL44118 price as of July 18, 1989,

which was $5,669,692. Based upon this formula the County shall contribute $594,000 annually toward Fire Department operations. This annual amount shall remain fixed at this level unless modified at the request of one of the parties upon agreement that this amount is no longer fair and reasonable.

The County will begin paying a portion of its share of the Fire Department costs as described above beginning the third year of this contract. The County shall phase such payment over a five-year period. The County shall pay 20 percent of $594,000 the third year of the Contract for its full share; 40 percent the fourth year of the Contract; and 60 percent the fifth year of the Contract. If the parties enter into a follow-on contract following the expiration of this Contract, or if this Contract is extended, the County shall continue to phase in payment in 20 percent increments; that is 80 and 100 percent in the next two years respectively. The County's annual share of Fire Department costs shall be deposited in the Special Bank account in twelve monthly installments on the first work day of each month.

B.05 MANAGEMENT ALLOWANCE

In addition to the costs and expenses reimbursed under the Contract Clause entitled "Allowable Cost and Payment," the County shall be given a management allowance, subject to Paragraph B.04 above, of $203,000 annually. This figure represents four percent of one year of operation under Contract No. DE-AC32-88AL44118 as of July 18, 1989, less the County's share of operating costs. This figure shall remain fixed unless the figure given in Paragraph B.04 above, representing the County's full share of Fire Department costs, is changed. DOE reserves the right, however, to request that the County reduce this figure by an amount equal to any savings or additional revenues that DOE may achieve in the County's operation by other means. The County reserves the right to refuse such a request if it does not appear to be in the County's best interest. Payment of the management allowance described in this Paragraph shall be phased in beginning the third year of this contract in 20 percent increments over a five-year period in the same manner in which the County's payment of its share of Fire Department costs is phased in as described in Paragraph B.04 above. DOE shall pay the annual management allowance to the County in twelve equal

monthly installments at the end of each month; provided, however, that in the event of termination or expiration, the final installment shall be retained pending compliance with subparagraph (e) of Paragraph H.16, Advance Payments.

B.06 LIMITATION OF FUNDS

Pursuant to the Contract Clause entitled, "Limitation of Funds," total funds in the amount of $3,675,395 have been allotted for obligation for the first six months with funds obligated every six months thereafter with the issuance of a unilateral modification to this contract. The funds allotted for obligation are available for payment of all allowable costs to be incurred for this contract.

B.07 WORK SCHEDULE

Work schedules will be established to meet the requirements and intent of Section 7(k) of the Fair Labor Standards Act (29 USCA. Section 207[k]) for shift firefighter personnel and a 40 hour-per-week work schedule for all other Fire Department personnel.

SECTION C - DESCRIPTION/SPECIFICATION/WORK STATEMENT

C.01 STATEMENT OF WORK

The Statement of Work is Attachment A to this contract.

C.02 REPORTS

Reports and deliverables shall be submitted by the Contractor in accordance with the provisions of this contract. See Attachment J for listing. This listing may not be inclusive of all the reporting requirements of this contract and the absence of a particular requirement herein does not waive the Contractors responsibility to provide it in the manner and at the time required elsewhere in this contract.

SECTION D - PACKAGING AND MARKING

D.01 PACKAGING

Preservation, packaging, and packing for shipment or mailing of all work deliverable hereunder shall be in accordance with good commercial practice and adequate to insure acceptance by common carrier and safe transportation at the most economical rates.

D.02 MARKING

(a) Each package, report or other deliverable shall be accompanied by a letter or other document which:

(1) Identifies the contract by number under which the item is being delivered.

(2) Identifies the deliverable Item Number or Report Requirement which requires the delivered item(s).

(3) Indicates whether the Contractor considers the delivered item to be a partial or full satisfaction of the requirement.

(b) For any package, report or other deliverable being delivered to a party other than the Contracting Officer, a copy of the document required in (a) above shall be simultaneously provided to the office administering the contract, as identified in Section G of the contract, or if none, to the Contracting Officer.

SECTION E - INSPECTION AND ACCEPTANCE

E.01 INSPECTION

Requirements for inspection are established in FAR Clause 52.246-5 under the Contract Clauses of this contract. Inspection of all items under this contract shall be accomplished by the DOE Technical Representative, or any other duly authorized Government representative of the Contracting Officer.

E.02 ACCEPTANCE

Any acceptance or approval of services under this contract (including reporting requirements) shall be accomplished by the Contracting Officer.

SECTION F - DELIVERIES OR PERFORMANCE

F.01 PERIOD OF PERFORMANCE

This contract shall commence on the effective date of the contract and shall be for a period of five (5) years unless sooner terminated as provided in the article entitled "TERMINATION."

SECTION G - CONTRACT ADMINISTRATION DATA

G.01 CORRESPONDENCE PROCEDURE

(a) To promote timely and effective administration, correspondence, including invoices and reports required by the contract to be submitted to the Government, shall be sent to the Contracting Officer.

U. S. Department of Energy
Los Alamos Area Office
528 35th Street
Los Alamos, NM 87544

(b) All correspondence, including approvals, from the Government to the Contractor shall be sent to the Contract Administrator at the address set forth below:

Contract Administrator
County Administrator
Incorporated County of Los Alamos
P. O. Box 30
Los Alamos, NM 87544

G.02 GOVERNMENT CONTACT FOR POST AWARD ADMINISTRATION

The Contractor shall use the Contracting Officer as the focal point for all matters regarding this contract except as otherwise provided by the Contracting Officer in writing. The Los Alamos Area Office (LAAO) is the contract administration office.

G.03 BILLING INSTRUCTIONS

In connection with the Contract Clause entitled "Allowable Cost and Payment" and Paragraph H.16, Advance Payments, and in order to support the amounts withdrawn from the Special Bank Account, the Contractor shall submit invoices to the Contracting Officer on a monthly basis. Such invoices shall be prepared in compliance with the Billing Instructions set forth in Attachment H of the contract and such other directions as may be provided by the Contracting Officer.

G.04 ANNUAL INDIRECT COST RATE SUBMISSION

(a) In accordance with the contract clause entitled "Allowable Cost and Payment", the Contractor, as soon as possible but not later than one hundred eighty (180) days after the expiration of its fiscal year, shall submit to the indirect cost rate Cognizant Contracting Officer (CCO), identified in paragraph (e) of this clause, a proposed final indirect rate or rates for that period based on the Contractor's actual cost experience during that period, together with supporting data or calculations.

(b) Allowability of costs and acceptability of cost allocation methods shall be determined in accordance with the cost principles in effect as of the date of this contract.

(c) The settlement of final indirect cost rates and indirect costs shall be accomplished prior to the Contracting Officer's approval of the final payment.

(d) Pending settlement of final indirect cost rates for any period, the Contractor shall be reimbursed for indirect rates at billing rates acceptable to the CCO. These billing rates are subject to appropriate adjustments when the final indirect cost rates are settled. The Contractor shall provide to the CCO annually, within 180 days after the expiration of its fiscal year, a billing rate proposal, together with supporting data. If billing rates change substantially at any time during the contract performance period, the Contractor shall notify the CCO in writing. Upon review of the annual billing rate proposal, or any notification of substantial rate change during the contract performance period, the CCO may adjust the approved billing rate. In the event that adjustment is to be applied retroactively, the Contractor shall make appropriate adjustments on its next voucher.

(e) The indirect cost rate CCO and address is as follows:

Herman Smith
U. S. Department of Energy
Albuquerque Operations Office
Financial Management Division
P. O. Box 5400
Albuquerque, New Mexico 87115
Telephone No. (505) 845-4107

The Contractor shall use the CCO as the point of contact for indirect cost rate matters as defined by the contract clause entitled "Allowable Cost and Payment."

(f) The billing rate for indirect costs for the first year of operation will be established as a provisional billing rate of 15% to be applied to salaries and benefits. If, during the period of performance of this contract, provisional rates have not been established for a subsequent period, via a contract modification, then the Contractor shall continue to bill those rates most recently approved by the Contracting Officer, or at lower rates until such time as the contract is modified to reflect the most current approved rates.

SECTION H - SPECIAL CONTRACT REQUIREMENTS

H.01 ADDITIONAL DEFINITIONS

With reference to the Contract Clause entitled "Definitions," and as used in the Statement of Work listed below are definitions which apply to the Contract;

(a) The term "University" means the Regents of the University of California which manages and operates the Los Alamos National Laboratory under DOE Contract No. W-7405-ENG-36.

(b) The terms "Laboratory" or "LANL" mean the Department of Energy owned Los Alamos National Laboratory located in Los Alamos, New Mexico.

(c) The term "County" and "Contractor" are used interchangeably and mean the Incorporated County of Los Alamos.

Interpretation of the terms and conditions of this Agreement shall be made in accordance with the definitions of the most recently published edition of the National Fire Protection Association (NFPA) standards unless such definitions are contrary to the express terms and conditions of this Agreement.

H.02 UNCLASSIFIED CONTROLLED NUCLEAR INFORMATION

(a) Definition. Unclassified Controlled Nuclear Information (UCNI) is defined as, and limited to, sensitive but unclassified Atomic Energy Defense Program information concerning design, production,

utilization, and safeguards of nuclear weapons or material. (See Title 10, Code of Federal Regulations (CFR) Part 1017, for complete details.) Official procedures for access to, and protection and transmission of UCNI are given below.

(b) Legend. Documents originated by the Contractor or furnished by the Government or the University to the Contractor in connection with this contract may contain UCNI as defined in Section 148 of the Atomic Energy Act of 1954, as amended. The following legend will be stamped or typed on the cover of such documents:

UNCLASSIFIED CONTROLLED NUCLEAR INFORMATION
NOT FOR PUBLIC DISSEMINATION

Unauthorized dissemination subject to civil and criminal sanctions under Section 148 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2168).

The Contractor shall be responsible for protecting such information from unauthorized dissemination in accordance with DOE regulations, requirements, and instructions.

(c) Access. UCNI may only be made available to authorized individuals, which, for purposes of this contract, means only to U. S. citizens who have a need to know in the performance of official duties or DOE authorized activities and who are employees of the Government, employees of a Government contractor or subcontractor, or employees of a prospective Government contractor or subcontractor for the purpose of bidding on a Government contract.

(d) Protection of UCNI. All parties shall be obliged under penalty of law to protect such information as required by 10 CFR 1017.17, such responsibility including, but not limited to, the following:

(1) General. UCNI required protection from unauthorized dissemination. UCNI must be protected and controlled in a manner consistent with that customarily accorded other types of unclassified but sensitive information (e.g.,

proprietary business information, personnel or medical records of employees, attorney-client information). The Contractor shall establish and maintain a system for the protection of UCNI in its possession or under its control that is consistent with the physical protection standards established in this section. Each Authorized Individual or person granted special access to UCNI who receives, acquires, or produces an UCNI or a document or material containing UCNI shall take reasonable and prudent steps to ensure that it is protected from unauthorized dissemination.

(2) Protection in Use or Storage. An Authorized Individual or a person granted special access to UCNI shall maintain physical control over any document or materials containing an UCNI notice that is in use so as to prevent unauthorized access to it. When any document or material containing an UCNI notice is not in use, it must be stored in a secure container (e.g., locked desk or file cabinet) or in a location where access is limited (e.g., locked or guarded office, controlled access facility).

(3) Reproduction. A document or material containing an UCNI notice may be reproduced to the minimum extent necessary consistent with the need to carry out official duties without permission of the originator provided the reproduced document or material is marked and protected in the same manner as the original document or material.

(4) Destruction. A document or material containing an UCNI notice may be disposed of by any method which assures sufficiently complete destruction to prevent its retrieval (providing the disposal is authorized by the Archivist of the United States under 41 CFR 101-11.4 and by agency records disposition schedules).

(5) Transmission.

(i) A document or material containing an UCNI notice must be packaged to prevent disclosure of the presence of UCNI when transmitted by a means which could allow access to the document or material by a person who is not an Authorized Individual or a person granted special access to UCNI. The address and return address must be indicated on the outside of the package.

(ii) A document or material containing an UCNI notice may be transmitted by:

A. U. S. first class, express, certified, or registered mail;

B. Any means approved for the transmission of classified documents or material;

C. An Authorized Individual or a person granted special access to UCNI when he or she can control access to the document or material being transmitted; or

D. Any other means determined by the DOE Assistant Secretary for Defense Programs to be sufficiently secure.

(iii) UCNI may be discussed or transmitted over an unprotected telephone or telecommunications circuit when required by operational considerations. More secure means of communication should be utilized whenever possible.

(6) Automated Data Processing (ADP). UCNI may be processed or produced on any ADP system which is certified for classified information which complies with the guidelines of Office of Management and Budget Circular No. A-130, "Management of Federal Information Resources," or which has been approved for such use in accordance with the provisions of applicable DOE directives.

(e) Penalties. Any person who violates Section 148 of the Atomic Energy Act or any regulation or order of the Head of Agency issued under Section 148 of the Atomic Energy Act, including the requirements of this Paragraph H.02, may be subject to a civil penalty; and may also be subject to a criminal penalty under Section 223 of the Atomic Energy Act of 1954, as amended. The DOE Assistant Secretary for Defense Programs may recommend to the Head of the Agency imposition of this civil penalty which shall not exceed $100,000 for each violation.

H.03 CONFIDENTIALITY OF INFORMATION

(a) To the extent that the work under this contract requires that the Contractor be given access to confidential or proprietary business, technical, or financial information belonging to the Government or other companies, the Contractor shall after receipt thereof, treat such information as confidential and agrees not to appropriate such information to its own use or to disclose such information to third parties unless specifically authorized by the Contracting Officer in writing. The foregoing obligations, however, shall not apply to:

(1) Information which, at the time of receipt by the Contractor, is in the public domain;

(2) Information which is published by others after receipt thereof by the Contractor or otherwise becomes part of the public domain through no fault of the Contractor;

(3) Information which the Contractor can demonstrate was in its possession at the time of receipt thereof and was not acquired directly or indirectly from the Government or other companies pursuant to this contract;

(4) Information which the Contractor can demonstrate was received by it from a third party who did not require the Contractor to hold it in confidence.

(b) The Contractor shall obtain the written agreement, in a form satisfactory to the Contracting Officer, of each employee permitted access, whereby the employee agrees that he or she will not discuss, divulge or disclose any such information or data to any person or entity except those persons within the Contractor's organization directly concerned with the performance of the Contract.

(c) The Contractor agrees, if requested by the Government, to sign an agreement identical, in all material respects, to the provisions of this Para. H.03, with each company supplying information to the Contractor under this contract, and to supply a copy of such agreement to the Contracting Officer. From time to time upon request of the Contracting Officer, the Contractor shall supply the Government with reports itemizing information received as confidential or proprietary and setting forth the company or companies from which the Contractor received such information.

(d) The Contractor agrees that upon request by the Contracting Officer it will execute a DOE approved agreement with any party whose facilities or proprietary data it is given access to or is furnished, restricting use and disclosure of the data or the information obtained from the facilities. Upon request by the Contracting Officer, such an agreement shall also be signed by Contractor personnel.

H.04 REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS

The Representations, Certifications and Other Statements of Offeror, submitted by the Contractor and that apply to this contract, are incorporated here by reference.

H.05 MODIFICATION AUTHORITY

Notwithstanding any of the other provisions of this contract, the Contracting Officer shall be the only individual authorized to:

(a) waive any requirement of this contract, or
(b) modify any term or condition of this contract.

H.06 GOVERNMENT-FURNISHED PROPERTY AND SERVICES

This Paragraph H.06 supplements the Contract Clause entitled, "Government Property (Cost-Reimbursement, Time-and-Material, or Labor-Hour Contracts)."

(a) General. Unless the Contracting Officer and the Contractor agree otherwise, DOE shall furnish, without cost to the Contractor, the property and services listed below subject to procedures prescribed by the Contracting Officer for the performance of this contract. In providing these services, the DOE may use any source available at the LANL. These sources may include the University of California, including any of its sub-contractors, or other sources as DOE may deem appropriate.

(b) Property.

(1) Equipment and Vehicles. The equipment and vehicles described in Attachment B.

(2) Facilities. The facilities described in Attachment C. No alterations to the facilities shall be made without specific written permission from the Contracting Officer; however, such permission shall not be unreasonably withheld.

(3) Supplies. Supplies, parts and materials which are on hand at the termination of Contract No. DE-AC32-88AL44118 shall be furnished to the Contractor and shall be accounted for and included in the Contractor's Property Management System.

(c) Services

(1) Utilities. Gas, electricity, water, steam and sewage.

(2) Telephone Service. Telephone services for local toll and long distance calls with access to the Federal Telephone System. Use of telephone services shall be in accordance with DOE Order 1450.3 dated May 26, 1988.

(3) Central Alarm Center. The computer based alarm system established at the Laboratory will operate as it currently exists, and responsibility for this system will remain with the University. The University through the Government's Central Alarm Station/Central Guard Facility shall notify the Contractor of all alarms and requests for service. Such notification shall include all available information for the Contractor to formulate the required response and tactics.

(4) Maintenance and Repair Services (Vehicles and Facilities). Services for repair and maintenance services for vehicles and facilities in order to keep them in a functional state of repair can be provided by the DOE, its contractors or subcontractors providing these services at the LANL to the extent that they are available.

(5) Health, Safety, and Environmental Services.

(i) Occupational Medicine: Pre-employment and annual physical examinations, as specified by NFPA, DOT, and substance abuse testing for Contractor Fire Department personnel as authorized by the Contracting Officer.

(ii) Emergency Response Training (including hazardous materials) and specific orientation and training on LANL facilities will be provided to Contractor for responses to fire suppression, emergency medical and rescue services.

(iii) Ionizing Radiation: Radiation monitoring services to Contractor fire suppression, emergency medical and rescue services personnel that include dosimetry, bioassay sampling, invivo counting, monitoring and instrumentation. DOE will evaluate the results and provide reports to the Contractor. The Contractor shall administer the issuance and collection of instruments, dosimetry devices, and samples and shall request and schedule services for its employees.

(6) Training. The Contractor may use DOE-owned facilities for training to meet requirements of the contract and is authorized to attend government-sponsored training programs and services.

(7) Communications. Access to the LANL trunk radio system and use of communications equipment is authorized by DOE. In addition, radios on the MEDNET public safety band are assigned to ambulances. In addition, the Contractor may also use the services of the Central Alarm Center, TA-64-1, to handle radio communications for the Fire Department's dispatch function.

(8) Instrumentation. Maintenance and repair services for Government radios and associated equipment and radiation detectors assigned to the Contractor for the performance of this contract.

(9) Security/Protective Services. Necessary Security and Protective services.

(10) Locksmith Services. Locksmith services including locks, lock cores, and keys.

(11) Supplies, Materials and Services Sources. The Contractor will use established sources available to DOE at Los Alamos. These sources include but are not limited to General Services Administration and the Los Alamos National Laboratory (LANL) warehouses to obtain supplies and materials if these sources are determined the most economical to meet the need. Additionally, the Contractor should also request Government rates for travel, lodging, etc., when possible.

H.07 INSURANCE REQUIREMENTS

In accordance with the Contract Clause entitled "Insurance - Liability to Third Persons," the following kinds and minimum amounts of insurance are required during the performance of this contract:

(a) Worker's Compensation and Employer's Liability Insurance:

(1) The amount required by the State of New Mexico under applicable Worker's Compensation and occupational disease statutes.

(2) Employer's liability insurance in the amount of $100,000.

(b) General Liability Insurance: Bodily injury liability coverage written on the comprehensive form of policy of at least $500,000 per occurrence.

(c) Automobile Liability Insurance: Coverage shall be on the comprehensive form of policy. It shall provide for bodily injury and property damage liability covering the operation of all automobiles used in connection with performing the contract. Policies covering automobiles operated in the United States shall provide coverage of at least $200,000 per person and $500,000 per occurrence for bodily injury and $20,000 per occurrence for property damage.

(d) The amount of liability coverage on other policies shall be commensurate with any legal requirements of the locality and sufficient to meet normal and customary claims.

H.08 LIMITATION OF LIABILITY

Notwithstanding anything to the contrary in the Contract Clause entitled "Insurance-Liability to Third Persons" or any other clause of this contract, no provision of this contract waives any of the sovereign immunity or statutory limitation of liability of the State of New Mexico or any of its political subdivisions, governmental entities, or public employees which is applicable to the Contractor.

H.09 PERSONNEL SECURITY "Q" CLEARANCES

All County personnel who are assigned to or oversee the Fire Department and who require a DOE "Q" clearance to perform their contract functions will be required to hold an active DOE "Q" clearance. The Government will conduct and assume all

cost and responsibility for background investigations for "Q" clearances. However, the Contractor shall be responsible for all pre-employment checks necessary to determine an individual's suitability for employment prior to requesting the Government to perform a background investigation on the individual for the purpose of obtaining a "Q" clearance.

H.10 COST PRINCIPLES FOR STATE AND LOCAL GOVERNMENTS

The contractor shall be subject to OMB Circular A-87 , Cost Principles for State and Local Governments. Should OMB Circular A-87 as it exists on the effective date of this contract be amended to impose upon contractors the requirements of the Civilian Employee and Contractor Travel Expenses Act of 1985, Public Law 99-234, the Contractor shall thereafter be required to comply with such amended provisions of OMB Circular A-87 for the remainder of the contract performance period.

H.11 AUDITS OF STATE AND LOCAL GOVERNMENTS

The Contractor shall be subject to OMB Circular A-128, Audits of State and Local Governments

H.12 SUBCONTRACTING PLAN

In accordance with the provision set forth in the clause entitled "Small Business and Small Disadvantaged Business Subcontracting Plan," the Contractor's Subcontracting Plan is attached hereto as Attachment F to the contract and is hereby made a part of this contract.

H.13 CONTRACT REPRESENTATIVES

(a) Department of Energy (DOE)

(1) The Contracting Officer may designate for the contract, a Contracting Officer Representative (COR) who shall be identified to the Contractor in writing by the Contracting Officer. The limitation on the authority of the COR to act for the Contracting Officer shall be set forth in writing and a copy provided to the Contractor.

(2) The Contracting Officer may designate a Technical Representative for this contract who may be an employee of the University of California. Such individual's name shall be identified, in writing, by the Contracting Officer. The duties of the Technical Representative shall be to monitor the contract performance by the Contractor for technical compliance with the terms of the contract and to provide technical advice to the Contracting Officer. The following duties will be performed by the Technical Representative:

(i) <u>Assist with Technical Matters</u>

A. Monitor compliance of Contractor with technical requirements of Contract.

B. Inform the Contracting Officer in writing of any performance failure.

C. In conjunction with the contract requirements establish a tracking system to assist the Government with meeting its Contract obligations. This includes, but is not limited to Government-furnished property and services and timely Government comment on deliverables required by the Contract.

D. Assist the Contractor in interpreting technical requirements of the Contract. All technical questions which cannot be resolved without increasing costs or requiring changes to the Contract shall be reported in writing to the Contracting Officer for immediate resolution. Such reports should contain the facts and recommendations pertinent to the questions at issue.

E. Recommend to the Contracting Officer technical changes required to meet minimum DOE Orders requirements for fire suppression, emergency and rescue services at LANL.

(ii) Monitor the Administrative and Funds Aspects.

A. Notify the Contracting Officer immediately, in writing of any indication that the cost to the Government, for completing performance under the Contract, will exceed the amount stated in the Contract.

B. Report any indication that costs are being incurred which are not appropriately chargeable to the Contract.

(iii) Property Management

Review and make recommendations on the Contractor's request for Government-furnished facilities, supplies materials, and equipment and forward the request to the Contracting Officer for disposition.

(iv) Assist in Closeout of the Contract

Upon expiration or termination of the contract, forward to the Contracting Officer a written statement attesting to the acceptability of the Contractor's technical performance and attesting to the completion of certain elements of the contract work including, but not limited to, submittals, reports, and other deliverables required by the contract.

(3) DOE and the Contractor understand and agree that all activities designated to be performed by the Technical Representative or other employees or agents of the University of California pursuant to this contract are performed for DOE under and pursuant to Contract No. W-7405-ENG-36 between the University and DOE.

(b) County of Los Alamos (County)

The County shall designate, in writing, a full time Contract Manager and an alternate who shall be responsible for the administration of this contract. The Contract Manager shall be authorized and responsible to make and implement decisions within the scope of the contract and authorized to represent the County at meetings on Contract matters.

H.14 PAYMENT FOR OVERTIME PREMIUMS

(a) DOE is in the process of seeking from the Secretary of the United States Department of Labor a waiver for this contract from the requirement of the Contract Work Hours and Safety Standards Act to pay one and one-half times the basic rate of pay for all hours worked in excess of forty hours per week. The requirements of the clause entitled "Contract Work Hours and Safety Standards Act--Overtime Compensation" will not be effective until such time as the Secretary of Labor makes a determination on the request for waiver and then only in the event that the request for waiver is denied. In the event the request for waiver is denied, the clause will be effective retroactively on the effective date of this contract. The Contractor will be notified by letter of the Secretary of Labor's determination as soon as DOE receives it. Upon receipt of notice that the referenced clause is applicable, the Contractor shall submit a cost proposal for any necessary contract price adjustment necessary to cover retroactive and prospective costs of the application of the clause.

(b) The use of overtime for hours worked in excess of the work schedules established pursuant to Paragraph B.07, Work Schedules, is authorized under this contract if the overtime premium does not exceed the amount established by the budget submitted by the Contractor and approved by the Contracting Officer as required by the Statement of Work, Part III, Attachment A, Paragraph IIIA, or the overtime premium is paid for work:

(1) Necessary to cope with emergencies such as those resulting from accidents or natural disasters;

(2) By indirect-labor employees such as those performing duties in connection with administration, protection, transportation, maintenance, standby plant protection, operation of utilities, or accounting; or

(3) That will result in lower overall costs to the Government. However, continued use of overtime to replace or supplement full-time personnel will not be allowed.

(c) Each incident requiring the payment of overtime premiums in excess of the standard work week shall be documented and such documentation shall contain the following information with copies provided to the Contracting Officer:

(1) The identity of the work unit (e.g., department or section in which the requested overtime was used),

together with present work load, staffing, and other data of the affected unit sufficient to permit the Contracting Officer to evaluate the necessity for the overtime; and

(2) An explanation of the effect that denial of the overtime would have had on contract performance.

(3) Documentation explaining how Contracting Officer approval was obtained, where appropriate.

H.15 PRIVACY ACT SYSTEMS OF RECORDS

Reference is made to the Contract Clauses entitled "Privacy Act Notification" and "Privacy Act." The Contractor will be required to operate the following system of records under this contract: Personnel Radiation Exposure Records (System No.DOE-35).

H.16 ADVANCE PAYMENTS

(a) Payments from Funds Available Under the Contract. Within the total funds obligated under this contract the Government, from time to time, shall advance funds necessary for performance of this contract. The payment for allowable costs and indirect costs, or for other payments which the Contracting Officer has specifically approved in writing, shall be made from funds advanced by the Government or otherwise available under the contract. The Contractor shall submit a separate voucher for each installment of indirect costs thirty (30) days after the end of the month covered by the voucher, and shall pay such installment of the indirect cost out of funds advanced by the Government or otherwise available under this contract.

(b) Special Bank Accounts - Use. All advances of Government funds shall be withdrawn pursuant to a Letter of Credit in favor of a bank qualified as a depository for federal monies or, at the option of the Government, shall be made by check payable to the Contractor, and shall be deposited only in the Special Bank Account established by a Special Bank Account Agreement for Use With the Checks-Paid Method of Letter of Credit Financing in the form and containing the provisions set forth in Attachment G of this contract. The Contractor shall likewise deposit in the Special Bank Account any revenues received by the Contractor in connection with the work under this contract. No part of the funds in the Special Bank Account shall be (1) mingled with any funds of the Contractor or (2) used for a purpose other than that of making payments for the management allowance and for costs allowable under this contract or payments for other items specifically

approved in writing by the Contracting Officer and the Contractor's indirect costs as provided for elsewhere in this contract. If the Contracting Officer shall at any time determine that the balance on such bank account exceeds the Contractor's current needs, the Contractor shall promptly make such disposition of the excess as the Contracting Officer may direct.

(c) Title to Funds Advanced. Title to the unexpended balance of any funds advanced and of any bank account established pursuant to this Paragraph H.16 shall remain in the Government and be superior to any claim or lien of the bank of deposit or others. It is understood that an advance to the Contractor hereunder is not a loan to the Contractor, and will not require the payment of interest by the Contractor, and that the Contractor acquires no right, title or interest in or to such advance other than the right to make expenditures therefrom, as provided in this Paragraph H.16.

(d) Review and Approval of Costs Incurred. The Contractor shall prepare and submit monthly (30 days after the end of the report month) a voucher for the total of net expenditures accrued (i.e., net costs incurred) for the period covered by the voucher, and DOE, after audit and appropriate adjustment, will approve such voucher. This approval by DOE will constitute an acknowledgment by DOE that the net costs incurred are allowable under the contract and that they have been recorded in the accounts maintained by the Contractor in accordance with DOE accounting policies, but will not relieve the Contractor of responsibility for DOE's assets in its care, for appropriate subsequent adjustments, or for errors later becoming known to DOE.

(e) Financial Settlement. The Government shall promptly pay to the Contractor the unpaid balance of allowable costs, indirect costs, and the final installment of the management allowance as provided for in Paragraph B.05, Management Allowance, upon expiration of the term of the contract, or completion of the work and its acceptance by the Government after (1) compliance by the Contractor with DOE's patent clearance requirements, and (2) the furnishing by the Contractor of:

(i) an assignment of the Contractor's rights to any refunds, rebates, allowances, accounts receivable, or other credits applicable to allowable costs under the contract;

(ii) a closing financial statement;

(iii) the accounting for Government-owned property required by the Contract Clause entitled "Government Property (Cost-Reimbursement, Time-and-Material or Labor-Hour Contracts)"; and

(iv) a release discharging the Government, its officers, agents, and employees from all liabilities, obligations, and claims arising out of or under this contract subject only to the following exceptions:

(A) specified claims in stated amounts or in estimated amounts where the amounts are not susceptible to exact statement by the Contractor.

(B) claims, together with reasonable expenses incidental thereto, based upon liabilities of the Contractor to third parties arising out of the performance of this contract; provided that such claims are not known to the Contractor on the date of the execution of the release; and provided further that the Contractor gives notice of such claims in writing to the Contracting Officer not more than six years after the date of the release or the date of any notice to the Contractor that the Government is prepared to make final payment, whichever is earlier; and

(C) Claims for reimbursement of costs (other than expenses of the Contractor by reason of any indemnification of the Government against patent liability), including reasonable expenses incidental thereto, incurred by the Contractor under the provisions of this contract relating to patents. In arriving at the amount due the Contractor under this Paragraph H.16, there shall be deducted any claim which the Government may have against the Contractor in connection with this contract, and deductions due under the terms of this contract, and not otherwise recovered by or credited to the Government. The unliquidated balance of the Special Bank Account may be applied to the amount due and any balance shall be returned to the Government forthwith.

(f) Claims. Claims for credit against funds advanced or for payment shall be accompanied by such supporting documents and justifications as the Contracting Officer shall prescribe.

(g) Discounts. The Contractor shall take and afford the Government the advantage of all known and available cash and trade discounts, rebates, allowances, credits, salvage, and commissions unless the Contracting Officer finds that action is not in the best interest of the Government.

(h) Revenues. All revenues accruing to the Contractor in connection with the work under this contract shall be Government property and shall be deposited in the Special Bank Account to be available for payment of allowable costs under this contract, except as shall be otherwise directed in writing by the Contracting Officer.

(i) Direct Payment of Charges. The Government reserves the right, upon 10 days written notice from the Contracting Officer to the Contractor, to pay directly to the persons concerned all amounts due which otherwise would be allowable under this contract. Any payment so made shall discharge the Government of all liability to the Contractor therefore.

H.17 OWNERSHIP OF RECORDS

(a) Government's Records.

(1) Except as is provided in subparagraph (b) of this Paragraph H.17 and as may be otherwise agreed upon by the Government and the Contractor, all records acquired or generated by the Contractor under this contract shall be the property of the Government, and shall be delivered to the Government or otherwise disposed of by the Contractor either as the Contracting Officer may from time to time direct during the progress of the work or, in any event, as the Contracting Officer shall direct upon settlement of this contract. The Contractor shall, subject to DOE's security regulations and requirements and other provisions of the contract, have the right to inspect and at its own expense duplicate any records delivered or to be delivered to the Government by the Contractor under this contract; or to retain duplicates which are in excess of the Government's requirements; provided, however, that nothing in this subparagraph shall constitute any commitments on the part of the Government to retain such records for any period beyond the DOE's customary retention periods for the various types of records.

(2) If the Contractor, pursuant to the New Mexico Public Records Act or any similar "rights to know" type of law or regulation, is requested to disclose any of the Government's records as defined in subparagraph (a)(1) above, the Contractor will not make any such disclosures and shall promptly notify DOE of such request and DOE shall be solely responsible for responding to such request and for any defense against such disclosure and shall have complete control of the defense and all litigation or negotiations associated therewith.

(b) Contractor's Own Records. The following records are considered the property of the Contractor and not within the scope of subparagraph (a) above:

(1) Personnel and medical records and files (excluding personnel radiation exposure records) maintained on individual employees, applicants and former employees;

(2) Worker's compensation files;

(3) Internal health and safety files;

(4) Employee relations records and files, such as records and files pertaining to:

(i) Qualifications or suitability for employment of any employee, applicant, or former employee;

(ii) Employee and union grievances;

(iii) Arbitration proceedings pursuant to the provisions of any labor contract;

(iv) Allegations, investigations, and resolution of employee misconduct;

(v) Employee discipline;

(vi) Employee charges of discrimination;

(vii) Negotiations with any labor organization in connection with any labor contract;

(5) Records and files pertaining to wages, salaries and benefits and wage, salary and benefit administration;

(6) Privileged or confidential Contractor financial information and correspondence between the Fire Department and other segments of the Contractor's organization located separate from the Fire Department; and

(7) Internal legal files. Upon expiration of this contract, however, if requested by DOE, copies of any such records pertaining to employees that continue in the employ of a successor contractor operating the Los Alamos Fire Department shall be, unless otherwise prohibited by law, delivered to the successor contractor.

(c) The provisions of subparagraph (b) above apply to all records described therein without regard to the date or origination of any such record.

(d) Inspection and Audit of Records. All records acquired or generated by the Contractor under this contract in the possession of the Contractor, including those described in subparagraph (b) above, shall be subject to inspection and audit by DOE at all reasonable times, and the Contractor shall afford DOE proper facilities for such inspection and audit; provided, however, that upon request by the Contracting Officer, the Contractor shall deliver such records to a location specified by the Contracting Officer for inspection by DOE.

H.18 FIRE DEPARTMENT MANAGEMENT TEAM

(a) Establishment - The County and the DOE hereby agree to establish a Fire Department Management Team (FDMT) which shall assist in the management of the Fire Department as described by the functions below. The FDMT shall be composed of equal representation from the County and DOE. A minimum of two (2) representatives from each organization shall be appointed to serve on the FDMT as voting members. A maximum of two (2) additional non-voting representatives may be appointed by the voting members of the FDMT. At least one member from each agency shall have technical knowledge and experience of Fire Department-type operations. Establishment of the FDMT shall be within 30 days after award of the contract.

(b) Mission - The mission of the FDMT shall be to provide both the DOE and the County a vehicle by which to collectively review and communicate the Fire Department's ability to provide essential services and to meet Fire Contract requirements. The FDMT shall also provide a forum for the resolution of conflicting interests.

(c) Functions - Specific functions to be performed by the FDMT shall include:

(1) Monitor the operations of the Fire Department to assure compliance with the terms of the Contract.

(2) Review the Fire Department operating procedures to assure that the Fire Department is operated to optimally utilize available resources in the most efficient and economical method possible.

(3) Review the Fire Department development of long range plans to assure that they reflect the future requirements of the Fire Department to meet the Doe and Los Alamos County needs.

(4) Provide recommendation to the Fire Chief to implement changes within the scope of the contract to meet County or DOE requirements for fire suppression, emergency medical, and rescue services.

(5) Review and make recommendations to the County and DOE regarding changes proposed by the Fire Department for staffing and equipment assignments to stations.

(6) Review and recommend for approval the Fire Department's annual operating budget.

(7) Develop for County and DOE approval, written operating procedures that will be used by the FDMT to perform the duties set forth herein. These procedures shall set forth the FDMT's operating rules to be followed in performing its function for issues involving policy. These procedures shall be submitted for DOE and County approval within 60 calendar days after appointment of the FDMT.

(8) Refer issues that cannot be resolved or that are not within the scope of the contract to the County and DOE for resolution.

(9) The FDMT will provide an annual report to the County and DOE on the overall state of the Fire Department. This written report shall be submitted in the first week of August of each year.

H.19 AUTHORITY HAVING JURISDICTION

With respect to the Los Alamos National Laboratory Fire Service Area, as defined in the Statement of Work and Attachment D to this contract, the Contracting Officer shall be the "authority having jurisdiction," as that term is defined in National Fire Protection Association publications. This authority is limited to matters involving the approval of equipment, facilities, and procedures affecting any facility owned by DOE or operated by DOE or any of its contractors.

H.20 EQUIVALENT FEDERAL WAGE RATES

In the performance of this contract the Contractor shall comply with the requirements of U. S. Department of Labor Wage Determination a copy of which is attached to this contract (see

Part III - SECTION J, Attachment I.) Furthermore, Clause(s), "Service Contract Act of 1965, as amended" and "Statement of Equivalent for Federal Hires Rates" are applicable and located in the contract Clauses Section of this Contract.

H.21 SUBCONTRACTS

Prior to the placement of subcontracts and in accordance with the clause, "Subcontract (Cost-Reimbursement and Letter Contract), "the Contractor shall insure that:

(a) They contain all of the clauses of this contract (altered when necessary for proper identification of the contracting parties) which contain a requirement for such inclusion in applicable subcontracts;

(b) Any applicable subcontractor Cost or Pricing Data and a Certificate of Current Cost or Pricing Data (see FAR 15.804-2) and subcontractor Representations and Certifications (see Part IV, Section K); and

(c) Any required prior notice and description of the subcontract is given to the Contracting Officer and any required consent is received. Except as may be expressly set forth therein, any consent by the Contracting Officer to the placement of subcontracts shall not be construed to constitute approval of the subcontractor or any subcontract terms or conditions, determination of the allowability of any cost, revision of this contract or any of the respective obligations of the parties thereunder, or creation of any subcontractor privity of contract with the Government.

(d) The Contractor shall also obtain and furnish to the Contracting Officer either an OCI Disclosure Statement or Representation form in accordance with DEAR 909.570-7 "Organizational Conflicts of Interest Disclosure or Representation" for all subcontractors to be utilized under this contract. No work shall be performed by the subcontractor until the Contracting Officer has cleared the subcontractor for Organizational Conflicts of Interest (OCI).

H.22 RELEASE OF INFORMATION

Any proposed public release of information including publications, exhibits or audiovisual productions pertaining to this contract or the work called for by this contract shall be submitted for approval prior to printing and distribution. Approval authority is HQ DOE, OPA/HQ, Washington, DC. Proposed releases are to be submitted to the Contracting Officer. All proposed releases should conform to the requirements of DOE Order 1340.1A, and 1350.

H.23 AUTOMATED DATA PROCESSING EQUIPMENT (ADPE) USAGE

Requirements for ADPE which were not included in the Contractor's original proposal may not be acquired (leased or purchased) without the prior written consent of the Contracting Officer. Whenever Contracting Officer written consent is required, the Contractor will furnish to the Contracting Officer information concerning the need for and selection of such ADPE, the specific make(s) and model(s), and the lease versus purchase determination.

H.24 AUTOMATED DATA PROCESSING EQUIPMENT (ADPE) LEASING

(a) If the Contractor leases ADPE equipment for use under this contract, the Contractor shall include a provision in the rental contract stating that the Government shall have the unilateral right to exercise any purchase option under the rental contract between the Contractor and the ADPE equipment vendor and to realize any other benefits earned through rental payments.

(b) The Contractor shall furnish a copy of the rental contract to the Contracting Officer.

H.25 APPRAISALS

(a) The Contracting Officer will perform an annual appraisal of the overall Fire Department operation to determine the adequacy of services provided as required in the Contract. Performance criteria will be based on specified service levels and adherence to developed plans, policies, and procedures referenced in the Contract.

(b) Pursuant to paragraph (a) above, the following performance appraisal areas will be evaluated:

(1) General Management and Planning Support. Factors in this area include the Fire Department's performance as an organization in complying with stated goals and mission, organizational planning, staffing, and coordination/cooperation with external sectors.

In addition, this area will address achievement of direct Contract-related objectives and cover activities such as program planning; quality and quantity of work; adherence to cost and schedule commitments; technical information management and reporting; and achievements in development of systems and methods to better meet requirements.

(2) Operations Support. Included in this area are required activities addressing quality assurance; security; information classification and control; facilities

management (facilities maintenance; real and personal property management); and operational safety, health, and environmental activities.

(3) Indirect Administrative Support. This area addresses the reimbursed indirect support to the Fire Department and includes such functions as human resource planning and management, auditing, computing resources management, procurement services, industrial relations, accounting, budgeting, and other indirect support activities (e.g., legal and public affairs) if applicable.

(c) The Contracting Officer will develop a report which will be made available to the Contractor for review and comment; the Contractor will have the opportunity to respond to the Contracting Officer's findings and provide additional information to clarify issues on any performance findings. A final report will be provided to the Contractor which defines final findings, priorities, and timeliness for corrective action.

(d) The following performance descriptors will be used:

(1) Satisfactory - Meets or exceeds the standard of performance; operational activities and tasks conducted in an efficient, timely, and acceptable manner. Deficiencies do not substantively affect performance.

(2) Marginal - Below the standard of performance; deficiencies are such that management attention and corrective action are required.

(3) Unsatisfactory - Below an acceptable standard of performance; serious deficiencies may require management attention and corrective action be taken promptly.

PART II
CONTRACT CLAUSES
SECTION I

Clause No. and Title			Page
1.	DEAR 952.202-1	DEFINITIONS (APR 1984)	1
2.	FAR 52.203-1	OFFICIALS NOT TO BENEFIT (APR 1984) .	1
3.	FAR 52.203-3	GRATUITIES (APR 1984)	1
4.	FAR 52.203-5	COVENANT AGAINST CONTINGENT FEES (APR 1984)	2
5.	FAR 52.203-6	RESTRICTIONS ON SUBCONTRACTOR SALES TO THE GOVERNMENT (JUL 1985)	3
6.	FAR 52.203-7	ANTI-KICKBACK PROCEDURES (OCT 1988) .	3
7.	FAR 52.203-9	REQUIRMENT FOR CERTIFICATE OF PROCURMENT INTEGRITY MODIFICATION (SEP 1990) . .	5
8.	FAR 52.203-10	PRICE OR FEE ADJUSTMENT FOR ILLEGAL OR IMPROPER ACTIVITY (SEPT 1990)	7
9.	FAR 52.203-12	LIMITATION ON PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (JAN 1990)	8
10.	DEAR 952.204-2	SECURITY (OCT 1987)	15
11.	DEAR 952.204-70	CLASSIFICATION (APR 1984)	16
12.	DEAR 952.204-74	FOREIGN OWNERSHIP, CONTROL, OR INFLUENCE OVER CONTRACTOR (APR 1984)	17
13.	DEAR 952.208-70	PRINTING (APR 1984)	18
14.	FAR 52.209-6	PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED, OR PROPOSED FOR DEBARMENT (JUNE 1991)	19
15.	DEAR 952.209-71	ORGANIZATIONAL CONFLICTS OF INTEREST-GENERAL (APR 1984)	20
16.	FAR 52.212-13	STOP-WORK ORDER (AUG 1989) - ALTERNATE I.	21

17.	DEAR 952.212-71	PRIORITIES AND ALLOCATIONS (ATOMIC ENERGY) (JUN 1987)	22
18.	FAR 52.215-1	EXAMINATION OF RECORDS BY COMPTROLLER GENERAL (APR 1984)	22
19.	FAR 52.215-2	AUDIT--NEGOTIATION (NOV 1989)	23
20.	FAR 52.215-33	ORDER OF PRECEDENCE (JAN 1986) . . .	25
21.	FAR 52.215-22	PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA (JAN 1991).	25
22.	FAR 52.215-24	SUBCONTRACTOR COST OR PRICING DATA (APR 1985)	27
23.	FAR 52.215-27	TERMINATION OF DEFINED BENEFIT PENSION PLANS (SEP 1989)	27
24.	DEAR 952.216-7	ALLOWABLE COST AND PAYMENT (JUL 1991)	28
25.	FAR 52.216-11	COST CONTRACT--NO FEE (APR 1984) . .	32
26.	FAR 52.216-12	COST-SHARING CONTRACT--NO FEE (APR 1984)	32
27.	DEAR 952.217-70	ACQUISITION OF REAL PROPERTY (APR 1984)	32
28.	FAR 52.219-8	UTILIZATION OF SMALL BUSINESS CONCERNS AND SMALL DISADVANTAGED BUSINESS CONCERNS (FEB 1990)	33
29.	DEAR 952.219-9	SMALL BUSINESS AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING PLAN (JAN 1991)	34
30.	FAR 52.219-13	UTILIZATION OF WOMEN-OWNED SMALL BUSINESSES (AUG 1986)	39
31.	FAR 52.219-16	LIQUIDATED DAMAGES-SMALL BUSINESS SUBCONTRACTING PLAN (AUG 1989) . . .	39
32.	FAR 52.220-3	UTILIZATION OF LABOR SURPLUS AREA CONCERNS (APR 1984)	40
33.	FAR 52.220-4	LABOR SURPLUS AREA SUBCONTRACTING PROGRAM (APR 1984)	41
34.	FAR 52.222-1	NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (APR 1984)	42

35.	FAR 52.222-3	CONVICT LABOR (APR 1984)	43
36.	FAR 52.222-26	EQUAL OPPORTUNITY (APR 1984)	43
37.	FAR 52.222-28	EQUAL OPPORTUNITY PREAWARD CLEARANCE OF SUBCONTRACTS (APR 1984)	45
38.	FAR 52.222-35	AFFIRMATIVE ACTION FOR SPECIAL DISABLED AND VIETNAM ERA VETERANS (APR 1984) .	45
39.	FAR 52.222-36	AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS (APR 1984)	49
40.	FAR 52.222-37	EMPLOYMENT REPORTS ON SPECIAL DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA (JAN 1988)	50
41.	FAR 52.222-41	SERVICE CONTRACT ACT OF 1965, AS AMENDED (MAY 1989)	51
42.	FAR 52.222-42	STATEMENT OF EQUIVALENT RATES FOR FEDERAL HIRES (MAY 1989)	60
43.	FAR 52.223-2	CLEAN AIR AND WATER (APR 1984) . . .	61
44.	FAR 52.223-3	HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA (DEC 1989) . . .	63
45.	FAR 52.223-6	DRUG-FREE WORKPLACE (JUL 1990) . . .	64
46.	DEAR 952.223-75	PRESERVATION OF INDIVIDUAL OCCUPATIONAL RADIATION EXPOSURE RECORDS (APR 1984)	67
47.	FAR 52.224-1	PRIVACY ACT NOTIFICATION (APR 1984) .	67
48.	FAR 52.224-2	PRIVACY ACT (APR 1984)	67
49.	DEAR 952.224-70	PAPERWORK REDUCTION ACT (APR 1984) .	68
50.	FAR 52.225-3	BUY AMERICAN ACT--SUPPLIES (JAN 1989)	69
51.	FAR 52.225-13	RESTRICTIONS ON CONTRACTING WITH SANCTIONED PERSONS (MAY 1989)	70
52.	FAR 52.227-1	AUTHORIZATION AND CONSENT (APR 1984)	71
53.	FAR 52.227-2	NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT (APR 1984)	72
54.	FAR 52.228-7	INSURANCE-LIABILITY TO THIRD PERSONS (APR 1984)	72

DELETE

DELETE

DELETE

FDC01

55.	FAR 52.229-10	STATE OF NEW MEXICO GROSS RECEIPTS AND COMPENSATING TAX (OCT 1988)	75
56.	FAR 52.230-3	COST ACCOUNTING STANDARDS (SEP 1987) .	76
57.	FAR 52.230-4	ADMINISTRATION OF COST ACCOUNTING STANDARDS (SEP 1987)	79
58.	FAR 52.232-9	LIMITATION ON WITHHOLDING OF PAYMENTS (APR 1984)	82
59.	FAR 52.232-22	LIMITATION OF FUNDS (APR 1984) . . .	82
60.	FAR 52.232-23	ASSIGNMENT OF CLAIMS (JAN 1986) . . .	85
61.	FAR 52.232-25	PROMPT PAYMENT (AUG 1989)	85
62.	FAR 52.233-1	DISPUTES ALTERNATE I (APR 1984) . . .	91
63.	FAR 52.233-3	PROTEST AFTER AWARD ALTERNATE 1 (JUN 1985)	92
64.	DEAR 952.235-70	KEY PERSONNEL (APR 1984)	93
65.	FAR 52.237-2	PROTECTION OF GOVERNMENT BUILDINGS, EQUIPMENT, AND VEGETATION (APR 1984)	94
66.	FAR 52.237-3	CONTINUITY OF SERVICES (APR 1984) . .	94
67.	FAR 52.242-1	NOTICE OF INTENT TO DISALLOW COSTS (APR 1984)	95
68.	FAR 52.243-2	CHANGES--COST-REIMBURSEMENT ALTERNATE I (AUG 1987)	95
69.	FAR 52.244-2	SUBCONTRACTS (COST-REIMBURSEMENT AND LETTER CONTRACTS) (JUL 1985)	96
70.	FAR 52.244-5	COMPETITION IN SUBCONTRACTING (APR 1984)	100
71.	DEAR 952.245-5	GOVERNMENT PROPERTY COST REIMBURSEMENT, TIME-AND-MATERIAL, OR LABOR-HOUR CONTRACTS (APR 1984)	100
72.	FAR 52.246-5	INSPECTION OF SERVICES-COST-REIMBURSEMENT (APR 1984)	106
73.	FAR 52.246-25	LIMITATION OF LIABILITY-SERVICES (APR 1984)	107

DELETE

DELETE

FDC01

74. FAR 52.247-34 F.O.B. DESTINATION (NOV 1991) 108

75. FAR 52.249-6 TERMINATION (COST-REIMBURSEMENT) (MAY 1986) 109

76. FAR 52.249-14 EXCUSABLE DELAYS (APR 1984) 115

77. DEAR 952.250-70 NUCLEAR HAZARDS INDEMNITY AGREEMENT (NOV 1991) 116

78. FAR 52.251-1 GOVERNMENT SUPPLY SOURCES (APR 1984) 120

79. FAR 52.251-2 INTERAGENCY FLEET MANAGEMENT SYSTEM VEHICLES AND RELATED SERVICES (JAN 1991) 120

80. DEAR 952.251-70 CONTRACTOR EMPLOYEE TRAVEL DISCOUNTS (APR 1989) 121

81. FAR 52.252-6 AUTHORIZED DEVIATIONS IN CLAUSES (APR 1984) 122

82. DEAR 970.5204-2 SAFETY AND HEALTH (GOVERNMENT-OWNED OR LEASED) (APR 1984) 122

83. DOE PR 9-9.110(C) - REPORTING OF ROYALTIES 123

84. FAR 52.222-4 CONTRACT WORK HOURS AND SAFETY STANDARDS ACT - OVERTIME COMPENSATION (MAR 1986) 123

85. DEAR 970.5204-58 WORKPLACE SUBSTANCE ABUSE PROGRAMS AT DOE SITES (AUG 1992) 125

1. DEAR 952.202-1 DEFINITIONS (APR 1984)

(a) The term "Head of Agency" means the Secretary, Deputy Secretary or Under Secretary of the Department of Energy.

(b) "Contracting Officer" means a person with the authority to enter into, administer, and/or terminate contracts and make related determinations and findings. The term includes certain authorized representatives of the Contracting Officer acting within the limits of their authority as delegated by the Contracting Officer.

(c) Except as otherwise provided in this contract, the term "subcontracts" includes, but is not limited to, purchase orders and changes and modifications to purchase orders under this contract.

(d) The term "DOE" means the Department of Energy.

2. FAR 52.203-1 OFFICIALS NOT TO BENEFIT (APR 1984)

No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this contract, or to any benefit arising from it. However, this clause does not apply to this contract to the extent that this contract is made with a corporation for the corporation's general benefit.

3. FAR 52.203-3 GRATUITIES (APR 1984)

(a) The right of the Contractor to proceed may be terminated by written notice if, after notice and hearing, the agency head or a designee determines that the Contractor, its agent, or another representative--

(1) Offered or gave a gratuity (e.g., an entertainment or gift) to an officer, official, or employee of the Government; and

(2) Intended, by the gratuity, to obtain a contract or favorable treatment under a contract.

(b) The facts supporting this determination may be reviewed by any court having lawful jurisdiction.

(c) If this contract is terminated under paragraph (a) above, the Government is entitled--

(1) To pursue the same remedies as in a breach of the contract; and

(2) In addition to any other damages provided by law, to exemplary damages of not less than 3 nor more than 10 times the cost incurred by the Contractor in giving gratuities to the person concerned, as determined by the agency head or a designee.

(This subparagraph (c)(2) is applicable only if this contract uses money appropriated to the Department of Defense.)

(d) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

4. FAR 52.203-5 COVENANT AGAINST CONTINGENT FEES (APR 1984)

(a) The Contractor warrants that no person or agency has been employed or retained to solicit or obtain this contract upon an agreement or understanding for a contingent fee, except a bona fide employee or agency. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or, in its discretion, to deduct from the contract price or consideration, or otherwise recover, the full amount of the contingent fee.

(b) "Bona fide agency," as used in this clause, means an established commercial or selling agency, maintained by a contractor for the purpose of securing business, that neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds itself out as being able to obtain any Government contract or contracts through improper influence.

"Bona fide employee," as used in this clause, means a person, employed by a contractor and subject to the contractor's supervision and control as to time, place, and manner of performance, who neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds out as being able to obtain any Government contract or contracts through improper influence.

"Contingent fee," as used in this clause, means any commission, percentage, brokerage, or other fee that is contingent upon the success that a person or concern has in securing a Government contract.

"Improper influence," as used in this clause, means any influence that induces or tends to induce a Government employee or officer to give consideration or to act regarding a Government contract on any basis other than the merits of the matter.

5. FAR 52.203-6 RESTRICTIONS ON SUBCONTRACTOR SALES TO THE GOVERNMENT (JUL 1985)

(a) Except as provided in (b) below, the Contractor shall not enter into any agreement with an actual or prospective subcontractor, nor otherwise act in any manner, which has or may have the effect of restricting sales by such subcontractors directly to the Government of any item or process (including computer software) made or furnished by the subcontractor under this contract or under any follow-on production contract.

(b) The prohibition in (a) above does not preclude the Contractor from asserting rights that are otherwise authorized by law or regulation.

(c) The Contractor agrees to incorporate the substance of this clause, including this paragraph (c), in all subcontracts under this contract.

6. FAR 52.203-7 ANTI-KICKBACK PROCEDURES (OCT 1988)

(a) Definitions.

"Kickback," as used in this clause, means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided, directly or indirectly, to any prime Contractor, prime Contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a subcontract relating to a prime contract.

"Person," as used in this clause, means a corporation, partnership, business association of any kind, trust, joint-stock company, or individual.

"Prime contract," as used in this clause, means a contract or contractual action entered into by the United States for the purpose of obtaining supplies, materials, equipment, or services of any kind.

"Prime Contractor," as used in this clause, means a person who has entered into a prime contract with the United States.

"Prime Contractor employee," as used in this clause, means any officer, partner, employee, or agent of a prime Contractor.

"Subcontract," as used in this clause, means a contract or contractual action entered into by a prime Contractor or subcontractor for the purpose of obtaining supplies, materials, equipment, or services of any kind under a prime contract.

"Subcontractor," as used in this clause, (1) means any person, other than the prime Contractor, who offers to furnish or furnishes any supplies, materials, equipment, or services of any kind under a prime contract or a subcontract entered into in connection with such prime contract, and (2) includes any person who offers to furnish or furnishes general supplies to the prime Contractor or a higher tier subcontractor.

"Subcontractor employee," as used in this clause, means any officer, partner, employee, or agent of a subcontractor.

(b) The Anti-Kickback Act of 1986 (41 U.S.C. 51-58) (the Act), prohibits any person from--

(1) Providing or attempting to provide or offering to provide any kickback;

(2) Soliciting, accepting, or attempting to accept any kickback; or

(3) Including, directly or indirectly, the amount of any kickback in the contract price charged by a prime Contractor to the United States or in the contract price charged by a subcontractor to a prime Contractor or higher tier subcontractor.

(c) (1) The Contractor shall have in place and follow reasonable procedures designed to prevent and detect possible violations described in paragraph (b) of this clause in its own operations and direct business relationships.

(2) When the Contractor has reasonable grounds to believe that a violation described in paragraph (b) of this clause may have occurred, the Contractor shall promptly report in writing the possible violation. Such reports shall be made to the inspector general of the contracting agency, the head of the contracting agency if the agency does not have an inspector general, or the Department of Justice.

(3) The Contractor shall cooperate fully with any Federal agency investigating a possible violation described in paragraph (b) of this clause.

(4) The Contracting Officer may (i) offset the amount of the kickback against any monies owed by the United States under the prime contract and/or (ii) direct that the Prime Contractor withhold from sums owed a subcontractor under the prime contract, monies withheld, the amount of the kickback. The Contracting Officer may order that monies withheld under subdivision (c)(4)(ii) of this clause be paid over to the Government unless the Government has already offset those monies under subdivision (c)(4)(i) of this clause. In either case, the Prime Contractor shall notify the Contracting Officer when the monies are withheld.

(5) The Contractor agrees to incorporate the substance of this clause, including this subparagraph (c)(5) but excepting subparagraph (c)(1), in all subcontracts under this contract.

7. FAR 52.203-9 REQUIREMENT FOR CERTIFICATE OF PROCUREMENT INTEGRITY MODIFICATION (SEP 1990)

(a) Definition. The definitions set forth in FAR 3,104-4 are hereby incorporated in this clause.

(b) The Contractor agrees that it will execute the certification set forth in paragraph (c) of this clause when requested by the Contracting Officer in connection with the execution of any modification of this contract.

(c) Certification. As required in paragraph (b) of this clause, the officer or employee responsible for the modification proposal shall execute the following certification:

CERTIFICATE OF PROCUREMENT INTEGRITY - MODIFICATION (SEP 1990)

(1) I, (Name of certifier) am the officer or employee responsible for the preparation of this modification proposal and hereby certify that, to the best of my knowledge and belief, with the exception of any information described in this certification, I have no information concerning a violation or possible violation of subsection 27(a), (b), (d), or (f) of the Office of Federal Procurement Policy Act, as amended* (41 U.S.C. 423), (hereinafter referred to as "the Act"), as implemented in the FAR, occurring during the conduct of this procurement (contract and modification number).

(2) As required by subsection 27(e)(1)(B) of the Act, I further certify that to the best of my knowledge and belief, each officer, employee, agent, representative, and consultant of (Name of Offeror) who has participated personally and substantially in the preparation or submission of this proposal has certified that he or she is familiar with, and will comply with, the requirements of subsection 27(a) of the Act, as implemented in the FAR, and will report immediately to me any information concerning a violation or possible violation of subsections 27(a), (b), (d), or (f) of the Act, as implemented in the FAR, pertaining to this procurement.

(3) Violations or possible violations: (Continue on plain bond paper if necessary and label Certificate of Procurement Integrity - Modification (Continuation Sheet), ENTER "NONE" IF NONE EXISTS)

_____

_____

_____

_____

(Signature of the officer or employee responsible for the modification proposal and date)
(Typed name of the officer or employee responsible for the modification proposal)

*The Act became effective on December 1, 1990. THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER TITLE 18, UNITED STATES CODE, SECTION 1001.

(End of certification)

(d) In making the certification in paragraph (2) of the certificate, the officer or employee of the competing Contractor responsible for the offer or bid, may rely upon a one-time certification to the competing Contractor, supplemented by periodic training. These certifications shall be maintained by the Contractor for a period of 6 years from the date a certifying employee's employment with the company ends or, for an agency, representative, or consultant, 6 years from the date such individual ceases to act on behalf of the contractor.

(e) The certification required by paragraph (c) of this clause is a material representation of fact upon which reliance will be placed in executing this modification.

8. FAR 52.203-10 PRICE OR FEE ADJUSTMENT FOR ILLEGAL OR IMPROPER ACTIVITY (SEPT 1990)

(a) The Government, at its election, may reduce the price of a fixed-price-type contract or contract modification and the total cost and fee under a cost-type contract or contract modification by the amount of profit or fee determined as set forth in paragraph (b) of this clause if the head of the contracting activity or his or her designee, determines that there was a violation of subsection 27(a) of the Office of Federal Procurement Policy Act as amended (41 U. S. C. 423) as implemented in the FAR. In the case of a contract modification, the fee subject to reduction is the fee specified in the particular contract modification at the time of execution, except as provided in subparagraph (b)(5) of this clause.

(b) The price or fee reduction referred to in paragraph (a) of this clause shall be--

(1) For cost-plus-fixed-fee contracts, the amount of the fee specified in the contract at the time of award;

(2) For cost-plus-incentive-fee contracts, the target fee specified in the contract at the time of award notwithstanding any minimum fee or "fee floor" specified in the contract.

(3) For cost-plus-award-fee contracts--

(i) The base fee established in the contract at the time of contract award;

(ii) If no base fee is specified in the contract, 10 percent of the amount of each award fee otherwise payable to the contractor for each incentive period or at each award fee determination point.

(4) For fixed-price-incentive contracts, the Government may--

(i) Reduce the contract target price and contract target profit both by an amount equal to the initial target profit specified in the contract at the time of contract award, or;

(ii) If an immediate adjustment to the contract target price and contract target profit would have a significant adverse impact on the incentive price revision relationship under the contract, or adversely affect the contract financing provisions, the Contracting Officer may defer such adjustment until establishment of the total final price of the contract.

The total final price established in accordance with the incentive price revision provisions of the contract shall be reduced by an amount equal to the initial target profit specified in the contract at the time of contract award and such reduced price shall be the total final contract price.

(5) For firm-fixed-price contract or contract modifications, by 10 percent of the initial contract price; 10 percent of the contract modification price; or a profit amount determined by the Contracting Officer from records or documents in existence prior to the date of the contract award or modification.

(c) The Government may, at its election, reduce a prime contractor's price or fee in accordance with the procedures of paragraph (b) of this clause for violations of the Act by its subcontractors by an amount not to exceed the amount of profit or fee reflected in the subcontract at the time the subcontract was first definitively priced.

(d) In addition to the remedy in paragraph (a) of this clause, the Government may terminate this contract or modification for default. The rights and remedies of the Government specified herein are not exclusive, and are in addition to any other rights and remedies provided by law or under this contract.

9. FAR 52.203-12 LIMITATION ON PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (JAN 1990)

(a) Definitions.

"Agency," as used in this clause, means executive agency as defined in 2.101.

"Covered Federal action," as used in this clause, means any of the following Federal actions:

(a) The awarding of any Federal contract.

(b) The making of any Federal grant.

(c) The making of any Federal Loan.

(d) The entering into of any cooperative agreement.

(e) The extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

"Indian tribe" and "tribal organization" as used in this clause, have the meaning provided in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) and include Alaskan Natives.

"Influencing or attempting to influence," as used in this clause, means making, with the intent to influence, any communication to or appearance before an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any covered Federal action.

"Local government," as used in this clause, means a unit of government in a State and, if chartered, established, or otherwise recognized by a State for the performance of a governmental duty, including a local public authority, a special district, an intrastate district, a council of governments, a sponsor group representative organization, and any other instrumentality of a local government.

"Officer or employee of an agency," as used in this clause, includes the following individuals who are employed by an agency:

(a) An individual who is appointed to a position in the Government under title 5, United States Code, including a position under a temporary appointment.

(b) A member of the uniformed services, as defined in subsection 101(3), title 37, United States Code.

(c) A special Government employee, as defined in Section 202, Title 18, United States Code.

(d) An individual who is a member of a Federal advisory committee, as defined by the Federal Advisory Committee Act, Title 5, United States Code, Appendix 2.

"Person," as used in this clause, means an individual, corporation, company, association, authority, firm, partnership, society, State, or local government, regardless of whether such entity is operated for profit, or not for profit. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Reasonable compensation," as used in this clause, means with respect to a regularly employed officer or employee of any person, compensation that is consistent with the normal compensation for such officer or employee for work that is not furnished to, not funded by, or not furnished in cooperation with the Federal Government.

"Reasonable payment," as used in this clause, means, with respect to professional and other technical services, a payment in an amount that is consistent with the amount normally paid for such services in the private sector.

"Recipient," as used in this clause, includes the Contractor and all subcontractors. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Regularly employed," as used in this clause,means, with respect to an officer or employee of a person requesting or receiving a Federal contract, an officer or employee who is employed by such person for at least 130 working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person for receipt of such contract. An officer or employee who is employed by such person for less than 130 working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person shall be considered to be regularly employed as soon as he or she is employed by such person for 130 working days.

"State," as used in this clause, means a State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, a territory or possession of the United States, an agency or instrumentality of a State, and multi-State, regional, or interstate entity having governmental duties and powers.

(b) Prohibitions

(1) Section 1352 of Title 31, United States Code, among other things, prohibits a recipient of a Federal contract, grant, loan, or cooperative agreement from using appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan, the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.

(2) The Act also requires Contractors to furnish a disclosure if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for

influencing or attempting to influence an officer or employee of any agency, a Member of Congress, or an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

(3) The prohibitions of the Act do not apply under the following conditions:

(i) Agency and legislative liaison by own employees.

(A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of a payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action if the payment is for agency and legislative liaison activities nor directly related to a covered Federal action.

(B) For purposes of subdivision (b)(3)(i)(A) of this clause, providing any information specifically requested by an agency or Congress is permitted at any time.

(C) The following agency and legislative liaison activities are permitted at any time where they are not related to a specific solicitation for any covered Federal action:

(1) Discussing with an agency the qualities and characteristics (including individual demonstrations) of the person's products or services, conditions or terms of sale, and service capabilities.

(2) Technical discussions and other activities regarding the application or adaptation of the person's products or services for an agency's use.

(D) The following agency and legislative liaison activities are permitted where they are prior to formal solicitation of any covered Federal action.

(1) Providing any information not specifically requested but necessary for an agency to make an informed decision about initiation of a covered Federal action;

(2) Technical discussions regarding the preparation of an unsolicited proposal prior to its official submission; and

(3) Capability presentations by persons seeking awards from an agency pursuant to the provisions of the Small Business Act, as amended by Pub.L.95-507, and subsequent amendments.

(E) Only those services expressly authorized by subdivision (b)(3)(i)(A) of this clause are permitted under this clause.

(ii) Professional and technical services.

(A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of:

(1) A payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal, amendment, or modification or a covered Federal action, if payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action.

(2) Any reasonable payment to a person other than an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal, amendment, or modification of a covered Federal action if the payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action. Persons other than officers or employees of a person requesting or receiving a covered Federal action include consultants and trade associations.

(B) For purposes of subdivision (b)(3)(ii)(A) of this clause, "professional and technical services" shall be limited to advice and analysis directly applying any professional or technical discipline. For example, drafting of a legal document accompanying a bid or proposal by a lawyer is allowable.

Similarly, technical advice provided by an engineer on the performance or operational capability of a piece of equipment rendered directly in the negotiation of a contract is allowable. However, communications with the intent to influence made by a professional (such as a licensed lawyer) or a technical person (such as a licensed accountant) are not allowable under this section unless they provided advice and analysis directly applying their professional or technical expertise and unless the

advice or analysis is rendered directly and solely in the preparation, submission or negotiation of a covered Federal action. Thus, for example, communications with the intent to influence made by a lawyer that do not provided legal advice or analysis directly and solely related to the legal aspects of his or her client's proposal, but generally advocate one proposal over another are not allowable under this section because the lawyer is not providing professional legal services. Similarly communications with the intent to influence made by an engineer providing an engineering analysis prior to the preparation or submission of a bid or proposal are not allowable under this section since the engineer is providing technical services but not directly in the preparation, submission, or negotiation of a covered Federal action.

(C) Requirements imposed by or pursuant to law as a condition for receiving a covered Federal award include those required by law or regulation and any other requirements in the actual award documents.

(D) Only those services expressly authorized by subdivisions (b)(3)(ii)(A)(1) and (2) of this clause are permitted under this clause.

(E) The reporting requirements of FAR 3.803(a) shall not apply with respect to payments of reasonable compensation made to regularly employed officers or employees of a person.

(iii) Disclosure.

(A) The Contractor who requests or receives from an agency a Federal contract shall file with that agency a disclosure form, OMB standard form LLL, Disclosure of Lobbying Activities, if such person has made or has agreed to make any payment using nonappropriated funds (to include profits from any covered Federal action), which would be prohibited under subparagraph (b)(1) of this clause, if paid for with appropriated funds.

(B) The Contractor shall file a disclosure form at the end of each calendar quarter in which there occurs any event that materially affects the accuracy of the information contained in any disclosure form previously filed by such person under subparagraph (c)(1) of this clause. An event that materially affects the accuracy of the information reported includes--

(1) A cumulative increase of $25,000 or more in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action; or

(2) A change in the person(s) or individual(s) influencing or attempting to influence a covered Federal action;
or

(3) A change in the officer(s), employee(s), or Member(s) contacted to influence or attempt to influence a covered Federal action.

(C) The Contractor shall require the submittal of a certification, and if required, a disclosure form by any person which requests or received any subcontract exceeding $100,000 under the Federal contract.

(D) All subcontractor disclosure forms (but not certifications) shall be forwarded from tier to tier until received by the prime Contractor. The prime Contractor shall submit all disclosures to the Contracting Officer at the end of the calendar quarter in which the disclosure form is submitted by the subcontractor. Each subcontractor certification shall be retained in the subcontract file of the awarding Contractor.

(iv) Agreement. The Contractor agrees not to make any payment prohibited by the clause.

(v) Penalties.

(A) Any person who makes an expenditure prohibited under paragraph (a) of this clause or who fails to file or amend the disclosure form to be filed or amended by paragraph (b) of this clause shall be subject to civil penalties as provided for by 31 U.S.C. 1352. An imposition of a civil penalty does not prevent the Government from seeking any other remedy that may be applicable.

(B) Contractors may rely without liability on the representation made by their subcontractors in the certification and disclosure form.

(vi) Cost allowability. Nothing in this clause makes allowable or reasonable any cost which would otherwise be unallowable or unreasonable. Conversely, costs made specifically unallowable by the requirements in this clause will not be made allowable under any other provision.

10. DEAR 952.204-2 SECURITY (OCT 1987)

(a) Responsibility. It is the contractor's duty to safeguard all classified information, special nuclear material, and other DOE property. The Contractor shall, in accordance with DOE security regulations and requirements, be responsible for safeguarding all classified information, and protecting against sabotage, espionage, loss and theft, the classified documents and material in the Contractor's possession in connection with the performance of work under this contract. Except as otherwise expressly provided in this contract, the Contractor shall, upon completion or termination of this contract, transmit to DOE any classified matter in the possession of the Contractor or any person under the Contractor's control in connection with performance of this contract. If retention by the Contractor of any classified matter is required after the completion or termination of the contract and such retention is approved by the Contracting Officer, the Contractor will complete a certificate of possession to be furnished to DOE specifying the classified matter to be retained. The certification shall identify the items and types or categories of retained, the conditions governing the retention of the matter, and the period of retention, if known. If the retention is approved by the Contracting Officer, the security provisions of the contract will continue to be applicable to the matter retained. Special nuclear material will not be retained after the completion or termination of the contract.

(b) Regulations. The Contractor agrees to conform to all security regulations and requirements of DOE.

(c) Definition of Classified Information. The term "Classified Information" means Restricted Data, Formerly Restricted Data, or National Security Information.

(d) Definition of Restricted Data. The term "Restricted Data" means all data concerning (1) design, manufacture, or utilization of atomic weapons; (2) the production of special nuclear material; or (3) the use of special nuclear material in the production of energy, but shall not include data declassified or removed from the Restricted Data category pursuant to Section 142 of the Atomic Energy Act of 1954, as amended.

(e) Definition of Formerly Restricted Data. The term "Formerly Restricted Data" means all data removed from the Restricted Data category under section 142 d. of the Atomic Energy Act of 1954, as amended.

(f) Definition of National Security Information. The term "National Security Information" means any information or material, regardless of its physical form or characteristics,

that is owned by, produced for or by, or is under the control of the United States Government, that has been determined pursuant to Executive Order 12356 or prior Orders to require protection against unauthorized disclosure, and which is so designated.

(g) Definition of Special Nuclear Material (SNM). SNM means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which pursuant to the provisions of Section 51 of the Atomic Energy Act of 1954, as amended, has been determined to be special nuclear material, but does not include source material; or (2) any material artificially enriched by any of the foregoing, but does not include source material.

(h) Security clearance of personnel. The Contractor shall not permit any individual to have access to any classified information, except in accordance with the Atomic Energy Act of 1954, as amended, Executive Order 12356, and the DOE's regulations or requirements applicable to the particular level and category of classified information to which access is required.

(i) Criminal liability. It is understood that disclosure of any classified information relating to the work or services ordered hereunder to any person not entitled to receive it, or failure to safeguard any classified information that may come to the Contractor or any person under the Contractor's control in connection with work under this contract, may subject the Contractor, its agents, employees, or subcontractors to criminal liability under the laws of the United States. (See the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 et seq.; 18 U.S.C. 793 and 794; and Executive Order 12356).

(j) Subcontracts and purchase orders. Except as otherwise authorized in writing by the Contracting Officer, the Contractor shall insert provisions similar to the foregoing in all subcontracts and purchase orders under this contract.

11. DEAR 952.204-70 CLASSIFICATION (APR 1984)

In the performance of the work under this contract, the Contractor shall ensure that an Authorized Original Classifier or Derivative Classifier shall assign classifications to all documents, material, and equipment originated or generated under the contract in accordance with classification regulations and guidance furnished to the Contractor by the DOE. Every subcontract and purchase order issued hereunder involving the origination or generation of classified documents, material, or equipment shall include a provision to the effect that in the performance of such subcontract or purchase order, the subcontractor or supplier shall ensure that an Authorized

Original Classifier or Derivative Classifier shall assign classifications to all such documents, materials, and equipment in accordance with classification regulations and guidance furnished to such subcontractor or supplier by the Contractor.

12. DEAR 952.204-74 FOREIGN OWNERSHIP, CONTROL, OR INFLUENCE OVER CONTRACTOR (APR 1984)

(a) For purposes of this clause, a foreign interest is defined as any of the following:

(1) A foreign government or foreign government agency;

(2) Any form of business enterprise organized under the laws of any country other than the United States or its possessions;

(3) Any form of business enterprise organized or incorporated under the laws of the U.S., or a State or other jurisdiction within the U.S., which is owned, controlled, or influenced by a foreign government, agency, firm, corporation or person; or

(4) Any person who is not a U.S. citizen.

(b) Foreign Ownership, Control, or Influence (FOCI) means the situation where the degree of ownership, control, or influence over a contractor by a foreign interest is such that a reasonable basis exists for concluding that compromise of classified information, special nuclear material as defined in 10 CFR Part 710, may result.

(c) For purposes of this clause, subcontractor means any subcontractor at any tier and the term "contracting officer" shall mean DOE contracting officer. When this clause is included in a subcontract, the term "contractor" shall mean subcontractor and the term "contract" shall mean subcontract.

(d) The contractor shall immediately provide the contracting officer written notice of any changes in the extent and nature of FOCI over the contractor which would affect the answers to the questions presented in DEAR 952.204-73. Further, notice of changes in ownership or control which are required to be reported to the Securities and Exchange Commission, the Federal Trade Commission, or the Department of Justice shall also be furnished concurrently to the contracting officer.

(e) In those cases where a contractor has changes involving FOCI, the DOE must determine whether the changes will pose an undue risk to the common defense and security. In making

this determination, the contracting officer shall consider proposals made by the contractor to avoid or mitigate foreign influences.

(f) If the contracting officer at any time determines that the contractor is, or is potentially, subject to FOCI, the contractor shall comply with such instructions as the contracting officer shall provide in writing to safeguard any classified information or significant quantity of special nuclear material.

(g) The contractor agrees to insert terms that conform substantially to the language of this clause including this paragraph (g) in all subcontracts under this contract that will require access to classified information or a significant quantity of special nuclear material. Additionally, the contractor shall require such subcontractors to submit a completed certification required in DEAR 952.204-73 prior to award of a subcontract. Information to be provided by a subcontractor pursuant to this clause may be submitted directly to the contracting officer.

(h) Information submitted by the contractor or any affected subcontractor as required pursuant to this clause shall be treated by DOE to the extent permitted by law, as business or financial information submitted in confidence to be used solely for purposes of evaluating FOCI.

(i) The requirements of this clause are in addition to the requirement that a contractor obtain and retain the security clearances required by the contract. This clause shall not operate as a limitation on DOE's rights, including its rights to terminate this contract.

(j) The contracting officer may terminate this contract for default either if the contractor fails to meet obligations imposed by this clause, e.g., provide the information required by this clause, comply with the contracting officer's instructions about safeguarding classified information, or make this clause applicable to subcontractors, or if, in the contracting officer's judgment, the contractor creates a FOCI situation in order to avoid performance or a termination for default. The contracting officer may terminate this contract for convenience if the contractor becomes subject to FOCI and for reasons other than avoidance of performance of the contract, cannot, or chooses not to, avoid or mitigate the FOCI problem.

13. DEAR 952.208-70 PRINTING (APR 1984)

The contractor shall not engage in, nor subcontract for, any printing (as that term is defined in Title I of the U.S. Government Printing and Binding Regulations in effect on the

effective date of this contract) in connection with the performance of work under this contract. Provided, however, that performance of a requirement under this contract involving the duplication of less than 5,000 copies of a single unit, or no more than 25,000 units in the aggregate of multiple units, will not be deemed to be printing. A unit is defined as one sheet, size 8 1/2 by 11 inches one side only, one color. A requirement is defined as a single publication document.

(1) The term "printing" includes the following processes: composition, plate making, presswork, binding, microform publishing, or the end items produced by such processes.

(2) If fulfillment of the contract will necessitate reproduction in excess of the limits set forth above, the contractor shall notify the contracting officer in writing and obtain the contracting officer's approval prior to acquiring on DOE's behalf production, acquisition, and dissemination of printed matter. Such printing must be obtained from the Government Printing Office (GPO), a contract source designated by GPO or a Joint Committee on Printing authorized federal printing plant.

(3) Printing services not obtained in compliance with this guidance will result in the cost of such printing being disallowed.

(4) The Contractor will include in each of his subcontracts hereunder a provision substantially the same as this clause including this paragraph (4).

14. FAR 52.209-6 PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED, OR PROPOSED FOR DEBARMENT (JUN 1991)

(a) The Government suspends or debars Contractors to protect the Government's interests. Contractors shall not enter into any subcontract in excess of the small purchase limitation at FAR 13.000 with a Contractor that has been debarred, suspended, or proposed for debarment unless there is a compelling reason to do so.

(b) The Contractor shall require each proposed first-tier subcontractor, whose subcontract will exceed the small purchase limiation at FAR 13.000, to disclose to the Contractor, in writing, whether as of the time of award of the subcontract, the subcontractor, or its principals, is or is not debarred, suspended, or proposed for debarment by the Federal Government.

(c) A corporate officer or designee of the Contractor shall notify the Contracting Officer, in writing, before entering into such subcontract with a party that is debarred, suspended, or proposed for debarment (see FAR 9.404 for information on the List of Parties Excluded from Procurement Programs). The notice must include the following:

(1) The name of the subcontractor;

(2) The Contractor's knowledge of the reasons for the subcontractor being on the list of Parties Excluded from Procurement Programs;

(3) The compelling reason(s) for doing business with the subcontractor notwithstanding its inclusion on the list of Parties Excluded from Procurement Programs; and

(4) The systems and procedures the Contractor has established to ensure that it is fully protecting the Government's interests when dealing with such subcontractor in view of the specific basis for the party's debarment, suspension, or proposed debarment.

(End of Clause)

15. DEAR 952.209-71 ORGANIZATIONAL CONFLICTS OF INTEREST-GENERAL (APR 1984)

(a) The Contractor warrants that, to the best of his knowledge and belief, and except as otherwise disclosed, there are no relevant facts which could give rise to organizational conflicts of interest, as defined in CFR 909.570 or that the Contractor has disclosed all relevant information.

(b) The Contractor agrees that, if after award, an organizational conflict of interest with respect to this contract is discovered, an immediate and full disclosure in writing shall be made to the Contracting Officer which shall include a description of the action which the contractor has taken or proposes to take to avoid or mitigate such conflicts. The Department may, however, terminate the contract for its convenience if it deems such termination to be in the best interest of the Government.

(c) In the event that the Contractor was aware of an organizational conflict of interest prior to the award of this contract and did not disclose the conflict to the Contracting Officer, the Government may terminate the contract for default.

(d) The provisions of this clause shall be included in all subcontracts for work to be performed similar to the service provided by the prime Contractor, and the terms "contract," "Contractor," and "Contracting Officer" modified appropriately to preserve the Government's rights.

(e) Prior to a contract modification when the Statement of Work is modified to add new work, the period of performance is significantly increased, or the parties to the contract are changed, the Department will request and the Contractor is required to submit either an organizational conflict of interest disclosure or representation (see 48 CFR 904.70 and 909.5), or an update of the previously submitted disclosure or representation.

16. FAR 52.212-13 STOP-WORK ORDER - (AUG 1989) ALTERNATE I

(a) The Contracting Officer may, at any time, by written order to the Contractor, require the Contractor to stop all, or any part, of the work called for by this contract for a period of 90 days after the order is delivered to the Contractor, and for any further period to which the parties may agree. The order shall be specifically identified as a stop-work order issued under this clause. Upon receipt of the order, the Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allowable to the work covered by the order during the period of work stoppage. Within a period of 90 days after a stop-work order is delivered to the Contractor, or within any extension of that period to which the parties shall have agreed, the Contracting Officer shall either-

(1) Cancel the stop-work order; or

(2) Terminate the work covered by the order as provided in the Termination clause of this contract.

(b) If a stop-work order issued under this clause is canceled or the period of the order or any extension thereof expires, the Contractor shall resume work. The Contracting Officer shall make an equitable adjustment in the delivery schedule, the estimated cost, the fee, or a combination thereof, and in any other terms of the contract that may be affected and the contract shall be modified, in writing, accordingly, if--

(1) The stop-work order results in an increase in the time required for, or in the Contractor's cost properly allowable to, the performance of any part of this contract; and

(2) The Contractor asserts a claim for the adjustment within 30 days after the end of the period of work stoppage; provided, that, if the Contracting Officer decides to justify the action, the Contracting Officer may receive and act upon the claim asserted at any time before payment under this contract.

(c) If a stop-work order is not canceled and the work covered by the order is terminated for the convenience of the Government, the Contracting Officer shall allow reasonable costs resulting from the stop-work order in the termination settlement.

(d) If a stop-work order is not canceled and the work covered by the order is terminated for default, the Contracting Officer shall allow, by equitable adjustment or otherwise, reasonable costs resulting from the stop-work order.

17. DEAR 952.212-71 PRIORITIES AND ALLOCATIONS (ATOMIC ENERGY) (JUN 1987)

The Contractor shall follow the provisions of the Defense Priorities and Allocations System (DPAS) regulation (see 15 CFR Part 350) in obtaining controlled materials and other products and materials needed to fill this contract.

18. FAR 52.215-1 EXAMINATION OF RECORDS BY COMPTROLLER GENERAL (APR 1984)

(a) This clause applies if this contract exceeds $10,000 and was entered into by negotiation.

(b) The Comptroller General of the United States or a duly authorized representative from the General Accounting Office shall, until 3 years after final payment under this contract or for any shorter period specified in Federal Acquisition Regulation (FAR) Subpart 4.7, Contractor Records Retention, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract.

(c) The Contractor agrees to include in first-tier subcontracts under this contract a clause to the effect that the Comptroller General or a duly authorized representative from the General Accounting Office shall, until 3 years after final payment under the subcontract or for any shorter period specified in FAR Subpart 4.7, have access to and the right to examine any of the subcontractor's directly pertinent books, documents,

papers, or other records involving transactions related to the subcontract. "Subcontract," as used in this clause, excludes (1) purchase orders not exceeding $10,000 and (2) subcontracts or purchase orders for public utility services at rates established to apply uniformly to the public, plus any applicable reasonable connection charge.

(d) The periods of access and examination in paragraphs (b) and (c) above for records relating to (1) appeals under the Disputes clause, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which the Comptroller General or a duly authorized representative from the General Accounting Office has taken exception shall continue until such appeals, litigation, claims, or exceptions are disposed of.

19. FAR 52.215-2 AUDIT--NEGOTIATION (DEC 1989)

(a) Examination of costs. If this is a cost-reimbursement, incentive, time-and-materials, labor-hour, or price-redeterminable contract, or any combination of these, the Contractor shall maintain-and the Contracting Officer or representatives of the Contracting Officer shall have the right to examine and audit books, records, documents, and other evidence and accounting procedures and practices, regardless of form (e.g. data bases, applications software, data base management software, utilities, etc.), sufficient to reflect properly all costs claimed to have been incurred or anticipated to be incurred in performing this contract. This right of examination shall include inspection at all reasonable times of the Contractor's plants, or parts of them, engaged in performing the contract.

(b) Cost or pricing data. If, pursuant to law, the Contractor has been required to submit cost or pricing data in connection with pricing this contract or any modification to this contract, the Contracting Officer or representatives of the Contracting Officer who are employees of the Government shall have the right to examine and audit all of the Contractor's books, records, documents, and other data, regardless of form (e.g., machine readable media such as disk, tape, etc.) or type (e.g., data bases, applications software, data base management software, utilities, etc.), including computations and projections related to proposing, negotiating, pricing, or performing the contract or modification in order to evaluate the accuracy, completeness, and currency of the cost or pricing data. The right of examination shall extend to all documents necessary to permit adequate evaluation of the cost or pricing data submitted, along with the computations and projections used.

(c) Reports. If the Contractor is required to furnish cost, funding, or performance reports, the Contracting Officer or representatives of the Contracting Officer who are employees of the Government shall have the right to examine and audit books, records, other documents, and supporting materials, for the purpose of evaluating (1) the effectiveness of the Contractor's policies and procedures to produce data compatible with the objectives of these reports and (2) the data reported.

(d) Availability. The Contractor shall make available at its office at all reasonable times the materials described in paragraphs (a) and (b) above, for examination, audit, or reproduction, until 3 years after final payment under this contract, or for any shorter period specified in Subpart 4.7, Contractor Records Retention, of the Federal Acquisition Regulation, or for any longer period required by statute or by other clauses of this contract. In addition-

(1) If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for 3 years after any resulting final termination settlement; and

(2) Records relating to appeals under the Disputes clause or to litigation or the settlement of claims arising under or relating to this contract shall be made available until such appeals, litigation, or claims are disposed of.

(e) Except as otherwise provided in FAR Subpart 4.7, Contractor Records Retention, the Contractor may transfer computer data in machine readable form from one reliable computer medium to another. The Contractor's computer data retention and transfer procedures shall maintain the integrity, reliability, and security of the original data. The contractor's choice of form or type of materials described in paragraphs (a), (b), and (c) of this clause affects neither the Contractor's obligations nor the Government's rights under this clause.

(f) The Contractor shall insert a clause containing all the terms of this clause, including this paragraph (f), in all subcontracts over $10,000 under this contract, altering the clause only as necessary to identify properly the contracting parties and the Contracting Officer under the Government prime contract.

20. FAR 52.215-33 ORDER OF PRECEDENCE (JAN 1986)

Any inconsistency in this solicitation or contract shall be resolved by giving precedence in the following order: (a) the Schedule (excluding the specifications); (b) representations and other instructions; (c) contract clauses; (d) other documents, exhibits, and attachments; and (e) the specifications.

(End of Clause)

21. FAR 52.215-22 PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA (JAN 1991)

(a) If any price, including profit or fee, negotiated in connection with this contract, or any cost reimbursable under this contract, was increased by any significant amount because--

(1) the Contractor or a subcontractor furnished cost or pricing data that were not complete, accurate, and current as certified in its Certificate of Current Cost or Pricing Data,

(2) a subcontractor or prospective subcontractor furnished the Contractor cost or pricing data that were not complete, accurate, and current as certified in the Contractor's Certificate of Current Cost or Pricing Data, or

(3) any of these parties furnished data of any description that were not accurate, the price or cost shall be reduced accordingly and the contract shall be modified to reflect the reduction.

(b) Any reduction in the contract price under paragraph (a) above due to defective data from a prospective subcontractor that was not subsequently awarded the subcontract shall be limited to the amount, plus applicable overhead and profit markup, by which (1) the actual subcontract or (2) the actual cost to the Contractor, if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor; provided, that the actual subcontract price was not itself affected by defective cost or pricing data.

(c) (1) If the Contracting Officer determines under paragraph (a) of this clause that a price or cost reduction should be made, the Contractor agrees not to raise the following matters as a defense:

(i) The Contractor or subcontractor was a sole source supplier or otherwise was in a superior bargaining position and thus the price of the contract would not have been modified even if accurate, complete, and current cost or pricing data had been submitted.

(ii) The Contracting Officer should have known that the cost or pricing data in issue were defective even though the Contractor or subcontractor took no affirmative action to bring the character of the data to the attention of the Contracting Officer.

(iii) The contract was based on an agreement about the total cost of the contract and there was no agreement about the cost of each item procured under the contract.

(iv) The Contractor or subcontractor did not submit a Certificate of Current Cost or Pricing Data.

(2) (i) Except as prohibited by subdivision (c)(2)(ii) of this clause, an offset in an amount determined appropriate by the Contracting Officer based upon the facts shall be allowed against the amount of a contract price reduction if--

(A) The Contractor certifies to the Contracting Officer that, to the best of the Contractor's knowledge and belief, the Contractor is entitled to the offset in the amount requested; and

(B) The Contractor proves that the cost or pricing data were available before the date of agreement on the price of the contract (or price of the modification) and that the data were not submitted before such date.

(ii) An offset shall not be allowed if--

(A) The understated data was known by the Contractor to be understated when the Certificate of Current Cost or Pricing Data was signed; or

(B) The Government proves that the facts demonstrate that the contract price would not have increased in the amount to be offset even if the available data had been submitted before the date of agreement on price.

(d) If any reduction in the contract price under this clause reduces the price of items for which payment was made prior to the date of the modification reflecting the price reduction, the Contractor shall be liable to and shall pay the United States at the time such overpayment is repaid --

(1) Simple interest on the amount of such overpayment to be computed from the date(s) of overpayment to the Contractor to the date the Government is repaid by the Contractor at the applicable underpayment rate effective for each quarter prescribed by the Secretary of the Treasury under 36 U.S.C. 6621(a)(2): and

(2) For Department of Defense contracts only, a penalty equal to the amount of the overpayment, if the Contractor or subcontractor knowingly submitted cost or pricing data which were incomplete, inaccurate, or noncurrent.

22. FAR 52.215-24 SUBCONTRACTOR COST OR PRICING DATA (APR 1985)

(a) Before awarding any subcontract expected to exceed $100,000 when entered into, or before pricing any subcontract modification involving a pricing adjustment expected to exceed $100,000, the Contractor shall require the subcontractor to submit cost or pricing data (actually or by specific identification in writing), unless the price is--

(1) Based on adequate price competition;

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

(b) The Contractor shall require the subcontractor to certify in substantially the form prescribed in Subsection 15.804-4 of the Federal Acquisition Regulation (FAR) that, to the best of its knowledge and belief, the data submitted under paragraph (a) above were accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract modification.

(c) In each subcontract that exceeds $100,000 when entered into, the Contractor shall insert either--

(1) The substance of this clause, including this paragraph (c), if paragraph (a) above requires submission of cost or pricing data for the subcontract; or

(2) The substance of the clause at FAR 52.215-25, Subcontractor Cost or Pricing Data-Modifications.

23. FAR 52.215-27 TERMINATION OF DEFINED BENEFIT PENSION PLANS (SEP 1989)

The Contractor shall promptly notify the Contracting Officer in writing when it determines that it will terminate a defined benefit pension plan or otherwise recpature such pension fund assets. If pension fund assets revert to the Contractor or are

constructively received by it under a termination or otherwise, the Contractor shall make a refund or give a credit to the Government for its equitable share as required by FAR 31.205-6(j)(4). The Contractor shall include the substance of this clause in all subcontracts under this contract which meet the applicability requirement of FAR 15.804(e).

24. DEAR 952.216-7 ALLOWABLE COST AND PAYMENT (JUL 1991)

(a) Invoicing. The Government shall make payments to the Contractor when requested as work progresses, but (except for small business concerns) not more often than once every 2 weeks, in amounts determined to be allowable by the Contracting Officer in accordance with Subpart 31.6 of the Federal Acquisition Regulation (FAR) in effect on the date of this contract and the terms of this contract. The Contractor may submit to an authorized representative of the Contracting Officer, in such form and reasonable detail as the representative may require, an invoice or voucher supported by a statement of the claimed allowable cost for performing this contract.

(b) Reimbursing costs.

(1) For the purpose of reimbursing allowable costs (except as provided in subparagraph (2) below, with respect to pension, deferred profit sharing, and employee stock ownership plan contributions), the term "costs" includes only--

(i) Those recorded costs that, at the time of the request for reimbursement, the Contractor has paid by cash, check, or other form of actual payment for items or services purchased directly for the contract;

(ii) When the Contractor is not delinquent in paying costs of contract performance in the ordinary course of business, costs incurred, but not necessarily paid, for--

(A) Materials issued from the Contractor's inventory and placed in the production process for use on the contract;

(B) Direct labor;

(C) Direct travel;

(D) Other direct in-house costs; and

(E) Properly allocable and allowable indirect costs, as shown in the records maintained by the Contractor for purposes of obtaining reimbursement under Government contracts; and

(iii) The amount of progress payments that have been paid to the Contractor's subcontractors under similar cost standards.

(2) Contractor contributions to any pension or other postretirement benefit, profit- sharing, or employee stock ownership plan funds that are paid quarterly or more often may be included in indirect costs for payment purposes; provided, that the Contractor pays the contribution to the fund within 30 days after the close of the period covered. Payments made 30 days or more after the close of a period shall not be included until the Contractor actually makes the payment. Accrued costs for such contributions that are paid less often than quarterly shall be excluded from indirect costs for payment purposes until the Contractor actually makes the payment.

(3) Notwithstanding the audit and adjustment of invoices or vouchers under paragraph (g) below, allowable indirect costs under this contract shall be obtained by applying indirect cost rates established in accordance with paragraph (d) below.

(4) Any statements in specifications or other documents incorporated in this contract by reference designating performance of services or furnishing of materials at the Contractor's expense or at no cost to the Government shall be disregarded for purposes of cost-reimbursement under this clause.

(c) Small business concerns. A small business concern may be paid more often than every 2 weeks and may invoice and be paid for recorded costs for items or services purchased directly for the contract, even though the concern has not yet paid for those items or services.

(d) Final indirect cost rates.

(1) Final annual indirect cost rates and the appropriate bases shall be established in accordance with Subpart 42.7 of the Federal Acquisition Regulation (FAR) in effect for the period covered by the indirect cost rate proposal.

(2) The Contractor shall, within 90 days after the expiration of each of its fiscal years, or by a later date approved by the Contracting Officer, submit to the cognizant Contracting Officer responsible for negotiating its final indirect cost rates and, if required by agency procedures, to the cognizant audit activity proposed final indirect cost rates for that period and supporting cost data specifying the contract

and/or subcontract to which the rates apply. The proposed rates shall be based on the contractor's actual cost experience for that period. The appropriate Government representative and Contractor shall establish the final indirect cost rates as promptly as practical after receipt of the Contractor's proposal.

(3) The Contractor and the appropriate Government representative shall execute a written understanding setting forth the final indirect cost rates. The understanding shall specify (i) the agree-upon final annual indirect cost rates, (ii) the bases to which the rates apply, (iii) the periods for which the rates apply, (iv) any specific indirect cost items treated as direct costs in the settlement, and (v) the affected contract and/or subcontract, identifying any with advance agreements or special terms and the applicable rates. The understanding shall not change any monetary ceiling, contract obligation, or specific cost allowance or disallowance provided for in this contract. The understanding is incorporated into this contract upon execution.

(4) Failure by the parties to agree on a final annual indirect cost rate shall be a dispute within the meaning of the Disputes clause.

(e) Billing rates. Until final annual indirect cost rates are established for any period, the Government shall reimburse the Contractor at billing rates established by the Contracting Officer or by an authorized representative (the cognizant auditor), subject to adjustment when the final rates are established. These billing rates--

(1) Shall be the anticipated final rates; and

(2) May be prospectively or retroactively revised by mutual agreement, at either party's request, to prevent substantial overpayment or underpayment.

(f) Quick-closeout procedures. When the Contractor and Contracting Officer agree, the quick-closeout procedures of Subpart 42.7 of the FAR may be used.

(g) Audit. At any time or times before final payment, the Contracting Officer may have the Contractor's invoices or vouchers and statements of cost audited. Any payment may be (1) reduced by amounts found by the Contracting Officer not to constitute allowable costs or (2) adjusted for prior overpayments or underpayments.

(h) Final payment.

(1) The Contractor shall submit a completion invoice or voucher, designated as such, promptly upon completion of the work, but no later than one year (or longer, as the Contracting Officer may approve in writing) from the completion date. Upon approval of that invoice or voucher, and upon the Contractor's compliance with all terms of this contract, the Government shall promptly pay any balance of allowable costs and that part of the fee (if any) not previously paid.

(2) The Contractor shall pay to the Government any refunds, rebates, credits, or other amounts (including interest, if any) accruing to or received by the Contractor or any assignee under this contract, to the extent that those amounts are properly allocable to costs for which the contractor has been reimbursed by the Government. Reasonable expenses incurred by the Contractor for securing refunds, rebates, credits, or other amounts shall be allowable costs if approved by the Contracting Officer. Before final payment under this contract, the Contractor and each assignee whose assignment is in effect at the time of final payment shall execute and deliver--

(i) An assignment to the Government, in form and substance satisfactory to the Contracting Officer, of refunds, rebates, credits, or other amounts (including interest, if any) properly allocable to costs for which the Contractor has been reimbursed by the Government under this contract; and

(ii) A release discharging the Government, its officers, agents, and employees from all liabilities, obligations, and claims arising out of or under this contract, except--

(A) Specified claims stated in exact amounts, or in estimated amounts when the exact amounts are not known;

(B) Claims (including reasonable incidental expenses) based upon liabilities of the Contractor to third parties arising out of the performance of this contract; provided that the claims are not known to the Contractor on the date of the execution of the release, and that the Contractor gives notice of the claims in writing to the Contracting Officer within 6 years following the release date or notice of final payment date, whichever is earlier; and

(C) Claims for reimbursement of costs, including reasonable incidental expenses, incurred by the Contractor under the patent clauses of this contract, excluding, however, any expenses arising from the Contractor's indemnification of the Government against patent liability.

25. FAR 52.216-11 COST CONTRACT--NO FEE (APR 1984)

(a) The Government shall not pay the Contractor a fee for performing this contract.

(b) After payment of 80 percent of the total estimated cost shown in the Schedule, the Contracting Officer may withhold further payment of allowable cost until a reserve is set aside in an amount that the Contracting Officer considers necessary to protect the Government's interest. This reserve shall not exceed one percent of the total estimated cost shown in the Schedule or $100,000, whichever is less.

26. FAR 52.216-12 COST-SHARING CONTRACT--NO FEE (APR 1984)

(a) The Government shall not pay to the Contractor a fee for performing this contract.

(b) After paying 80 percent of the Government's share of the total estimated cost of performance shown in the Schedule, the Contracting Officer may withhold further payment of allowable cost until a reserve is set aside in an amount that the Contracting Officer considers necessary to protect the Government's interest. This reserve shall not exceed one percent of the Government's share of the total estimated cost shown in the Schedule or $100,000, whichever is less.

27. DEAR 952.217-70 ACQUISITION OF REAL PROPERTY (APR 1984)

(a) Notwithstanding any other provision of the contract, the prior approval of the contracting officer shall be obtained when, in performance of this contract, the contractor acquires or proposes to acquire use of real property by:

(1) Purchase, on the Government's behalf or in the contractor's own name, with title eventually vesting in the Government.

(2) Lease, and the Government assumes liability for, or will otherwise pay for the obligation under the lease as a reimbursable contract cost.

(3) Acquisition of temporary interest through easement, license or permit, and the Government funds the entire cost of the temporary interest.

(b) Justification of and execution of any real property acquisitions shall be in accordance and compliance with directions provided by the contracting officer.

(c) The substance of this clause, including this paragraph (c), shall be included in any subcontract occasioned by this contract under which property described in paragraph (a) of this clause shall be acquired.

28. FAR 52.219-8 UTILIZATION OF SMALL BUSINESS CONCERNS AND SMALL DISADVANTAGED BUSINESS CONCERNS (FEB 1990)

(a) It is the policy of the United States that small business concerns and small business concerns owned and controlled by socially and economically disadvantaged individuals shall have the maximum practicable opportunity to participate in performing contracts let by any Federal agency, including contracts and subcontracts for subsystems, assemblies, components, and related services for major systems. It is further the policy of the United States that its prime contractors establish procedures to ensure the timely payment of amounts due pursuant to the terms of their subcontracts with small business concerns and small business concerns owned and controlled by socially and economically disadvantaged individuals.

(b) The Contractor hereby agrees to carry out this policy in the awarding of subcontracts to the fullest extent consistent with efficient contract performance. The Contractor further agrees to cooperate in any studies or surveys as may be conducted by the United States Small Business Administration or the awarding agency of the United States as may be necessary to determine the extent of the Contractor's compliance with this clause.

(c) As used in this contract, the term "small business concern" shall mean a small business as defined pursuant to section 3 of the Small Business Act and relevant regulations promulgated pursuant thereto. The term "small business concern owned and controlled by socially and economically disadvantaged individuals" shall mean a small business concern (1) which is at least 51 percent unconditionally owned by one or more socially and economically disadvantaged individuals; or, in the case of any publicly owned business, at least 51 per centum of the stock of which is unconditionally owned by one or more socially and economically disadvantaged individuals; and (2) whose management and daily business operations are controlled by one or more of such individuals. This term also means a small business concern that is a least 51 percent unconditionally owned by an economically disadvantaged Indian tribe or Native Hawaiian organization, or a publicly owned business having at least 51

percent of its stock unconditionally owned by one of these entities which has its management and daily business controlled by members or an economically disadvantaged Indian tribe or Native Hawaiian Organization, and which meets the requirements or 13CFR 124. The Contractor shall presume that socially and economically disadvantaged individuals include Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Asian-Indian Americans and other minorities, or any other individual found to be disadvantaged by the Administration pursuant to section 8(a) of the Small Business Act. The Contractor shall presume that socially and economically disadvantaged entities also include Indian Tribes and Native Hawaiian Organizations.

(d) Contractors acting in good faith may rely on written representations by their subcontractors regarding their status as either a small business concern or a small business concern owned and controlled by socially and economically disadvantaged individuals.

29. DEAR 952.219-9 SMALL BUSINESS AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING PLAN (JAN 1991)

(a) This clause does not apply to small business concerns.

(b) "Commercial product," as used in this clause, means a product in regular production that is sold in substantial quantities to the general public and/or industry at established catalog or market prices. It also means a product which, in the opinion of the Contracting Officer, differs only insignificantly from the Contractor's commercial product.

"Subcontract," as used in this clause, means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for performance of the contract or subcontract.

(c) The offeror, upon request by the Contracting Officer, shall submit and negotiate a subcontracting plan, where applicable, which addresses separately subcontracting with small business concerns and small disadvantaged business concerns and which shall be included in and made a part of the resultant contract. The subcontracting plan shall be negotiated within the time specified by the Contracting Officer. Failure to submit and negotiate the subcontracting plan shall make the offeror ineligible for award of a contract.

(d) The offeror's subcontracting plan shall include the following:

(1) Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business concerns and small disadvantaged business concerns as subcontractors. The offeror shall include all subcontracts that contribute to contract performance, and may include a proportionate share of products and services that are normally allocated as indirect costs.

(2) A statement of--

(i) Total dollars planned to be subcontracted;

(ii) Total dollars planned to be subcontracted to small business concerns; and

(iii) Total dollars planned to be subcontracted to small disadvantaged business concerns.

(3) A description of the principal types of supplies and services to be subcontracted, and an identification of the types planned for subcontracting to (i) small business concerns and (ii) small disadvantaged business concerns.

(4) A description of the method used to develop the subcontracting goals in (1) above.

(5) A description of the method used to identify potential sources for solicitation purposes (e.g., existing company source list, the Procurement Automated Source System (PASS) of the Small Business Administration, the National Minority Purchasing Council Vendor Information Service, the Research and Information Division of the Minority Business Development Agency in the Department of Commerce, or small and small disadvantaged business concerns trade associations).

(6) A statement as to whether or not the offeror included indirect costs in establishing subcontracting goals, and a description of the method used to determine the proportionate share of indirect costs to be incurred with (i) small business concerns and (ii) small disadvantaged business concerns.

(7) The name of the individual employed by the offeror who will administer the offeror's subcontracting program, and a description of the duties of the individual.

(8) A description of the efforts the offeror will make to assure that small business concerns and small disadvantaged business concerns have an equitable opportunity to compete for subcontracts.

(9) Assurances that the offeror will include the clause in this contract entitled "Utilization of Small Business Concerns and Small Disadvantaged Business Concerns" in all subcontracts that offer further subcontracting opportunities, and that the offeror will require all subcontractors (except small business concerns) who receive subcontracts in excess of $500,000 ($1,000,000 for construction of any public facility), to adopt a plan similar to the plan agreed to by the offeror.

(10) Assurances that the offeror will (i) cooperate in any studies or surveys as may be required, (ii) submit periodic reports in order to allow the Government to determine the extent of compliance by the offeror with the subcontracting plan, (iii) submit, not later than the 25th day of the succeeding month, Standard Form (SF) 294 only, (DOE contractors need not submit SF 295) on a quarterly basis current as the last day of March, June, September and December, and upon contract completion, in accordance with the instructions on the form except the report shall be submitted quarterly rather than semiannually and additionally shall indicate at the remarks block the number and dollar amount of award made to labor surplus area concerns to the extent such reporting is required by the terms of their contract, and (iv) ensure that its subcontractors agree to submit SF 294 in accordance with the instructions at (iii) above.

(11) A recitation of the types of records the offeror will maintain to demonstrate procedures that have been adopted to comply with the requirements and goals in the plan, including established source lists; and a description of its efforts to locate small and small disadvantaged business concerns and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated):

(i) Source lists, guides, and other data that identify small and small disadvantaged business concerns.

(ii) Organizations contacted in an attempt to locate sources that are small or small disadvantaged business concerns.

(iii) Records on each subcontract solicitation resulting in an award of more than $100,000, indicating (A) whether small business concerns were solicited and if not, why not, (B) whether small disadvantaged business concerns were solicited and if not, why not, and (C) if applicable, the reason award was not made to a small business concern.

(iv) Records of any outreach efforts to contact (A) trade associations, (B) business development organizations, and (C) conferences and trade fairs to locate small and small disadvantaged business sources.

(v) Records of internal guidance and encouragement provided to buyers through (A) workshops, seminars, training, etc., and (B) monitoring performance to evaluate compliance with the program's requirements.

(vi) On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having company or division-wide annual plans need not comply with this requirement.

(e) In order to effectively implement this plan to the extent consistent with efficient contract performance, the Contractor shall perform the following functions:

(1) Assist small business and small disadvantaged business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation by such concerns. Where the Contractor's lists of potential small business and small disadvantaged subcontractors are excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.

(2) Provide adequate and timely consideration of the potentialities of small business and small disadvantaged business concerns in all "make-or-buy" decisions.

(3) Counsel and discuss subcontracting opportunities with representatives of small and small disadvantaged business firms.

(4) Provide notice to subcontractors concerning penalties and remedies for misrepresentations of business status as small business or small disadvantaged business for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan.

(f) A master subcontracting plan on a plant or division-wide basis which contains all the elements required by (d) above, except goals, may be incorporated by reference as a part of the subcontracting plan required of the offeror by this clause; provided:

(1) the master plan has been approved,

(2) the offeror provides copies of the approved master plan and evidence of its approval to the Contracting Officer, and

(3) goals and any deviations from the master plan deemed necessary by the Contracting Officer to satisfy the requirements of this contract are set forth in the individual subcontracting plan.

(g) (1) If a commercial product is offered, the subcontracting plan required by this clause may relate to the offeror's production generally, for both commercial and noncommercial products, rather than solely to the Government contract. In these cases, the offeror shall, with the concurrence of the Contracting Officer, submit one company-wide or division-wide annual plan.

(2) The annual plan shall be reviewed for approval by the agency awarding the offeror its first prime contract requiring a subcontracting plan during the fiscal year, or by an agency satisfactory to the Contracting Officer.

(3) The approval plan shall remain in effect during the offeror's fiscal year for all of the offeror's commercial products.

(h) Prior compliance of the offeror with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the offeror for award of the contract.

(i) The failure of the Contractor or subcontractor to comply in good faith with (1) the clause of this contract entitled "Utilization of Small Business Concerns and Small Disadvantaged Business Concerns," or (2) an approved plan required by this clause, shall be a material breach of the contract.

30. FAR 52.219-13 UTILIZATION OF WOMEN-OWNED SMALL BUSINESSES (AUG 1986)

(a) "Women-owned small businesses," as used in this clause, means small business concerns that are at least 51 percent owned by women who are United States citizens and who also control and operate the business.

"Control," as used in this clause, means exercising the power to make policy decisions.

"Operate," as used in this clause, means being actively involved in the day-to-day management of the business.

"Small business concern," as used in this clause, means a concern including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria and size standards in 13 CFR 121.

(b) It is the policy of the United States that women-owned small businesses shall have the maximum practicable opportunity to participate in performing contracts awarded by any Federal agency.

(c) The Contractor agrees to use its best efforts to give women-owned small businesses the maximum practicable opportunity to participate in the subcontracts it awards to the fullest extent consistent with the efficient performance of its contract.

(d) The Contractor may rely on written representations by its subcontractors regarding their status as women-owned small businesses.

31. FAR 52.219-16 LIQUIDATED DAMAGES-SMALL BUSINESS SUBCONTRACTING PLAN (AUG 1989)

(a) "Failure to make a good faith effort to comply with the subcontracting plan," as used in this clause, means a willful or intentional failure to perform in accordance with the requirements of the subcontracting plan approved under the clause in this contract entitled "Small Business and Small Disadvantaged Business Subcontracting Plan," or willful or intentional action to frustrate the plan.

(b) If, at contract completion, or in the case of a commercial products plan, at the close of the fiscal year for which the plan is applicable, the Contractor has failed to meet its subcontracting goals and the Contracting Officer decides in accordance with paragraph (c) of this clause that the Contractor failed to make good faith effort to comply with its

subcontracting plan, established in accordance with the clause in this contract entitled Small and Small Disadvantaged Business Subcontracting Plans, the Contractor shall pay the Government liquidated damages in an amount stated. The amount of damages attributable to the Contractor's failure to comply shall be an amount equal to the actual dollar amount by which the Contractor failed to achieve each subcontract goal or, in the case of a commercial products plan, that portion of the dollar amount allocable to Government contracts by which the Contractor failed to achieve each subcontract goal.

(c) Before the Contracting Officer makes a final decision that the Contractor has failed to make such good faith effort, the Contracting Officer shall give the Contractor written notice specifying the failure and permitting the Contractor to demonstrate what good faith efforts have been made. Failure to respond to the notice may be taken as an admission that no valid explanation exists. If, after consideration of all the pertinent data, the Contracting Officer finds that the Contractor failed to make a good faith effort to comply with the subcontracting plan, the Contracting Officer shall issue a final decision to that effect and require that the Contractor pay the Government liquidated damages as provided in paragraph (b) of this clause.

(d) With respect to commercial products plans, i.e., company-wide or division-wide subcontracting plans approved under paragraph (g) of the clause in this contract entitled, Small Business and Small Disadvantaged Business Subcontracting Plan, the Contracting Officer of the agency that originally approved the plan will exercise the functions of the Contracting Officer under this clause on behalf of all agencies that awarded contracts covered by that commercial products plan.

(e) The Contractor shall have the right of appeal, under the clause in this contract entitled Disputes, from any final decision of the Contracting Officer.

(f) Liquidated damages shall be in addition to any other remedies that the Government may leave.

32. FAR 52.220-3 UTILIZATION OF LABOR SURPLUS AREA CONCERNS (APR 1984)

(a) Applicability. This clause is applicable if this contract exceeds the appropriate small purchase limitation in Part 13 of the Federal Acquisition Regulation.

(b) Policy. It is the policy of the Government to award contracts to concerns that agree to perform substantially in Labor Surplus Areas (LSA's) when this can be done consistent with the efficient performance of the contract and at prices no higher

than are obtainable elsewhere. The Contractor agrees to use its best efforts to place subcontracts in accordance with this policy.

(c) Order of preference. In complying with paragraph (b) above and with paragraph (c) of the clause of this contract entitled Utilization of Small Business Concerns and Small Disadvantaged Business Concerns, the Contractor shall observe the following order of preference in awarding subcontracts:

(1) small business concerns that are LSA concerns,

(2) other small business concerns, and

(3) other LSA concerns.

(d) Definitions.

"Labor Surplus Area," as used in this clause, means a geographical area identified by the Department of Labor in accordance with 20 CFR 654, Subpart A, as an area of concentrated unemployment or underemployment or an area of labor surplus.

"Labor surplus area concern," as used in this clause, means a concern that together with its first-tier subcontractors will perform substantially in labor surplus areas. Performance is substantially in labor surplus areas if the costs incurred under the contract on account of manufacturing, production, or performance of appropriate services in labor surplus areas exceed 50 percent of the contract price.

33. FAR 52.220-4 LABOR SURPLUS AREA SUBCONTRACTING PROGRAM (APR 1984)

(a) See the Utilization of Labor Surplus Area Concerns clause of this contract for applicable definitions.

(b) The Contractor agrees to establish and conduct a program to encourage Labor Surplus Area (LSA) concerns to compete for subcontracts within their capabilities when the subcontracts are consistent with the efficient performance of the contract at prices no higher than obtainable elsewhere. The Contractor shall--

(1) Designate a liaison officer who will (i) maintain liaison with authorized representatives of the Government on LSA matters, (ii) supervise compliance with the Utilization of Labor Surplus Area Concerns clause, and (iii) administer the Contractor's labor surplus area subcontracting program;

(2) Provide adequate and timely consideration of the potentialities of LSA concerns in all make-or-buy decisions;

(3) Ensure that LSA concerns have an equitable opportunity to compete for subcontracts, particularly by arranging solicitations, time for the preparation of offers, quantities, specifications, and delivery schedules so as to facilitate the participation of LSA concerns;

(4) Include the Utilization of LSA Concerns clause in subcontracts that offer substantial LSA subcontracting opportunities; and

(5) Maintain records showing (i) the procedures adopted and (ii) the Contractor's performance, to comply with this clause. The records will be kept available for review by the Government until the expiration of 1 year after the award of this contract, or for such longer period as may be required by any other clause of this contract or by applicable law or regulations.

(c) The Contractor further agrees to insert in any related subcontract that may exceed $500,000 and that contains the Utilization of LSA Concerns clause, terms that conform substantially to the language of this clause, including this paragraph (c), and to notify the Contracting Officer of the names of subcontractors.

34. FAR 52.222-1 NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (APR 1984)

(a) If the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this contract, the Contractor shall immediately give notice, including all relevant information, to the Contracting Officer.

(b) The Contractor agrees to insert the substance of this clause, including this paragraph (b), in any subcontract to which a labor dispute may delay the timely performance of this contract; except that each subcontract shall provide that in the event its timely performance is delayed or threatened by delay by any actual or potential labor dispute, the subcontractor shall immediately notify the next higher tier subcontractor or the prime Contractor, as the case may be, of all relevant information concerning the dispute.

35. FAR 52.222-3 CONVICT LABOR (APR 1984)

The Contractor agrees not to employ any person undergoing sentence of imprisonment in performing this contract except as provided by 18 U.S.C. 4082(c)(2) and Executive Order 11755, December 29, 1973.

36. FAR 52.222-26 EQUAL OPPORTUNITY (APR 1984)

(a) If, during any 12-month period (including the 12 months preceding the award of this contract), the Contractor has been or is awarded nonexempt Federal contracts and/or subcontracts that have an aggregate value in excess of $10,000, the Contractor shall comply with subparagraphs (b)(1) through (11) below. Upon request, the Contractor shall provide information necessary to determine the applicability of this clause.

(b) During performing this contract, the Contractor agrees as follows:

(1) The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

(2) The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to, (i) employment, (ii) upgrading, (iii) demotion, (iv) transfer, (v) recruitment or recruitment advertising, (vi) layoff or termination, (vii) rates of pay or other forms of compensation, and (viii) selection for training, including apprenticeship.

(3) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.

(4) The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(5) The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's

commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

(6) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

(7) The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor. Standard Form 100 (EEO-1), or any successor form, is the prescribed form to be filed within 30 days following the award, unless filed within 12 months preceding the date of award.

(8) The Contractor shall permit access to its books, records, and accounts by the contracting agency or the Office of Federal Contract Compliance Programs (OFCCP) for the purposes of investigation to ascertain the Contractor's compliance with the applicable rules, regulations, and orders.

(9) If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.

(10) The Contractor shall include the terms and conditions of subparagraph (b)(1) through (11) of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.

(11) The Contractor shall take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing these terms and conditions, including sanctions for noncompliance; provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of any direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

(c) Notwithstanding any other clause in this contract, disputes relative to this clause will be governed by the procedures in 41 CFR 60-1.1.

37. FAR 52.222-28 EQUAL OPPORTUNITY PREAWARD CLEARANCE OF SUBCONTRACTS (APR 1984)

Notwithstanding the clause entitled "Subcontractors," the Contractor shall not enter into a first-tier subcontract for an estimated or actual amount of $1 million or more without obtaining in writing from the Contracting Officer a clearance that the proposed subcontractor is in compliance with equal opportunity requirements and therefore is eligible for award.

38. FAR 52.222-35 AFFIRMATIVE ACTION FOR SPECIAL DISABLED AND VIETNAM ERA VETERANS (APR 1984)

(a) Definitions. "Appropriate office of the State employment service system," as used in this clause, means the local office of the Federal-State national system of public employment offices assigned to serve the area where the employment opening is to be filled, including the District of Columbia, Guam, Puerto Rico, Virgin Islands, American Samoa, and the Trust Territory of the Pacific Islands.

"Openings that the Contractor proposes to fill from within its own organization," as used in this clause, means employment openings for which no one outside the Contractor's organization (including any affiliates, subsidiaries, and the parent companies) will be considered and includes any openings that the Contractor proposes to fill from regularly established "recall" lists.

"Openings that the Contractor proposes to fill under a customary and traditional employer-union hiring arrangement," as used in this clause, means employment openings that the Contractor proposes to fill from union halls, under their customary and traditional employer-union hiring relationship.

"Suitable employment openings," as used in this clause--

(1) Includes, but is not limited to, openings that occur in jobs categorized as--

(i) Production and nonproduction;

(ii) Plant and office;

(iii) Laborers and mechanics;

(iv) Supervisory and nonsupervisory;

(v) Technical; and

(vi) Executive, administrative, and professional positions compensated on a salary basis of less than $25,000 a year; and

(2) Includes full-time employment, temporary employment of over 3 days, and part-time employment, but not openings that the Contractor proposes to fill from within its own organization or under a customary and traditional employer-union hiring arrangement, nor openings in an educational institution that are restricted to students of that institution.

(b) General.

(1) Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against the individual because the individual is a special disabled or Vietnam Era veteran. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified special disabled and Vietnam Era veterans without discrimination based upon their disability or veterans' status in all employment practices such as--

(i) Employment;

(ii) Upgrading;

(iii) Demotion or transfer;

(iv) Recruitment;

(v) Advertising;

(vi) Layoff or termination;

(vii) Rates of pay or other forms of compensation; and

(viii) Selection for training, including apprenticeship.

(2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Vietnam Era Veterans' Readjustment Assistance Act of 1972 (the Act), as amended.

(c) Listing openings.

(1) The Contractor agrees to list all suitable employment openings existing at contract award or occurring during contract performance, at an appropriate office of the State employment service system in the locality where the opening occurs. These openings include those occurring at any Contractor facility, including one not connected with performing this contract. An independent corporate affiliate is exempt from this requirement.

(2) State and local government agencies holding Federal contracts of $10,000 or more shall also list all their suitable openings with the appropriate office of the State employment service.

(3) The listing of suitable employment openings with the State employment service system is required at least concurrently with using any other recruitment source or effort and involves the obligations of placing a bona fide job order, including accepting referrals of veterans and nonveterans. This listing does not require hiring any particular job applicant or hiring from any particular group of job applicants and is not intended to relieve the Contractor from any requirements of Executive orders or regulations concerning nondiscrimination in employment.

(4) Whenever the Contractor becomes contractually bound to the listing terms of this clause, it shall advise the State employment service system, in each State where it has establishments, of the name and location of each hiring location in the State. As long as the Contractor is contractually bound to these terms and has so advised the State system, it need not advise the State system of subsequent contracts. The Contractor may advise the State system when it is no longer bound by this contract clause.

(5) Under the most compelling circumstances, an employment opening may not be suitable for listing, including situations when (i) the Government's needs cannot reasonably be supplied, (ii) listing would be contrary to national security, or (iii) the requirement of listing would not be in the Government's interest.

(d) Applicability.

(1) This clause does not apply to the listing of employment openings which occur and are filled outside the 50 states, the District of Columbia, Puerto Rico, Guam, Virgin Islands, American Samoa, and the Trust Territory of the Pacific Islands.

(2) The terms of paragraph (c) above of this clause do not apply to openings that the Contractor proposes to fill from within its own organization or under a customary and traditional employer-union hiring arrangement. This exclusion does not apply to a particular opening once an employer decides to consider applicants outside of its own organization or employer-union arrangement for that opening.

(e) Postings.

(1) The Contractor agrees to post employment notices stating (i) the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified special disabled veterans and veterans of the Vietnam era, and (ii) the rights of applicants and employees.

(2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. They shall be in a form prescribed by the Director, Office of Federal Contract Compliance Programs, Department of Labor (Director), and provided by or through the Contracting Officer.

(3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of the Act, and is committed to take affirmative action to employ, and advance in employment, qualified special disabled and Vietnam Era veterans.

(f) Noncompliance.

If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.

(g) Subcontracts.

The Contractor shall include the terms of this clause in every subcontract or purchase order of $10,000 or more unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Director to enforce the terms, including action for noncompliance.

39. FAR 52.222-36 AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS (APR 1984)

(a) General.

(1) Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against any employee or applicant because of physical or mental handicap. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap in all employment practices such as--

(i) Employment;

(ii) Upgrading;

(iii) Demotion or transfer;

(iv) Recruitment;

(v) Advertising;

(vi) Layoff or termination;

(vii) Rates of pay or other forms of compensation; and

(viii) Selection for training, including apprenticeship.

(2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Rehabilitation Act of 1973 (29 U.S.C. 793) (the Act), as amended.

(b) Postings.

(1) The Contractor agrees to post employment notices stating (i) the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified handicapped individuals and (ii) the rights of applicants and employees.

(2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. They shall be in a form prescribed by the Director, Office of Federal Contract Compliance Programs, Department of Labor (Director), and provided by or through the Contracting Officer.

(3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Section 503 of the Act and is committed to take affirmative action to employ, and advance in employment, qualified physically and mentally handicapped individuals.

(c) Noncompliance. If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.

(d) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order in excess of $2,500 unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Director to enforce the terms, including action for noncompliance.

40. FAR 52.222-37 EMPLOYMENT REPORTS ON SPECIAL DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA (JAN 1988)

(a) The contractor shall report at least annually, as required by the Secretary of Labor, on:

(1) The number of special disabled veterans and the number of veterans of the Vietnam era in the workforce of the contractor by job category and hiring location; and

(2) The total number of new employees hired during the period covered by the report, and of that total, the number of special disabled veterans, and the number of veterans of the Vietnam era.

(b) The above items shall be reported by completing the form entitled "Federal Contractor Veterans' Employment Report VETS-100."

(c) Reports shall be submitted no later than March 31 of each year beginning March 31, 1988.

(d) The employment activity report required by paragraph (a)(2) of this clause shall reflect total hires during the most recent 12-month period as of the ending date selected for the employment profile report required by paragraph (a)(1) of this clause. Contractors may select an ending date: (1) As of the end of any pay period during the period January through March 1st of the year the report is due, or (2) as of December 31, if the

contractor has previous written approval from the Equal Employment Opportunity Commission to do so for purposes of submitting the Employer Information Report EEO-1 (Standard Form 100).

(e) The count of veterans reported according to paragraph (a) of this clause shall be based on voluntary disclosure. Each contractor subject to the reporting requirements at 38 U.S.C. 2012(d) shall invite all special disabled veterans and veterans of the Vietnam era who wish to benefit under the affirmative action program at 38 U.S.C. 2012 to identify themselves to the contractor. The invitation shall state that the information is voluntarily provided, that the information will be kept confidential, that disclosure or refusal to provide the information will not subject the applicant or employee to any adverse treatment and that the information will be used only in accordance with the regulations promulgated under 38 U.S.C. 2012.

(f) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order of $10,000 or more unless exempted by rules, regulations, or orders of the Secretary.

41. FAR 52.222-41 SERVICE CONTRACT ACT OF 1965, AS AMENDED (MAY 1989)

(a) Definitions. "Act," as used in this clause, means the Service Contract Act of 1965, as amended (41. U.S.C. 351, et seq.).

"Contractor," as used in this clause or in any subcontract, shall be deemed to refer to "Government Prime Contractor."

"Service employee," as used in this clause, means any person engaged in the performance of this contract other than any person employed in a bona fide executive, administrative, or professional capacity as these terms are defined in Part 541 of Title 29, Code of Federal Regulations, as revised. It includes all such persons regardless of any contractual relationship that may be alleged to exist between a Contractor or subcontractor and such persons.

(b) Applicability. This contract is subject to the following provisions and to all other applicable provisions of the Act and regulations of the Secretary of Labor (29 CFR Part 4). This clause does not apply to contracts or subcontracts administratively exempted by the Secretary of Labor or exempted by 41 U.S.C. 356, as interpreted in Subpart C of 29 CFR Part 4.

(c) Compensation. (1) Each service employee employed in the performance of this contract by the Contractor or any subcontractor shall be paid not less than the minimum monetary wages and shall be furnished fringe benefits in accordance with the wages and fringe benefits determined by the Secretary of Labor, or authorized representative, as specified in any wage determination attached to this contract.

(2) (i) If a wage determination is attached to this contract, the Contractor shall classify any class of service employee which is not listed therein and which is to be employed under the contract (i.e., the work to be performed is not performed by any classification listed in the wage determination) so as to provide a reasonable relationship (i.e., appropriate level of skill comparison) between such unlisted classifications and the classifications listed in the wage determination. Such conformed class of employees shall be paid the monetary wages and furnished the fringe benefits as are determined pursuant to the procedures in this paragraph (c).

(ii) This conforming procedure shall be initiated by the Contractor prior to the performance of contract work by the unlisted class of employee. The Contractor shall submit Standard Form (SF) 1444, Request for Authorization of Additional Classification and Rate, to the Contracting Officer no later than 30 days after the unlisted class of employee performs any contract work. The Contracting Officer shall review the proposed classification and rate and promptly submit the completed SF 1444 (which must include information regarding the agreement or disagreement of the employees' authorized representatives or the employees' themselves together with the agency recommendation), and all pertinent information to the Wage and Hour Division, Employment Standards Administration U.S. Department of Labor. The Wage and Hour Division will approve, modify, or disapprove the action or render a final determination in the event of disagreement within 30 days of receipt or will notify the Contracting Officer within 30 days of receipt that additional time is necessary.

(iii) The final determination of the conformance action by the Wage and Hour division shall be transmitted to the Contracting Officer who shall promptly notify the Contractor of the action taken. Each affected employee shall be furnished by the Contractor with a written copy of such determination or it shall be posted as a part of the wage determination.

(iv) (A) The process of establishing wage and fringe benefit rates that bear a reasonable relationship to those listed in a wage determination cannot be reduced to any single formula. The approach used may vary from wage determination to wage determination depending on the circumstances. Standard wage

and salary administration practices which rank various job classifications by pay grade pursuant to point schemes or other job factors may, for example, be relied upon. Guidance may also be obtained from the way different jobs are rated under Federal pay systems (Federal Wage Board Pay System and the General Schedule) or from other wage determinations issued in the same locality. Basic to the establishment of any conformable wage rate(s) is the concept that a pay relationship should be maintained between job classifications based on the skill required and the duties performed.

(B) In the case of a contract modification, an exercise of an option or extension of an existing contract, or in any other case where a contractor succeeds a contract under which the classification in question was previously conformed pursuant to paragraph (c) of this clause, a new conformed wage rate and fringe benefits may be assigned to such conformed classification by indexing (i.e., adjusting) the previous conformed rate and fringe benefits by an amount equal to the average (mean) percentage increase (or decrease, where appropriate) between the wages and fringe benefits specified for all classifications to be used on the contract which are listed in the current wage determination, and those specified for the corresponding classifications in the previously applicable wage determination. Where conforming actions are accomplished in accordance with this paragraph prior to the performance of contract work by the unlisted class of employees, the Contractor shall advise the Contracting Officer of the action taken but the other procedures in subdivision (c)(2)(ii) of this clause need not be followed.

(C) No employee engaged in performing work on this contract shall in any event be paid less than the currently applicable minimum wage specified under section 6(a)(1) of the Fair Labor Standards Act of 1938, as amended.

(v) The wage rate and fringe benefits finally determined pursuant to paragraph (c)(2) of this clause shall be paid to all employees performing in the classification from the first day on which contract work is performed by them in the classification. Failure to pay such unlisted employees the compensation agreed upon by the interested parties and/or finally determined by the Wage and Hour Division retroactive to the date such class of employees commenced contract work shall be a violation of the Act and this contract.

(vi) Upon discovery of failure to comply with subparagraph (c) of this clause, the Wage and Hour Division shall make a final determination of conformed classification, wage rate, and/or fringe benefits which shall be retroactive to the date such class of employees commenced contract work.

(3) Adjustment of Compensation. If the term of this contract is more than 1 year, the minimum monetary wages and fringe benefits required to be paid or furnished thereunder to service employees under this contract shall be subject to adjustment after 1 year and not less often than once every 2 years, under wage determinations issued by the Wage and Hour Division.

(d) Obligation to Furnish Fringe Benefits. The contractor or subcontractor may discharge the obligation to furnish fringe benefits specified in the attachment or determined under subparagraph (c)(2) of this clause by furnishing equivalent combinations of bona fide fringe benefits, or by making equivalent or differential cash payments only in accordance with Subpart D of 29 CFR Part 4.

(e) Minimum Wage. In the absence of a minimum wage attachment for this contract, neither the contractor nor any subcontractor under this contract shall pay any person performing work under the contract (regardless of whether the person is a service employee) less than the minimum wage specified by section 6(a)(1) of the Fair Labor Standards Act of 1938. Nothing in this provision shall relieve the contractor or any subcontractor of any other obligation under law or contract for the payment of a higher wage to any employee.

(f) Successor Contracts. If this contract succeeds a contract, subject to the Service Contract Act of 1965 as amended, under which substantially the same services were furnished in the same locality and service employees were paid wages and fringe benefits provided for in a collective bargaining agreement, in the absence of the minimum wage attachment for this contract setting forth such collectively bargained wage rates and fringe benefits, neither the Contractor nor any subcontractor under this contract shall pay any service employee performing any of the contract work (regardless of whether or not such employee was employed under the predecessor contract), less than the wages and fringe benefits provided for in such collective bargaining agreement, to which such employee would have been entitled if employed under the predecessor contract, including accrued wages and fringe benefits and any prospective increases in wages and fringe benefits provided for under such agreement. No Contractor or subcontractor under this contract may be relieved of the foregoing obligation unless the limitations of 29 CFR Part 4.1b(b) apply or unless the Secretary of Labor or the Secretary's authorized representative finds, after a hearing as provided in 29 CFR Part 4.10 that the wages and/or fringe benefits provided for in such agreement are substantially at variance with those which prevail for services of a character similar in the locality, or determines, as provided in 29 CFR Part 4.11, that the collective bargaining agreement applicable to service

employees employed under the predecessor contract was not entered into as a result of arm's-length negotiations. Where it is found in accordance with the review procedures provided in 29 CFR 4.10 and/or 4.11 and Parts 6 and 8 that some or all of the wages and/or fringe benefits contained in a predecessor contractor's collective bargaining agreement are substantially at variance with those which prevail for services of a character similar in the locality, and/or that the collective bargaining agreement applicable to service employees employed under the predecessor contract was not entered into as a result of arm's-length negotiations, the Department will issue a new or revised wage determination setting forth the applicable wage rates and fringe benefits. Such determination shall be made part of the contract or subcontract, in accordance with the decision of the Administrator, the Administrative Law Judge, or the Board of Service Contract Appeals, as the case may be, irrespective of whether such issuance occurs prior to or after the award of a contract or subcontract. 53 Comp. Gen 401(1973). In the case of a wage determination issued solely as a result of a finding of substantial variance, such determination shall be effective as of the date of the final administrative decision.

(g) Notification to Employees. The Contractor and any subcontractor under this contract shall notify each service employee commencing work on this contract of the minimum monetary wage and any fringe benefits required to be paid pursuant to this contract, or shall post the wage determination attached to this contract. The poster provided by the Department of Labor (Publication WH 1313) shall be posted in a prominent and accessible place at the worksite. Failure to comply with this requirement is a violation of Section 2(a)(4) of the Act and of this contract.

(h) Safe and Sanitary Working Conditions. The contractor or subcontractor shall not permit any part of the services called for by this contract to be performed in buildings or surroundings or under working conditions provided by or under the control or supervision of the contractor or subcontractor which are unsanitary or hazardous or dangerous to the health or safety of service employees engaged to furnish these services, and the contractor or subcontractor shall comply with the safety and health standards applied under 29 CFR Part 1925.

(i) Records.

(1) The contractor and each subcontractor performing work subject to the Act shall make and maintain for 3 years from the completion of the work, and make them available for inspection and transcription by authorized representatives of the Wage and Hour Division, Employment Standards Administration, a record of the following:

(i) For each employee subject to the Act--

(A) Name and address and social security number;

(B) Correct work classification or classifications, rate or rates of monetary wages paid and fringe benefits provided, rate or rates of fringe benefits payments in lieu of fringe benefits, and total daily and weekly compensation.

(C) Daily and weekly hours worked by each employee; and

(D) Any deductions, rebates, or refunds from the total daily or weekly compensation of each employee.

(ii) For those classes of services employees not included in any wage determination attached to this contract, wage rates or fringe benefits determined by the interested parties or by the Administrator or authorized representative under the terms of paragraph (c) of this clause. A copy of the report required by subdivision (c)(2)(ii) of this clause will fulfill this requirement.

(iii) Any list of the predecessor Contractor's employees which had been furnished to the Contractor as prescribed by paragraph (n) of this clause.

(2) The contractor shall also make available a copy of this contract for inspection or transcription by authorized representatives of the Wage and Hour Division.

(3) Failure to make and maintain or to make available such records for inspection and transcription shall be a violation of the regulations and this contract, and in the case of failure to produce such records, the contracting officer, upon direction of the Department of Labor and notification of the contractor, shall take action to cause suspension of any further payment or advance of funds until such violation ceases.

(4) The contractor shall permit authorized representatives of the Wage and Hour Division to conduct interviews with employees at the worksite during normal working hours.

(j) Pay Periods. The contractor shall unconditionally pay to each employee subject to the Act all wages due free and clear and without subsequent deduction (except as otherwise provided by law or Regulations, 29 CFR Part 4), rebate, or kickback on any

account. These payments shall be made no later than one pay period following the end of the regular pay period in which such wages were earned or accrued. A pay period under this Act may not be of any duration longer than semi-monthly.

(k) Withholding of Payments and Termination of Contract. The contracting officer shall withhold or cause to be withheld from the Government prime contractor under this or any other Government contract with the prime contractor such sums as an appropriate official of the Department of Labor requests or such sums as the contracting officer decides may be necessary to pay underpaid employees employed by the contractor or subcontractor. In the event of failure to pay any employees subject to the Act all or part of the wages or fringe benefits due under the Act, the agency may, after authorization or by direction of the Department of Labor and written notification to the contractor, take action to cause suspension of any further payment or advance of funds until such violations have ceased. Additionally, any failure to comply with the requirements of these clauses relating to the Service Contract Act of 1965, may be grounds for termination of the right to proceed with the contract work. In such event, the Government may enter into other contracts or arrangements for completion of the work, charging the contractor in default with any additional cost.

(l) Subcontracts. The contractor agrees to insert this clause in all subcontracts subject to the Act.

(m) Collective Bargaining Agreements Applicable to Service Employees. If wages to be paid or fringe benefits to be furnished any service employees employed by the Government Prime Contractor or any subcontractor under the contract are provided for in a collective bargaining agreement which is or will be effective during any period in which the contract is being performed, the Government Prime Contractor shall report such fact to the Contracting Officer, together with full information as to the application and accrual of such wages and fringe benefits, including any prospective increases, to service employees engaged in work on the contract, and a copy of the collective bargaining agreement. Such report shall be made upon commencing performance of the contract, in the case of collective bargaining agreements effective at such time, and in the case of such agreements or provisions or amendments thereof effective at a later time during the period of contract performance, such agreements shall be reported promptly after negotiation thereof.

(n) Seniority List. Not less than 10 days prior to completion of any contract being performed at a Federal facility where service employees may be retained in the performance of the succeeding contract and subject to a wage determination which contains vacation or other benefit provisions based upon length

of service with a contractor (predecessor) or successor (29 CFR 4.173), the incumbent Prime Contractor shall furnish to the Contracting Officer a certified list of the names of all service employees on the contractor's or subcontractor's payroll during the last month of contract performance. Such list shall also contain anniversary dates of employment on the contract either with the current or predecessor contractors of each such service employee. The contracting officer shall turn over such list to the successor contractor at the commencement of the succeeding contract.

(o) Rulings and Interpretations. Rulings and interpretations of the Service Contract Act of 1965, as amended, are contained in Regulations, 29 CFR Part 4.

(p) Contractor's Certification.

(1) By entering into this contract, the Contractor (and officials thereof) certifies that neither it (nor he or she) nor any person or firm who has a substantial interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of the sanctions imposed pursuant to Section 5 of the Act.

(2) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract pursuant to Section 5 of the Act.

(3) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

(q) Variations, Tolerances, and Exemptions Involving Employment. Notwithstanding any of the clauses in paragraphs (b) through (o) of this clause relating to the Service Contract Act of 1965, the following employees may be employed in accordance with the following variations, tolerances, and exemptions, which the Secretary of Labor, pursuant to Section 4(b) of the Act prior to its amendment by Public Law 92-473, found to be necessary and proper in the public interest or to avoid serious impairment of the conduct of Government business:

(1) Apprentices, student-learners, and workers whose earning capacity is impaired by age, physical, or mental deficiency or injury may be employed at wages lower than the minimum wages otherwise required by Section 2(a)(1) or 2(b)(1) of the Service Contract Act without diminishing any fringe benefits or cash payments in lieu thereof required under Section 2(a)(2) of that Act, in accordance with the conditions and procedures prescribed for the employment of apprentices, student-learners,

handicapped persons, and handicapped clients of sheltered workshops under Section 14 of the Fair Labor Standards Act of 1938, in the regulations issued by the Administrator (29 CFR Parts 520, 521, 524 and 525).

(2) The Administrator will issue certificates under the Act for the employment of apprentices, student-learners, handicapped persons, or handicapped clients of sheltered workshops not subject to the Fair Labor Standards Act of 1938, or subject to different minimum rates of pay under the two acts, authorizing appropriate rates of minimum wages (but without changing requirements concerning fringe benefits or supplementary cash payments in lieu thereof), applying procedures prescribed by the applicable regulations issued under the Fair Labor Standards Act of 1938 (29 CFR Parts 520, 521, 524 and 525).

(3) The Administrator will also withdraw, annul, or cancel such certificates in accordance with the regulations in 29 CFR Parts 525 and 528.

(r) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they perform when they are employed and individually registered in a bona fide apprenticeship program registered with a State Apprenticeship Agency which is recognized by the U. S. Department of Labor, or if no such recognized agency exists in a State, under a program registered with the Bureau of Apprenticeship and Training, Employment and Training Administration, U. S. Department of Labor. Any employee who is not registered as an apprentice in an approved program shall be paid the wage rate and fringe benefits contained in the applicable wage determination for the journeyman classification of work actually performed. The wage rates paid apprentices shall not be less than the wage rate for their level of progress set forth in the registered program, expressed as the appropriate percentage of the journeyman's rate contained in the applicable wage determination. The allowable ratio of apprentices to journeymen employed on the contract work in any craft classification shall not be greater than the ratio permitted to the contractor as to his entire work force under the registered program.

(s) Tips. An employee engaged in an occupation in which he or she customarily and regularly receives more than $30 a month in tips may have the amount of tips credited by the employer against the minimum wage required by Section 2(a)(i) or Section 2(b)(1) of the Act in accordance with Section 3(m) of the Fair Labor Standards Act and Regulations, 29 CFR Part 531: Provided, however, that the amount of such credit may not exceed $1.34 per hour beginning January 1, 1981. To use this provision:

(1) The employer must inform tipped employees about this tip credit allowance before the credit is utilized;

(2) The employees must be allowed to retain all tips (individually or through a pooling arrangement and regardless of whether the employer elects to take a credit for tips received);

(3) The employer must be able to show by records that the employee receives at least the applicable Service Contract Act minimum wage through the combination of direct wages and tip credit; and

(4) The use of such tip credit must have been permitted under any predecessor collective bargaining agreement applicable by virtue of Section 4(c) of the Act.

(t) Disputes Concerning Labor Standards. The U.S. Department of Labor has set forth in 29 CFR Parts 4, 6, and 8 procedures for resolving disputes concerning labor standards requirements. Such disputes shall be resolved in accordance with those procedures and not the Disputes clause of this contact. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

42. FAR 52.222-42 STATEMENT OF EQUIVALENT RATES FOR FEDERAL HIRES (MAY 1989)

In compliance with the Service Contract Act of 1965, as amended, and the regulations of the Secretary of Labor (29 CFR Part 4), this clause identifies the classes of service employees expected to be employed under the contract and states the wages and fringe benefits payable to each if they were employed by the contracting agency subject to the provisions of 5 U.S.C. 5341 or 5332.

This Statement is for Information Only: It is Not a Wage Determination

Employee class	Monetary wage--Fringe benefits
Supervisory Firefighters/GS-081-7 (Station Chief)	22,214/yr.*
Lead Firefighter/GS-081-5	19,992/yr.*
Firefighter/GS-081-5	17.937/yr.*
Firefighter (Trainee II)/GS-081-4	16,031/yr.*
Firefighter (Trainee I)/GS-081-3	14,281/yr.*
Secretary/GS-318-4	16,031/yr.*

*Fringe Benefits:

FDC-E

Annual Leave. Employees earn vacation or "annual" leave. The amount earned caries with the length of Federal Service. Employees earn 13 days of annual leave each year the first three years of employment, 20 days per year for 3 to 15 years. Under certain conditions, time spent in the military service is creditable towards leave earnings rates for annual leave.

Sick Leave. Regardless of the length of service employees earn 13 days of sick leave each year. Sick leave not used accumulates year after year and protects employees from loss and salary due to an extended illness. Accumulated sick leave also enhances retirement benefits.

Health Insurance. Employees can enroll in one of a variety of health plans. Regardless of the plan selected, employees and the Government contribute to the plan.

Life Insurance. Federal employees are eligible for basic life insurance and may select optional life insurance. This coverage will be based on their annual salary and will include payments for loss of limbs and/or eyesight in addition to accidental death.

Retirement. A bill creating a new retirement plan has recently been signed into law for Federal employees hired since January 1, 1987, and provides Social Security benefits earned through Federal employment; a modified retirement plan for which employees will pay 1.3 percent of their salary; and an optional, tax-deferred thrift savings plan with government-matching contributions.

43. FAR 52.223-2 CLEAN AIR AND WATER (APR 1984)

NOTE: This clause applies to this contract only if the price is (a) in excess of $100,000; (b) a facility to be used has been the subject of a conviction under the applicable portion of the Air Act (42 U.S.C. 7413(c)(1)) or the Water Act (33 U.S.C. 1319(c)) and is listed by EPA as a violating facility; or (c) the acquisition is not exempt under FAR 23.104.

(a) "Air Act," as used in this clause, means the Clean Air Act (42 U.S.C. 7401 et seq.).

"Clean air standards," as used in this clause, means--

(1) Any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, work practices, or other requirements contained in, issued under, or otherwise adopted under the Air Act or Executive Order 11738;

(2) An applicable implementation plan as described in section 110(d) of the Air Act (42 U.S.C. 7410(d));

(3) An approved implementation procedure or plan under section 111(c) or section 111(d) of the Air Act (42 U.S.C. 7411(c) or (d)); or

(4) An approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 7412(d)).

"Clean water standards," as used in this clause, means any enforceable limitation, control, condition, prohibition, standard, or other requirement promulgated under the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by local government to ensure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. 1317).

"Compliance," as used in this clause, means compliance with--

(1) Clean air or water standards; or

(2) A schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency, or an air or water pollution control agency under the requirements of the Air Act or Water Act and related regulations.

"Facility," as used in this clause, means any building, plant, installation, structure, mine, vessel or other floating craft, location, or site of operations, owned, leased, or supervised by a Contractor or subcontractor, used in the performance of a contract or subcontract. When a location or site of operations includes more than one building, plant, installation, or structure, the entire location or site shall be deemed a facility except when the Administrator, or a designee, of the Environmental Protection Agency, determines that independent facilities are collocated in one geographical area.

"Water Act," as used in this clause, means Clean Water Act (33 U.S.C. 1251 et seq.).

(b) The Contractor agrees--

(1) To comply with all the requirements of section 114 of the Clean Air Act (42 U.S.C. 7414) and section 308 of the Clean Water Act (33 U.S.C. 1318) relating to inspection, monitoring, entry, reports, and information, as well as other

requirements specified in section 114 and section 308 of the Air Act and the Water Act, and all regulations and guidelines issued to implement those acts before the award of this contract;

(2) That no portion of the work required by this prime contract will be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities on the date when this contract was awarded unless and until the EPA eliminates the name of the facility from the listing;

(3) To use best efforts to comply with clean air standards and clean water standards at the facility in which the contract is being performed; and

(4) To insert the substance of this clause into any nonexempt subcontract, including this subparagraph (b)(4).

44. FAR 52.223-3 HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA (DEC 1989)

DELETE

(a) The Contractor agrees to submit a Material Safety Data Sheet (Department of Labor Form OSHA-20), as prescribed in Federal Standard No. 313B, for all hazardous materials 5 days before delivery of the material, whether or not listed in Appendix A of the Standard. This obligation applies to all materials delivered under this contract which will involve exposure to hazardous materials or items containing these materials.

(b) "Hazardous material," as used in this clause, is as defined in Federal Standard No. 313B, in effect on the date of this contract.

DELETE

(c) Neither the requirements of this clause nor any act or failure to act by Government shall relieve the Contractor of any responsibility or liability for the safety of Government, Contractor, or subcontractor personnel or property.

(d) Nothing contained in this clause shall relieve the Contractor from complying with applicable Federal, state and local laws, codes, ordinances, and regulations (including the obtaining of licenses and permits) in connection with hazardous material.

(e) The Government's rights in data furnished under this contract with respect to hazardous material are as follows:

(1) To use, duplicate, and disclose any data to which this clause is applicable. The purposes of this right are to (i) apprise personnel of the hazards to which they may be exposed in using, handling, packaging, transporting, or disposing of

hazardous materials; (ii) obtain medical treatment for those affected by the material; and (iii) have others use, duplicate, and disclose the data for the Government for these purposes.

(2) To use, duplicate, and disclose data furnished under this clause, in accordance with subparagraph (e)(1) above, in precedence over any other clause of this contract providing for rights in data.

(3) That the Government is not precluded from using similar or identical data acquired from other sources.

(4) That the data shall not be duplicated, disclosed, or released outside the Government, in whole or in part for any acquisition or manufacturing purpose, if the following legend is marked on each piece of data to which this clause applies--

"This is furnished under United States Government Contract No. ..... and shall not be used, duplicated, or disclosed for any acquisition or manufacturing purpose without the permission of..... This legend shall be marked on any reproduction of this data."

(5) That the Contractor shall not place the legend or any other restrictive legend on any data which (i) the Contractor or any subcontractor previously delivered to the Government without limitations or (ii) should be delivered without limitations under the conditions specified in the Federal Acquisition Regulation in the clause at 52.227-14, Rights in Data.

(f) The Contractor shall insert this clause, including this paragraph (f), with appropriate changes in the designation of the parties, in subcontracts at any tier (including purchase designations or purchase orders) under this contract involving hazardous material.

45. FAR 52.223-6 DRUG-FREE WORKPLACE (JUL 1990)

(a) Definitions. As used in this clause,

"Controlled substance" means a controlled substance in schedules I through V of section 202 of the Controlled Substances Act (21 U.S.C. 812) and as further defined in regulation at 21 CFR 1308.11 - 1308.15.

"Conviction" means a finding of guilt (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the Federal or State criminal drug statutes.

DELETE

"Criminal drug statute" means the Federal or non-Federal criminal statute involving the manufacture, distribution, dispensing, possession or use of any controlled substance.

"Drug-free workplace" means a site(s) for the performance of work done by the Contractor in connection with a specific contract at which employees of the contractor are prohibited from engaging in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance.

"Employee" means an employee of a Contractor directly engaged in the performance of work under a Government contract.

"Directly engaged" is defined to include all direct cost employees and any other Contractor employee who has other than a minimal impact or involvement in contract performance.

"Individual" means an offeror/contractor that has no more than one employee including the offeror/contractor.

(b) The Contractor, if other than an individual, shall--within 30 calendar days after award (unless a longer period is agreed to in writing for contracts of 30 calendar days or more performance duration); or as soon as possible for contracts of less than 30 calendar days performance duration--

DELETE

(1) Publish a statement notifying its employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition;

(2) Establish an ongoing drug-free awareness program to inform such employees about--

(i) The dangers of drug abuse in the workplace;

(ii) The contractor's policy of maintaining a drug-free workplace;

(iii) Any available drug counseling, rehabilitation, and employee assistance programs; and

(iv) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace.

(3) Provide all employees engaged in performance of the contract with a copy of the statement required by subparagraph (b)(1) of this clause;

(4) Notify such employees in writing in the statement required by subparagraph (b)(1) of this clause that, as a condition of continued employment of this contract, the employee will--

(i) Abide by the terms of the statement; and

(ii) Notify the employer in writing of the employee's conviction under a criminal drug statute for a violation occurring in the workplace no later than five (5) calendar days after such conviction.

(5) Notify the Contracting Officer in writing within 10 calendar days after receiving notice under subdivision (b)(4)(ii) of this clause, from an employee or otherwise receiving actual notice of such conviction. The notice shall include the position title of the employee;

(6) Within 30 calendar days after receiving notice under subdivision (b)(4)(ii) of this clause of a conviction, take one of the following actions with respect to any employee who is convicted of drug abuse violations occurring in the workplace:

(i) Taking appropriate personnel action against such employee, up to and including termination; or

(ii) Require such employee to satisfactorily participate in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency.

(7) Make a good faith effort to maintain a drug-free workplace through implementation of subparagraphs (b)(1) though (b)(6) of this clause.

(c) The Contractor, if an individual, agrees by award of the contract or acceptance of a purchase order, not to engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in the performance of this contract.

(d) In addition to other remedies available to the Government, the Contractor's failure to comply with the requirements of paragraphs (b) or (c) of this clause may, pursuant to FAR 23.506, render the contractor subject to suspension of contract payments, termination of the contract for default, and suspension or debarment.

DELETE

46. DEAR 952.223-75 PRESERVATION OF INDIVIDUAL OCCUPATIONAL RADIATION EXPOSURE RECORDS (APR 1984)

Individual occupational radiation exposure records generated in the performance of work under this contract shall be subject to inspection by DOE and shall be preserved by the Contractor until disposal is authorized by DOE or at the option of the Contractor delivered to DOE upon completion or termination of the contract. If the Contractor exercises the foregoing option, title to such records shall vest in DOE upon delivery.

47. FAR 52.224-1 PRIVACY ACT NOTIFICATION (APR 1984)

The Contractor will be required to design, develop, or operate a system of records on individuals, to accomplish an agency function subject to the Privacy Act of 1974, Public Law 93-579, December 31, 1974 (5 U.S.C. 552a) and applicable agency regulations. Violation of the Act may involve the imposition of criminal penalties.

48. FAR 52.224-2 PRIVACY ACT (APR 1984)

(a) The Contractor agrees to-

(1) Comply with the Privacy Act of 1974 (the Act) and the agency rules and regulations issued under the Act in the design, development, or operation of any system of records on individuals to accomplish an agency function when the contract specifically identifies-

(i) The systems of records; and

(ii) The design, development, or operation work that the Contractor is to perform;

(2) Include the Privacy Act notification contained in this contract in every solicitation and resulting subcontract and in every subcontract awarded without a solicitation, when the work statement in the proposed subcontract requires the design, development, or operation of a system of records on individuals that is subject to the Act; and

(3) Include this clause, including this subparagraph (3), in all subcontracts awarded under this contract which requires the design, development, or operation of such a system of records.

(b) In the event of violations of the Act, a civil action may be brought against the agency involved when the violation concerns the design, development, or operation of a system of records on individuals to accomplish an agency function, and

criminal penalties may be imposed upon the officers or employees of the agency when the violation concerns the operation of a system of records on individuals to accomplish an agency function. For purposes of the Act, when the contract is for the operation of a system of records on individuals to accomplish an agency function, the Contractor and any employee of the Contractor is considered to be an employee of the agency.

(c) (1) "Operation of a system of records," as used in this clause, means performance of any of the activities associated with maintaining the system of records, including the collection, use, and dissemination of records.

(2) "Record," as used in this clause, means any item, collection, or grouping of information about an individual that is maintained by an agency, including, but not limited to, education, financial transactions, medical history, and criminal or employment history and that contains the person's name, or the identifying number, symbol, or other identifying particular assigned to the individual, such as a fingerprint or voiceprint or a photograph.

(3) "System of records on individuals," as used in this clause means a group of any records under the control of any agency from which information is retrieved by the name of the individual or by some identifying number, symbol, or other identifying particular assigned to the individual.

49. DEAR 952.224-70 PAPERWORK REDUCTION ACT (APR 1984)

(a) In the event that it subsequently becomes a contractual requirement to collect or record information calling either for answer to identical questions from 10 or more persons other than Federal employees, or information from Federal employees which is to be used for statistical compilations of general public interest, the Federal Reports Act will apply to this contract. No plan, questionnaire, interview guide, or other similar device for collecting information (whether repetitive or single-time) may be used without first obtaining clearance from the Office of Management and Budget (OMB).

(b) The contractor shall request the required OMB clearance from the contracting officer before expending any funds or making public contacts for the collection of data. The authority to expend funds and to proceed with the collection of data shall be in writing by the Contracting Officer. The Contractor must plan at least 90 days for OMB clearance. Excessive delay caused by the Government which arises out of

causes beyond the control and without the fault or negligence of the contractor will be considered in accordance with the clause entitled "Excusable Delays," if such clause is applicable. If not, the period of performance may be extended pursuant to this clause if approved by the Contracting Officer.

50. FAR 52.225-3 BUY AMERICAN ACT--SUPPLIES (JAN 1989)

(a) The Buy American Act (41 U.S.C. 10) provides that the Government give preference to domestic end products.

"Components," as used in this clause, means those articles, materials, and supplies incorporated directly into the end products.

"Domestic end product," as used in this clause, means (1) an unmanufactured end product mined or produced in the United States, or (2) an end product manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind as the products referred to in subparagraphs (b)(2) or (3) of this clause shall be treated as domestic. Scrap generated, collected, and prepared for processing in the United States is considered domestic. On acquisitions above $25,000 in value, components of Canadian origin are treated as domestic.

"End products," as used in this clause, means those articles, materials, and supplies to be acquired for public use under this contract.

(b) The Contractor shall deliver only domestic end products, except those--

(1) For use outside the United States;

(2) That the Government determines are not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality;

(3) For which the agency determines that domestic preference would be inconsistent with the public interest: or;

(4) For which the agency determines the cost to be unreasonable (see section 25.105 of the Federal Acquisition Regulation).

(The foregoing requirements are administered in accordance with Executive Order No. 10582, dated December 17, 1954, as amended, and Subpart 25.1 of the Federal Acquisition Regulation.)

51. FAR 52.225-13 RESTRICTIONS ON CONTRACTING WITH SANCTIONED PERSONS (MAY 1988) DELETE

(a) Definitions.

(1) "Component part," means any article which is not usable for its intended functions without being imbedded or integrated into any other product and which, if used in production of a finished product, would be substantially transformed in that process.

(2) "Finished product," means any article which is usable for its intended function without being imbedded in, or integrated into, any other product. It does not include an article produced by a person, other than a sanctioned person, that contains parts or components of the sanctioned person if the parts or components have been substantially transformed during production of the finished product.

(3) "Sanctioned person," means a company or other foreign person upon whom prohibitions have been imposed.

(4) "Substantially transformed," when referring to a component part or finished product, means that the part or product has been subjected to a substantial manufacturing or processing operation by which the part or product is converted or combined into a new and different article of commerce having a new name, character, and use.

(b) General. Section 2443 of the Multilateral Export Control Enhancement Amendments Act (Pub L. 100-418) and Executive Order 12661, effective December 28, 1988, impose, for a period of 3 years, with certain exceptions, a prohibition on contracting with, or procuring (including rental and lease/purchase) directly or indirectly the products or services of (1) Toshiba Machine Company, (2) Kongsberg Trading Company, (3) Toshiba Corporation, or (4) Kongsberg Vaapenfabrikk. The Act and Executive Order also prohibit, for the same 3-year period, the importation into the United States of all products produced by Toshiba Machine Company and Kongsberg Trading Company. These prohibitions also apply to subsidiaries, successor entities or joint ventures of Toshiba Machine Company or Kongsberg Trading Company.

(c) Restriction. Unless listed by the Contractor in its offer, in the solicitation provision at FAR 52.225-12 Notice of Restrictions on Contracting with Sanctioned Persons, or unless one of the exceptions in paragraph (d) of this clause applies, the Contractor agrees that no products or services delivered to the Government under this contract will be products or services of a sanctioned person.

(d) Exceptions. The restrictions Do Not apply--

(1) To finished products of nonsanctioned persons containing components of a sanctioned person if these components have been substantially transformed during the manufacture of the finished product.

(2) To products or services of a sanctioned person provided-

(i) The products are designed to the specifications of a nonsanctioned person marketed under the trademark, brand or name of the nonsanctioned person;

(ii) The business relationship between the nonsanctioned person and the sanctioned person clearly existed prior to June 30, 1987; and

(iii) The nonsanctioned person is not directly or indirectly owned by a sanctioned person.

(3) If a determination has been made in accordance with FAR 25.1003 (a) or (b).

(e) Award. Award of any contract resulting from this solicitation will not affect the Contractor's obligation to comply with importation regulations of the Secretary of the Treasury.

52. FAR 52.227-1 AUTHORIZATION AND CONSENT (APR 1984)

(a) The Government authorizes and consents to all use and manufacture, in performing this contract or any subcontract at any tier, of any invention described in and covered by United States patent (1) embodied in the structure or composition of any article the delivery of which is accepted by the Government under this contract or (2) used in machinery, tools, or methods whose use necessary results from compliance by the Contractor or a subcontractor with (i) specifications or written provisions forming a part of this contract or (ii) specific written instructions given by the Contracting Officer directing the manner of performance. The entire liability to the Government for infringement of a patent of the United States shall be determined solely by the provisions of the indemnity clause, if any, included in this contract or any subcontract hereunder (including any lower-tier subcontract), and the Government assumes liability for all other infringements to the extent of the authorization and consent hereinabove granted.

(b) The Contractor agrees to include, and require inclusion of, this clause, suitably modified to identify the parties, in all subcontracts at any tier for supplies or services (including construction, architect-engineer services, and materials, supplies, models, samples, and design or testing services expected to exceed $25,000; however, omission of this clause from any subcontract, under or over $25,000, does not affect this authorization and consent.

53. FAR 52.227-2 NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT (APR 1984)

(a) The Contractor shall report to the Contracting Officer, promptly and in reasonable written detail, each notice of claim of patent or copyright infringement based on the performance of this contract of which the Contractor has knowledge.

(b) In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this contract or out of the use of any supplies furnished or work or services performed under this contract, the Contractor shall furnish to the Government, when requested by the Contracting Officer, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Contractor has agreed to indemnify the Government.

(c) The Contractor agrees to include, and require inclusion of, this clause in all subcontracts at any tier for supplies or services (including construction and architect-engineer subcontracts and those for material, supplies, models, samples, or design or testing services) expected to exceed the dollar amount set forth in 13.000 of the Federal Acquisition Regulation (FAR).

54. FAR 52.228-7 INSURANCE-LIABILITY TO THIRD PERSONS (APR 1984)

(a) (1) Except as provided in subparagraph (2) immediately following, or in paragraph (h) of this clause (if the clause has a paragraph (h)), the Contractor shall provide and maintain workers' compensation, employer's liability, comprehensive general liability (bodily injury), comprehensive automobile liability (bodily injury and property damage) insurance, and such other insurance as the Contracting Officer may require under this contract.

(2) The Contractor may, with the approval of the Contracting Officer, maintain a self-insurance program; provided that, with respect to workers' compensation, the Contractor is qualified pursuant to statutory authority.

(3) All insurance required by this paragraph shall be in a form and amount and for those periods as the Contracting Officer may require or approve and with insurers approved by the Contracting Officer.

(b) The Contractor agrees to submit for the Contracting Officer's approval, to the extent and in the manner required by the Contracting Officer, any other insurance that is maintained by the Contractor in connection with the performance of this contract and for which the Contractor seeks reimbursement.

(c) Except as provided in paragraph (h) of this clause (if the clause has a paragraph (h)), the Contractor shall be reimbursed--

(1) For that portion (i) of the reasonable cost of insurance allocable to this contract and (ii) required or approved under this clause; and

(2) For certain liabilities (and expenses incidental to such liabilities) to third persons not compensated by insurance or otherwise without regard to and as an exception to the limitation of cost or the limitation of funds clause of this contract. These liabilities must arise out of the performance of this contract, whether or not caused by the negligence of the Contractor or of the Contractor's agents, servants, or employees, and must be represented by final judgments or settlements approved in writing by the Government. These liabilities are for--

(i) Loss of or damage to property (other than property owned, occupied, or used by the Contractor, rented to the Contractor, or in the care, custody, or control of the Contractor); or

(ii) Death or bodily injury.

(d) The Government's liability under paragraph (c) of this clause is subject to the availability of appropriated funds at the time a contingency occurs. Nothing in this contract shall be construed as implying that the Congress will, at a later date, appropriate funds sufficient to meet deficiencies.

(e) The Contractor shall not be reimbursed for liabilities (and expenses incidental to such liabilities)--

(1) For which the Contractor is otherwise responsible under the express terms of any clause specified in the Schedule or elsewhere in the contract;

(2) For which the Contractor has failed to insure or to maintain insurance as required by the Contracting Officer; or

(3) That result from willful misconduct or lack of good faith on the part of any of the Contractor's directors, officers, managers, superintendents, or other representatives who have supervision or direction of--

(i) All or substantially all of the Contractor's business;

(ii) All or substantially all of the Contractor's operations at any one plant or separate location in which this contract is being performed; or

(iii) A separate and complete major industrial operation in connection with the performance of this contract.

(f) The provisions of paragraph (e) of this clause shall not restrict the right of the Contractor to be reimbursed for the cost of insurance maintained by the Contractor in connection with the performance of this contract, other than insurance required in accordance with this clause; provided, that such cost is allowable under the Allowable Cost and Payment clause of this contract.

(g) If any suit or action is filed or any claim is made against the Contractor, the cost and expense of which may be reimbursable to the Contractor under this contract, and the risk of which is then uninsured or is insured for less than the amount claimed, the Contractor shall--

(1) Immediately notify the Contracting Officer and promptly furnish copies of all pertinent papers received;

(2) Authorize Government representatives to collaborate with counsel for the insurance carrier in settling or defending the claim when the amount of the liability claimed exceeds the amount of coverage; and

(3) Authorize Government representatives to settle or defend the claim and to represent the Contractor in or to take charge of any litigation, if required by the Government, when the liability is not insured or covered by bond. The Contractor may, at its own expense, be associated with the Government representatives in any such claim or litigation.

55. FAR 52.229-10 STATE OF NEW MEXICO GROSS RECEIPTS AND COMPENSATING TAX (OCT 1988)

(a) Within thirty (30) days after award of this contract, the Contractor shall advise the State of New Mexico of this contract by registering with the State of New Mexico, Taxation and Revenue Department, Revenue Division, pursuant to the Tax Administration Act of the State of New Mexico and shall identify the contract number.

(b) The Contractor shall pay the New Mexico gross receipts taxes, pursuant to the Gross Receipts and Compensating Tax Act of New Mexico, assessed against the contract fee and costs paid for performance of this contract, or of any part or portion thereof, within the State of New Mexico. The allowability of any gross receipts taxes or local option taxes lawfully paid to the State of New Mexico by the Contractor or its subcontractors will be determined in accordance with the Allowable Cost and Payment clause of this contract except as provided in paragraph (d) of this clause.

(c) The Contractor shall submit applications for Nontaxable Transaction Certificates, Form CSR-3C, to the State of New Mexico Taxation and Revenue Department, Revenue Division, P.O. Box 630, Santa Fe, New Mexico 87509. When the Type 15 Nontaxable Transaction Certificate is issued by the Revenue Division, the Contractor shall use these certificates strictly in accordance with this contract, and the agreement between the U. S. Department of Energy and the New Mexico Taxation and Revenue Department.

(d) The Contractor shall provide Type 15 Nontaxable Transaction Certificates to each vendor in New Mexico selling tangible personal property to the contractor for use in the performance of this contract. Failure to provide a Type 15 Nontaxable Transaction Certificate to vendors will result in the vendor's liability for the gross receipt taxes and those taxes, which are then passed on to the Contractor, shall not be reimbursable as an allowable cost by the Government.

(e) The Contractor shall pay the New Mexico compensating user tax for any tangible personal property which is purchased pursuant to a Nontaxable Transaction Certificate if such property is not used for Federal purposes.

(f) Out-of-state purchase of tangible personal property by the Contractor which would be otherwise subject to compensation tax shall be governed by the principles of this clause. Accordingly, compensating tax shall be due from the contractor only if such property is not used for Federal purposes.

(g) The U. S. Department of Energy may receive information regarding the Contractor from the Revenue Division of the New Mexico Taxation and Revenue Department and, at the discretion of the U. S. Department of Energy, may participate in any matters or proceedings pertaining to this clause or the above-mentioned Agreement. This shall not preclude the Contractor from having its own representative nor does it obligate the U. S. Department of Energy to represent its Contractor.

(h) The Contractor agrees to insert the substance of this clause, including this paragraph (h), in each subcontract which meets the criteria in 29.401-6(b)(1) through (3) of the Federal Acquisition Regulation, 48 CFR Part 29.

(i) Paragraphs (a) through (h) of this clause shall be null and void should the Agreement referred to in paragraph (c) of this clause be terminated; provided, however, that such termination shall not nullify obligations already incurred prior to the date of the termination.

56. FAR 52.230-3 COST ACCOUNTING STANDARDS (SEP 1987) DELETE

(a) Unless the contract is exempt under FAR 30.201-1 and 30.201-2, the provisions of Federal Acquisition Regulation (FAR) Subpart 30.3 are incorporated herein by reference and the Contractor, in connection with this contract, shall--

(1) (National Defense Contracts Only) By submission of a Disclosure Statement, disclose in writing the Contractor's cost accounting practices as required by FAR 30.202-1 through 30.202-5. The practices disclosed for this contract shall be the same as the practices currently disclosed and applied on all other contracts and subcontracts being performed by the Contractor and which contain a Cost Accounting Standards (CAS) clause. If the Contractor has notified the Contracting Officer that the Disclosure Statement contains trade secrets and commercial or financial information which is privileged and confidential, the Disclosure Statement shall be protected and shall not be released outside of the Government.

(2) Follow consistently the Contractor's cost accounting practices in accumulating and reporting contract performance cost data concerning this contract. If any change in cost accounting practices is made for the purposes of any contract or subcontract subject to CAS requirements, the change must be applied prospectively to this contract and the Disclosure Statement must be amended accordingly. If the contract price or cost allowance of this contract is affected by such changes, adjustment shall be made in accordance with subparagraph (a)(4) or (a)(5) of this clause, as appropriate.

(3) Comply with all CAS, including any modifications and interpretations indicated thereto contained in FAR Subpart 30.4, in effect on the date of award of this contract or, if the Contractor has submitted cost or pricing data, on the date of final agreement on price as shown on the Contractor's signed certificate of current cost or pricing data. The Contractor shall also comply with any CAS (or modifications to CAS) which hereafter become applicable to a contract or subcontract of the Contractor. Such compliance shall be required prospectively from the date of applicability to such contract or subcontract.

(4) (i) Agree to an equitable adjustment as provided in the Changes clause of this contract if the contract cost is affected by a change which, pursuant to subparagraph (a)(3) of this clause, the Contractor is required to make to the Contractor's established cost accounting practices.

(ii) Negotiate with the Contracting Officer to determine the terms and conditions under which a change may be made to a cost accounting practice, other than a change made under other provisions of subparagraph (a)(4) of this clause; provided that no agreement may be made under this provision that will increase costs paid by the United States.

(iii) When the parties agree to a change to a cost accounting practice, other than a change under subdivision (a)(4)(i) of this clause, negotiate an equitable adjustment as provided in the Changes clause of this contract.

(5) Agree to an adjustment of the contract price or cost allowance, as appropriate, if the Contractor or a subcontractor fails to comply with an applicable Cost Accounting Standard, or to follow any cost accounting practice consistently and such failure results in any increased costs paid by the United States. Such adjustment shall provide for recovery of the increased costs to the United States, together with interest thereon computed at the rate determined by the Secretary of the Treasury pursuant to Pub. L. 92-41, 85 Stat. 97, from the time the payment by the United States was made to the time the adjustment is effected.

DELETE

(b) If the parties fail to agree whether the Contractor or a subcontractor has complied with an applicable CAS in FAR Subpart 30.4 or a CAS rule or regulation in FAR Subpart 30.3 and as to any cost adjustment demanded by the United States, such failure to agree shall be a dispute concerning a question of fact within the meaning of the Disputes clause of this contract.

(c) The Contractor shall permit any authorized representatives of the Government to examine and make copies of any documents, papers, or records relating to compliance with the requirements of this clause.

(d) The Contractor shall include in all negotiated subcontracts which the Contractor enters into, the substance of this clause, except paragraph (b), and shall require such inclusion in all other subcontracts, of any tier, including the obligation to comply with all CAS in effect on the subcontract's award data, on the date of final agreement on price as shown on the subcontractor's signed Certificate of Current Cost or Pricing Data. This requirement shall apply only to negotiated subcontracts in excess of $100,000 where the price negotiated is not based on--

(1) Established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(2) Prices set by law or regulation, and except that the requirement shall not apply to negotiated subcontracts otherwise exempt from the requirement to include a CAS clause as specified in FAR 30.201-1.

Note (1): New or modified CAS shall be applicable to both national defense and nondefense CAS-covered contracts upon award of a new national defense CAS-covered contract containing the new or modified Standard. The award of a new nondefense CAS-covered contract shall not trigger application of new CAS or modification to CAS.

Note (2): Subcontractors shall be required to submit their Disclosure Statements to the Contractor. However, if a subcontractor has previously submitted its Disclosure Statement to a Government Administrative Contracting Officer (ACO), it may satisfy that requirement by certifying to the Contractor the date of the Statement and the address of the ACO.

DELETE

Note (3): In any case where a subcontractor determines that the Disclosure Statement information is privileged and confidential and declines to provide it to the Contractor or higher tier subcontractor, the Contractor may authorize direct submission of that subcontractor's Disclosure Statement to the same Government offices to which the Contractor was required to make submission of its Disclosure Statement. Such authorization shall in no way relieve the Contractor of liability as provided in subparagraph (a)(5) of this clause. In view of the foregoing and since the contract may be subject to adjustment under this clause by reason of any failure to comply with rules, regulations, and Standards as specified in FAR Subparts 30.3 and 30.4 in connection with covered subcontracts, it is expected that the Contractor may wish to include a clause in each such subcontract requiring the subcontractor to appropriately indemnify the Contractor. However, the inclusion of such a clause and the terms thereof are matters for negotiation and agreement between the Contractor and the subcontractor, provided that they do not conflict with the Government. It is also expected that any subcontractor subject to such indemnification will generally require substantially similar indemnification to be submitted by its subcontractors.

DELETE

Note (4): If the subcontractor is a business unit which, pursuant to FAR 30.201-2(b) is entitled to elect modified contract coverage and to follow 30.401 and 30.402, the clause at 52.230-5, "Disclosure Consistency of Cost Accounting Practices," of the Federal Acquisition Regulation shall be inserted in lieu of this clause.

Note (5): The terms defined in FAR 30.301 and 31.001 shall have the same meanings herein. As there defined, "negotiated subcontract" means any subcontract except a firm-fixed-price subcontract made by a Contractor or subcontractor after receiving offers from at least two persons not associated with each other or with such Contractor or subcontractor, providing (1) the solicitation to all competitors is identical, (2) price is the only consideration in selecting the subcontractor from among the competitors solicited, and (3) the lowest offer received in compliance with the solicitation from among those solicited is accepted.

57. FAR 52.230-4 ADMINISTRATION OF COST ACCOUNTING STANDARDS (SEP 1987) DELETE

For the purpose of administering the Cost Accounting Standards (CAS) requirements under this contract, the Contractor shall take the steps outlined in paragraphs (a) through (f) of this clause:

DELETE

(a) Submit to the cognizant Contracting Officer a description of any accounting change, the potential impact of the change on contracts containing a CAS clause, and if not obviously immaterial, a general dollar magnitude cost impact analysis of the change which displays the potential shift of costs between CAS-covered contracts by contract type (i.e., firm-fixed-price, incentive, cost-plus-fixed-fee, etc.) and other contractor business activity. As related to CAS-covered contracts, the analysis should display the potential impact of funds of the various Agencies/Departments (i.e., Department of Energy, National Aeronautics and Space Administration, Army, Navy, Air Force, other Department of Defense, other Government) as follows:

(1) For any change in cost accounting practices required to comply with a new CAS in accordance with subparagraph (a)(3) and subdivision (a)(4)(i) of the CAS clause, within 60 days (or such other date as may be mutually agreed to) after award of a contract requiring this change.

(2) For any change in cost accounting practices proposed in accordance with subdivision (a)(4)(ii) or (a)(4)(iii) of the CAS clause or with subparagraph (a)(3) of the Disclosure and Consistency of Cost Accounting Practices clause, not less than 60 days (or such other date as may be mutually agreed to) before the effective date of the proposed change.

(3) For any failure to comply with an applicable CAS or to follow a disclosed practice as contemplated by subparagraph (a)(5) of the CAS clause or by subparagraph (a)(4) of the Disclosure and Consistency of Cost Accounting Practices clause, within 60 days (or such other date as may be mutually agreed to) after the date of agreement of noncompliance by the Contractor.

(b) Submit a cost impact proposal in the form and manner specified by the cognizant Contracting Officer within 60 days (or such other date as may be mutually agreed to) after the date of determination of the adequacy and compliance of a change submitted pursuant to paragraph (a) of this clause. If the cost impact proposal is not submitted within the specified time, or any extension granted by the cognizant Contracting Officer, an amount not to exceed 10 percent of each payment made after that date may be withheld until such time as a proposal has been provided in the form and manner specified by the cognizant Contracting Officer.

(c) Agree to appropriate contract and subcontract amendments to reflect adjustments established in accordance with subparagraphs (a)(4) and (a)(5) of the CAS clause or with subparagraphs (a)(3) or (a)(4) of the CAS Disclosure and Consistency of Cost Accounting Practices clause.

(d) For all subcontracts subject either to the CAS clause or to the Disclosure and Consistency of Cost Accounting Practices clause--

(1) So state in the body of the subcontract, in the letter of award, or in both (self-deleting clauses shall not be used); and

(2) Include the substance of this clause in all negotiated subcontracts.

In addition, within 30 days after award of the subcontract, submit the following information to the Contractor's cognizant contract administration officer for transmittal to the contract administration office cognizant of the subcontractor's facility:

(i) Subcontractor's name and subcontract number.
(ii) Dollar amount and date of award.
(iii) Name of Contractor making the award.
(iv) Any changes the subcontractor has made or proposes to make to accounting practices that affect prime contract or subcontracts containing the CAS clause or Disclosure and Consistency of Cost Accounting Practices clause, unless these changes have already been reported. If award of the subcontract results in making one or more CAS effective for the first time, this fact shall also be reported.

(e) Notify the Contracting Officer in writing of any adjustments required to subcontracts under this contract and agree to an adjustment, based on them, to this contractor's price or estimated cost and fee. This notice is due within 30 days after proposed subcontract adjustments are received and shall include a proposal for adjusting the higher tier subcontract or the prime contract appropriately.

(f) For subcontracts containing the CAS clause, require the subcontractor to comply with all Standards in effect on the date of award or of final agreement on price, as shown on the subcontractor's signed Certificate of Current Cost or Pricing Data, whichever is earlier.

DELETE

58. FAR 52.232-9 LIMITATION ON WITHHOLDING OF PAYMENTS (APR 1984)

If more than one clause or Schedule term of this contract authorizes the temporary withholding of amounts otherwise payable to the Contractor for supplies delivered or services performed, the total of the amounts withheld at any one time shall not exceed the greatest amount that may be withheld under any one clause or Schedule term at that time; provided that this limitation shall not apply to-

(a) Withholdings pursuant to any clause relating to wages or hours of employees;

(b) Withholdings not specifically provided for by this contract;

(c) The recovery of overpayments; and

(d) Any other withholding for which the Contracting Officer determines that this limitation is inappropriate.

59. FAR 52.232-22 LIMITATION OF FUNDS (APR 1984)

(a) The parties estimate that performance of this contract will not cost the Government more than (1) the estimated cost specified in the Schedule or, (2) if this is a cost-sharing contract, the Government's state of the estimated cost specified in the Schedule. The Contractor agrees to use its best efforts to perform the work specified in the Schedule and all obligations under this contract within the estimated cost, which, if this is a cost-sharing contract, includes both the Government's and the Contractor's share of the cost.

(b) The Schedule specifies the amount presently available for payment by the Government and allotted tot his contract, the items covered, the Government's share of the cost if this is a cost-sharing contract, and the period of performance it is estimated the allotted amount will cover. The parties contemplate that the Government will allot additional funds incrementally to the contract up to the full estimated cost to the Government specified in the Schedule, exclusive of any fee. The Contractor agrees to perform, or have performed, work on the contract up to the point at which the total amount paid and payable by the Government under the contract approximates but does not exceed the total amount actually allotted by the Government to the contract.

(c) The Contractor shall notify the Contracting Officer in writing whenever it has reason to believe that the costs it expects to incur under this contract in the next 60 days, when added to all costs previously incurred, will exceed 75 percent of (1) the total amount so far allotted to the contract by the Government or, (2) if this is a cost-sharing contract, the amount then allotted to the contract by the Government plus the Contractor's corresponding share. The notice shall state the estimated amount of additional funds required to continue performance of the period specified in the Schedule.

(d) Sixty days before the end of the period specified in the Schedule, the Contractor shall notify the Contracting Officer in writing of the estimated amount of additional funds, if any, required to continue timely performance under the contract or for any further period specified in the Schedule or otherwise agreed upon, and when the funds will be required.

(e) If, after notification, additional funds are not allotted by the end of the period specified in the Schedule or another agree-upon date, upon the Contractor's written request the Contracting Officer will terminate this contract on that date in accordance with the provisions of the Termination clause of this contract. If the Contractor estimates that the funds available will allow it to continue to discharge its obligations beyond that date, it may specify a later date in its request, and the Contracting Officer may terminate this contract on that later date.

(f) Except as required by other provisions of this contract, specifically citing and stated to be an exception to this clause-

(1) The Government is not obligated to reimburse the Contractor for costs incurred in excess of the total amount allotted by; the Government to this contract; and

(2) The Contractor is not obligated to continue performance under this contract (including actions under the Termination clause of this contract) or otherwise incur costs in excess of (i) the amount then allotted to the contract by the Government or, (ii) if this is a cost-sharing contract, the amount then allotted by the Government to the contract plus the Contractor's corresponding share, until the Contracting Officer notifies the Contractor in writing that the amount allotted by the Government has been increased and specifies an increased amount, which shall then constitute the total amount allotted by the Government to this contract.

(g) The estimated cost shall be increased to the extent that (1) the amount allotted by the Government or, (2) if this is a cost-sharing contract, the amount then allotted by the Government to the contract plus the Contractor's corresponding share, exceeds the estimated cost specified in the Schedule. If this is a cost-sharing contract, the increase shall be allocated in accordance with the formula specified in the Schedule.

(h) No notice, communication, or representation in any form other than that specified in subparagraph (f)(2) above, or from any person other than the Contracting Officer, shall affect the amount allotted by; the Government to this contract. In the absence of the specified notice, the Government is not obligated to reimburse the Contractor for any costs in excess of the total amount allotted by the Government to this contract, whether incurred during the course of the contract or as a result of termination.

(i) When and to the extent that the amount allotted by the Government to the contract is increased, any costs the Contractor incurs before the increase that are in excess of (1) the amount previously allotted by the Government or, (2) if this is a cost-sharing contract, the amount previously allotted by the Government to the contract plus the Contractor's corresponding share, shall be allowable to the same extent as if incurred afterward, unless the Contracting Officer issues a termination or other notice and directs that the increase is solely to cover termination or other specified expenses.

(j) Change orders shall not be considered an authorization to exceed the amount allotted by the Government specified in the Schedule, unless they contain a statement increasing the amount allotted.

(k) Nothing in this clause shall affect the right of the Government to terminate this contract. If this contract is terminated, the Government and the Contractor shall negotiate an equitable distribution of all property produced or purchased under the contract, based upon the share of costs incurred by each.

(l) If the Government does not allot sufficient funds to allow completion of the work, the Contractor is entitled to a percentage of the fee specified in the Schedule equaling the percentage of the completion of the work contemplated by this contract.

60. FAR 52.232-23 ASSIGNMENT OF CLAIMS (JAN 1986)

(a) The Contractor, under the Assignment of Claims Act, as amended, 31 U.S.C. 3727, 41 U.S.C. 15 (hereafter referred to as "the Act"), may assign its rights to be paid amounts due or to become due as a result of the performance of this contract to a bank, trust company, or other financing institution, including any Federal lending agency. The assignee under such an assignment may thereafter further assign or reassign its right under the original assignment to any type of financing institution described in the preceding sentence.

(b) Any assignment or reassignment authorized under the Act and this clause shall cover all unpaid amounts payable under this contract, and shall not be made to more than one party, except that an assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in the financing of this contract.

(c) The Contractor shall not furnish or disclose to any assignee under this contract any classified document (including this contract) or information related to work under this contract until the Contracting Officer authorizes such action in writing.

61. FAR 52.232-25 PROMPT PAYMENT (AUG 1989)

Notwithstanding any other payment clause in this contract, the Government will make invoice payments and contract financing payments under the terms and conditions specified in this clause. Payment shall be considered as being made on the day a check is dated or an electronic funds transfer is made. Definitions of pertinent terms are set forth in 32.902. All days referred to in this clause are calendar days, unless otherwise specified. The term "foreign vendor" means an incorporated concern not incorporated in the United States, or an unincorporated concern having its principal place of business outside the United States.

(a) Invoice Payments.

(1) For purposes of this clause, "invoice payment" means a Government disbursement of monies to a Contractor under a contract or other authorization for supplies or services accepted by the Government. This includes payments for partial deliveries that have been accepted by the Government and final cost or fee payments where amounts owed have been settled between the Government and the Contractor.

(2) Except as indicated in subparagraph (a)(3) and paragraph (c) of this clause, the due date for making invoice payments by the designated payment office shall be the later of the following two events:

(i) The 30th day after the designated billing office has received a proper invoice from the Contractor.

(ii) The 30th day after Government acceptance of supplies delivered or services performed by the Contractor. On a final invoice where the payment amount is subject to contract settlement actions, acceptance shall be deemed to have occurred on the effective date of the contract settlement. However, if the designated billing office fails to annotate the invoice with the actual date of receipt the invoice payment due date shall be deemed to be the 30th day after the date the Contractor's invoice is dated, provided a proper invoice is received and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(3) The due date on contracts for meat and meat food products, contracts for perishable agricultural commodities, contracts for dairy products, edible fats or oils, and food products prepared from edible fats or oils, and contracts not requiring submission of an invoice shall be as follows:

(i) The due date for meat and meat food products, as defined in Section 2(a)(3) of the Packers and Stockyard Act of 1921 (7 U.S.C. 182(3)) and further defined in Pub. L. 98-181 to include any edible fresh or frozen poultry meat, any perishable poultry meat food product, fresh eggs, and any perishable egg product, will be as close as possible to, but not later than, the 7th day after product delivery.

(ii) The due date for perishable agricultural commodities, as defined in Section 1(4) of the Perishable Agricultural Commodities Act of 1930 (7 U.S.C. 499a(44)), will be as close as possible to, but not later than, the 10th day after product delivery, unless another date is specified in the contract.

(iii) The due date for dairy products, as defined in section 111(e) of the Dairy Production Stabilization Act of 1963 (7 U.S.C. 4502(e)), edible fats or oils, and food products prepared from edible fats or oils, will be as close as possible to, but not later than, the 10th day after the date on which a proper invoice has been received.

(iv) If the contract does not require submission of an invoice for payment (e.g. periodic lease payments), the due date will be as specified in the contract.

(4) An invoice is the Contractor's bill or written request for payment under the contract for supplies delivered or services performed. An invoice shall be prepared and submitted to the designated billing office specified in the contract. A proper invoice must include the items listed in subdivisions (a)(4)(i) through (a)(4)(viii) of this clause. If the invoice does not comply with these requirements, then the Contractor will be notified of the defect within 7 days after receipt of the invoice at the designated billing office (3 days for meat and meat food products and 5 days for perishable agricultural commodities, edible fats or oils, and food products prepared from edible fats or oils). Untimely notification will be taken into account in the computation of any interest penalty owed the Contractor in the manner described in subparagraph (a)(6) of this clause.

(i) Name and address of the Contractor.

(ii) Invoice date.

(iii) Contract number or other authorization for supplies delivered or services performed (including order number and contract line item number).

(iv) Description, quantity, unit of measure, unit price, and extended price of supplies delivered or services performed.

(v) Shipping and payment terms (e.g., shipment number and date of shipment, prompt payment discount terms). Bill of lading number and weight of shipment will be shown for shipments on Government bills of lading.

(vi) Name and address of Contractor official to whom payment is to be sent (must be the same as that in the contract or in a proper notice of assignment).

(vii) Name (where practicable), title, phone number and mailing address of person to be notified in event of a defective invoice.

(viii) Any other information or documentation required by other requirements of the contract (such as evidence of shipment).

(5) An interest penalty shall be paid automatically by the Government, without request from the contractor, if payment is not made by the due date and the conditions listed in

subdivisions (a)(5)(i) through (a)(5)(iii) of this clause are met, if applicable. An interest penalty shall not be paid on contracts awarded to foreign vendors outside the United States for work performed outside the United States.

(i) A proper invoice was received by the designated billing office.

(ii) A receiving report or other Government documentation authorizing payment was processed and there was no disagreement over quantity, quality, or contractor compliance with any contract term or condition.

(iii) In the case of a final invoice for any balance of funds due the Contractor for supplies delivered or services performed, the amount was not subject to further contract settlement actions between the Government and the Contractor.

(6) The interest penalty shall be at the rate established by the Secretary of the Treasury under Section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) that is in effect on the day after the due date, except where the interest penalty is prescribed by other governmental authority. This rate is referred to as the "Renegotiation Board Interest Rate," and it is published in the Federal Register semiannually on or about January 1 and July 1. The interest penalty shall accrue daily on the invoice payment amount approved by the Government and be compounded in 30-day increments inclusive from the first day after the due date through the payment date. That is, interest accrued at the end of any 30-day period will be added to the approved invoice payment amount and be subject to interest penalties if not paid in the succeeding 30-day period. If the designated billing office failed to notify the contractor of a defective invoice within the periods prescribed in subparagraph (a)(4) of this clause, then the due date on the corrected invoice will be adjusted by subtracting the number of days taken beyond the prescribed notification of defects period. Any interest penalty owed the Contractor will be based on this adjusted due date. Adjustments will be made by the designated payment office for errors in calculating interest penalties, if requested by the Contractor.

(i) For the sole purpose of computing an interest penalty that might be due the contractor, Government acceptance shall be deemed to have occurred constructively on the 7th day (unless otherwise specified in this contract) after the Contractor delivered the supplies or performed the services in accordance with the terms and conditions of the contract, unless there is a disagreement over quantity, quality, or contractor compliance with a contract provision. In the event that actual acceptance occurs within the constructive

acceptance period, the determination of an interest penalty shall be based on the actual date of acceptance. The constructive acceptance requirement does not, however, compel Government officials to accept supplies or services, perform contract administration functions, or make payment prior to fulfilling their responsibilities.

(ii) The following periods of time will not be included in the determination of an interest penalty:

(A) The period taken to notify the contractor of defects in invoices submitted to the Government, but this may not exceed 7 days (3 days for meat and meat food products and 5 days for perishable agricultural commodities, dairy products, edible fat or oils, and food products prepared from edible fats or oils).

(B) The period between the defects notice and resubmission of the corrected invoice by the Contractor.

(iii) Interest penalties will not continue to accrue after the filing of a claim for such penalties under the clause at 52.233-1, Disputes, or for more than 1 year. Interest penalties of less than $1.00 need not be paid.

(iv) Interest penalties are not required on payment delays due to disagreement between the Government and Contractor over the payment amount or other issues involving contract compliance or on amounts temporarily withheld or retained in accordance with the terms of the contract. Claims involving disputes, and any interest that may be payable, will be resolved in accordance with the clause at 52.233-1, Disputes.

(7) An interest penalty shall also be paid automatically by the designated payment office, without request from the contractor, if a discount for prompt payment is taken improperly. The interest penalty will be calculated as described in subparagraph (a)(6) of this clause on the amount of discount taken for the period beginning with the first day after the end of the discount period through the date when the contractor is paid.

(8) If this contract was awarded on or after October 1, 1989, a penalty amount, calculated in accordance with regulations issued by the Office of Management and Budget, shall be paid in addition to the interest penalty amount if the contractor--

(i) Is owed an interest penalty;

(ii) Is not paid the interest penalty within 10 days after the date the invoice amount is paid; and

(iii) Makes a written demand, not later than 40 days after the date the invoice amount is paid, that the agency pay such a penalty.

(b) Contract Financing Payments

(1) For purposes of this clause, "contract financing payment" means a Government disbursement of monies to a Contractor under a contract clause or other authorization prior to acceptance of supplies or services by the Government. Contract financing payments include advance payments, progress payments based on cost under the clause at 52.232-16, Progress Payments, progress payments based on a percentage or stage of completion (32.102(e)(1)) other than those made under the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts, or the clause at 52.232-10, Payments Under Fixed-Price Architect-Engineer Contracts, and interim payments on cost type contracts.

(2) For contracts that provide for contract financing, requests for payment shall be submitted to the designated billing office as specified in this contract or as directed by the Contracting Officer. Contract financing payments shall be made on the (insert day as prescribed by Agency head; if not prescribed, insert 30th day) day after receipt of a proper contract financing request by the designated billing office. In the event that an audit or other review of a specific financing request is required to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the due date specified.

(3) For advance payments, loans, or other arrangements that do not involve recurrent submissions of contract financing requests, payment shall be made in accordance with the corresponding contract terms or as directed by the Contracting Officer.

(4) Contract financing payments shall not be assessed an interest penalty for payment delays.

(c) If this contract contains the clause at 5.213-1, Fast Payment Procedure, payments will be made within 15 days after the date of receipt of the invoice.

62. FAR 52.233-1 DISPUTES ALTERNATE I (APR 1984)

(a) This contract is subject to the Contract Disputes Act of 1978 (41 U.S.C. 601-613) (the Act).

(b) Except as provided in the Act, all disputes arising under or relating to this contract shall be resolved under this clause.

(c) "Claim," as used in this clause, means a written demand or a written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to this contract. A claim arising under a contract, unlike a claim relating to that contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. However, a written demand or written assertion by the Contractor seeking the payment of money exceeding $50,000 is not a claim under the Act until certified as required by subparagraph (d)(2) below. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim under the Act. The submission may be converted to a claim under the Act, by complying with the submission and certification requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.

(d) (1) A claim by the Contractor shall be made in writing and submitted to the Contracting Officer for a written decision. A claim by the Government against the Contractor shall be subject to a written decision by the Contracting Officer.

(2) For Contractor claims exceeding $50,000, the Contractor shall submit with the claim a certification that--

(i) The claim is made in good faith;

(ii) Supporting data are accurate and complete to the best of the Contractor's knowledge and belief; and

(iii) The amount requested accurately reflects the contract adjustment for which the Contractor believes the Government is liable.

(3) (i) If the Contractor is an individual, the certification shall be executed by that individual.

(ii) If the Contractor is not an individual, the certification shall be executed by--

(A) A senior company official in charge at the Contractor's plant or location involved; or

(B) An officer or general partner of the Contractor having overall responsibility for the conduct of the Contractor's affairs.

(e) For Contractor claims of $50,000 or less, the Contracting Officer must, if requested in writing by the Contractor, render a decision within 60 days of the request. For Contractor-certified claims over $50,000, the Contracting Officer must, within 60 days, decide the claim or notify the Contractor of the date by which the decision will be made.

(f) The Contracting Officer's decision shall be final unless the Contractor appeals or files a suit as provided in the Act.

(g) The Government shall pay interest on the amount found due and unpaid from (1) the date the Contracting Officer receives the claim (properly certified if required), or (2) the date payment otherwise would be due, if that date is later, until the date of payment. Simple interest on claims shall be paid at the rate, fixed by the Secretary of the Treasury as provided in the Act, which is applicable to the period during which the Contracting Officer receives the claim and then at the rate applicable for each 6-month period as fixed by the Treasury Secretary during the pendency of the claim.

(h) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under or relating to the contract, and comply with any decision of the Contracting Officer.

63. FAR 52.233-3 PROTEST AFTER AWARD ALTERNATE 1 (JUN 1985)

(a) Upon receipt of a notice of protest (as defined in 33.101 of the FAR) the Contracting Officer may, by written order to the Contractor, direct the Contractor to stop performance of the work called for by this contract. The order shall be specifically identified as a stop-work order issued under this clause. Upon receipt of the order, the Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of work stoppage. Upon receipt of the final decision in the protest, the Contracting Officer shall either--

(1) Cancel the stop-work order; or

(2) Terminate the work covered by the order as provided in the Termination clause of this contract.

(b) If a stop-work order issued under this clause is canceled either before or after a final decision in the protest, the Contractor shall resume work. The Contracting Office shall make an equitable adjustment in the delivery schedule, the estimated cost, the fee, or a combination thereof, and in any other terms of the contract may be affected and the contract shall be modified, in writing, accordingly, if--

(1) The stop-work order results in an increase in the time required for, or in the Contractor's cost properly allocable to, the performance of any part of this contract; and

(2) The Contractor requests an adjustment within 30 days after the end of the period of work stoppage; provided, that if the Contracting Officer decides the facts justify the action, the Contracting Officer may receive and act upon the request at any time before final payment under this contract.

(c) If a stop-work order is not canceled and the work covered by the order is terminated for the convenience of the Government, the Contracting Officer shall allow reasonable costs resulting from the stop-work order in arriving at the termination settlement.

(d) If a stop-work order is not canceled and the work covered by the order is terminated for default, the Contracting Officer shall allow, by equitable adjustment or otherwise, reasonable costs resulting from the stop-work order.

(e) The Government's rights to terminate this contract at any time are not affected by action taken under this clause.

64. DEAR 952.235-70 KEY PERSONNEL (APR 1984)

The personnel specified below are considered to be essential to the work being performed hereunder. Prior to diverting any of the specified individuals to other programs, the Contractor shall notify the Contracting Officer reasonably in advance and shall submit justification (including proposed substitutions) in sufficient detail to permit evaluation of the impact on the program. No diversion shall be made by the Contractor without the written consent of the Contracting Officer: Provided, that the Contracting Officer may ratify in writing such diversion and such ratification shall constitute the consent of the Contracting Officer required by this clause.

The list below may be amended from time to time during the course of the contract to either add or delete personnel, as appropriate.

Title	Name
Contract Manager	Richard W. Tuttle
Fire Chief	Douglas R. MacDonald

Assistant Chief, Operations*
*To be subsequently named.

65. FAR 52.237-2 PROTECTION OF GOVERNMENT BUILDINGS, EQUIPMENT, AND VEGETATION (APR 1984)

The Contractor shall use reasonable care to avoid damaging existing buildings, equipment, and vegetation on the Government installation. If the Contractor's failure to use reasonable care causes damage to any of this property, the Contractor shall replace or repair the damage at no expense to the Government as the Contracting Officer directs. If the Contractor fails or refuses to make such repair or replacement, the Contractor shall be liable for the cost, which may be deducted from the contract price.

66. FAR 52.237-3 CONTINUITY OF SERVICES (APR 1984)

(a) The Contractor recognizes that the services under this contract are vital to the Government and must be continued without interruption and that, upon contract expiration, a successor, either the Government or another Contractor, may continue them. The Contractor agrees to (1) furnish phase-in training and (2) exercise its best efforts and cooperation to effect an orderly and efficient transition to a successor.

(b) The Contractor shall, upon the Contracting Officer's written notice, (1) furnish phase-in, phase-out services for up to 60 days after this contract expires and (2) negotiate in good faith a plan with a successor to determine the nature and extent of phase-in, phase-out services required. The plan shall specify a training program and a date for transferring responsibilities for each division of work described in the plan, and shall be subject to the Contracting Officer's approval. The Contractor shall provide sufficient experienced personnel during the phase-in, phase-out period to ensure that the services called for by this contract are maintained at the required level of proficiency.

(c) The Contractor shall allow as many personnel as practicable to remain on the job to help the successor maintain the continuity and consistency of the services required by this contract. The Contractor also shall disclose necessary personnel records and allow the successor to conduct onsite interviews with these employees. If selected employees are agreeable to the change, the Contractor shall release them at a mutually agreeable date and negotiate transfer of their earned fringe benefits to the successor.

(d) The Contractor shall be reimbursed for all reasonable phase-in, phase-out costs (i.e., costs incurred within the agreed period after contract expiration that result from phase-in, phase-out operations) and a fee (profit) not to exceed a pro rata portion of the fee (profit) under this contract.

67. FAR 52.242-1 NOTICE OF INTENT TO DISALLOW COSTS (APR 1984)

(a) Notwithstanding any other clause of this contract--

(1) The Contracting Officer may at any time issue to the Contractor a written notice of intent to disallow specified costs incurred or planned for incurrence under this contract that have been determined not to be allowable under the contract terms; and

(2) The Contractor may, after receiving a notice under subparagraph (1) above, submit a written response to the Contracting Officer, with justification for allowance of the costs. If the Contractor does respond within 60 days, the Contracting Officer shall, within 60 days of receiving the response, either make a written withdrawal of the notice or issue a written decision.

(b) Failure to issue a notice under this Notice of Intent to Disallow Costs clause shall not affect the Government's rights to take exception to incurred costs.

68. FAR 52.243-2 CHANGES--COST-REIMBURSEMENT ALTERNATE I (AUG 1987)

(a) The Contracting Officer may at any time, by written order, and without notice to the sureties, if any, make changes within the general scope of this contract in any one or more of the following:

(1) Description of services to be performed.

(2) Time of performance (i.e., hours of the day, days of the week, etc.).

(3) Place of performance of the services.

(b) If any such change cause an increase or decrease in the estimated cost of, or the time required for, performance of any part of the work under this contract, whether or not changed by the order, or otherwise affects any other terms and conditions of this contract, the Contracting Officer shall make an equitable adjustment in the (1) estimated cost, delivery or completion schedule, or both; (2) amount of any fixed fee; and (3) other affected terms and shall modify the contract accordingly.

(c) The Contractor must assert its right to an adjustment under this clause within 30 days from the date of receipt of the written order. However, if the Contracting Officer decides that the facts justify it, the Contracting Officer may receive and act upon a proposal submitted before final payment of the contract.

(d) Failure to agree to any adjustment shall be a dispute under the Disputes clause. However, nothing in this clause shall excuse the Contractor from proceeding with the contract as changed.

(e) Notwithstanding the terms and conditions of paragraphs (a) and (b) above, the estimated cost of this contract and, if this contract is incrementally funded, the funds allotted for the performance of this contract, shall not be increased or considered to be increased except by specific written modification of the contract indicating the new contract estimated cost and, of this contract is incrementally funded, the new amount allotted to the contract. Until this modification is made, the Contractor shall not be obligated to continue performance or incur costs beyond the point established in the Limitation of Cost or Limitation of Funds clause of this contract.

69. FAR 52.244-2 SUBCONTRACTS (COST-REIMBURSEMENT AND LETTER CONTRACTS) (JUL 1985)

(a) "Subcontract," as used in this clause, includes but is not limited to purchase orders, and changes and modifications to purchase orders. The Contractor shall notify the Contracting Officer reasonably in advance of entering into any subcontract if--

(1) The proposed subcontract is of the cost-reimbursement, time-and-materials, or labor-hour type;

(2) The proposed subcontract is fixed-price and exceeds either $25,000 or 5 percent of the total estimated cost of this contract;

(3) The proposed subcontract has experimental, developmental, or research work as one of its purposes; or

(4) This contract is not a facilities contract and the proposed subcontract provides for the fabrication, purchase, rental, installation, or other acquisition of special test equipment valued in excess of $10,000 or of any items of facilities.

(b) (1) In the case of a proposed subcontract that (i) is of the cost-reimbursement, time-and-materials, or labor-hour type and is estimated to exceed $10,000, including any fee, (ii) is proposed to exceed $100,000, or (iii) is one of a number of subcontracts with a single subcontractor, under this contract, for the same or related supplies or services that, in the aggregate, are expected to exceed $100,000, the advance notification required by paragraph (a) above shall include the information specified in subparagraph (2) below.

(2) (i) A description of the supplies or services to be subcontracted.

(ii) Identification of the type of subcontract to be used.

(iii) Identification of the proposed subcontractor and an explanation of why and how the proposed subcontract was selected, including the competition obtained.

(iv) The proposed subcontract price and the Contractor's cost or price analysis.

(v) The subcontractor's current, complete, and accurate cost or pricing data and Certificate of Current Cost or Pricing Data, if required by other contract provisions.

(vi) The subcontractor's Disclosure Statement or Certificate relating to Cost Accounting Standards when such data are required by other provisions of this contract.

(vii) A negotiation memorandum reflecting--

(A) The principal elements of the subcontract price negotiations;

(B) The most significant consideration controlling establishment of initial or revised prices;

(C) The reason cost or pricing data were or were not required;

(D) The extent, if any, to which the Contractor did not rely on the subcontractor's cost or pricing data in determining the price objective and in negotiating the final price;

(E) The extent to which it was recognized in the negotiation that the subcontractor's cost or pricing data were not accurate, complete, or current; the action taken by the Contractor and the subcontractor; and the effect of any such defective data on the total price negotiated;

(F) The reasons for any significant difference between the Contractor's price objective and the price negotiated; and

(G) A complete explanation of the incentive fee or profit plan when incentives are used. The explanation shall identify each critical performance element, management decisions used to quantify each incentive element, reasons for the incentives, and a summary of all trade-off possibilities considered.

(c) The Contractor shall obtain the Contracting Officer's written consent before placing any subcontract for which advance notification is required under paragraph (a) above. However, the Contracting Officer may ratify in writing any such subcontract. Ratification shall constitute the consent of the Contracting Officer.

(d) If the Contractor has an approved purchasing system and the subcontract is within the scope of such approval, the Contractor may enter into the subcontracts described in subparagraphs (a)(1) and (a)(2) above without the consent of the Contracting Officer, unless this contract is for the acquisition of major systems, subsystems, or their components.

(e) Even if the Contractor's purchasing system has been approved, the Contractor shall obtain the Contracting Officer's written consent before placing subcontracts that have been selected for special surveillance and identified in the Schedule of this contract.

(f) Unless the consent or approval specifically provides otherwise, neither consent by the Contracting Officer to any subcontract nor approval of the Contractor's purchasing system shall constitute a determination (1) of the acceptability of any subcontract terms or conditions, (2) of the allowability of any cost under this contract, or (3) to relieve the Contractor of any responsibility for performing this contract.

(g) No subcontract placed under this contract shall provide for payment on a cost-plus-a-percentage-of-cost basis, and any fee payable under cost-reimbursement type subcontracts shall not exceed the fee limitations in paragraph 15.903(d) of the Federal Acquisition Regulation (FAR).

(h) The Contractor shall give the Contracting Officer immediate written notice of any action or suit filed and prompt notice of any claim made against the Contractor by any subcontractor or vendor that, in the opinion of the Contractor, may result in litigation related in any way to this contract, with respect to which the Contractor may be entitled to reimbursement from the Government.

(i) (1) The Contractor shall insert in each price redetermination or incentive price revision subcontract under this contract the substance of the paragraph "Quarterly limitation on payments statement" of the clause at 52.216-5, Price Redetermination--Prospective, 52.216-6, Price Redetermination--Retroactive, 52.216-16, Incentive Price Revision--Firm Target, or 52.216-17, Incentive Price Revision--Successive Targets, as appropriate, modified in accordance with the paragraph entitled "Subcontracts" of that clause.

(2) Additionally, the Contractor shall include in each cost-reimbursement subcontract under this contract a requirement that the subcontractor insert the substance of the appropriate modified subparagraph referred to in subparagraph (1) above in each lower tier price redetermination or incentive price revision subcontract under that subcontract.

(j) To facilitate small business participation in subcontracting, the Contractor agrees to provide progress payments on subcontracts under this contract that are fixed-price subcontracts with small business concerns in conformity with the standards for customary progress payments stated in FAR 32.502-1 and 32.504(f), as in effect on the date of this contract. The Contractor further agrees that the need for such progress payments will not be considered a handicap or adverse factor in the award of subcontracts.

(k) The Government reserves the right to review the Contractor's purchasing system as set forth in FAR Subpart 44.3.

70. FAR 52.244-5 COMPETITION IN SUBCONTRACTING (APR 1984)

The Contractor shall select subcontractors (including suppliers) on a competitive basis to the maximum practical extent consistent with the objectives and requirements of the contract.

71. DEAR 952.245-5 GOVERNMENT PROPERTY (COST REIMBURSEMENT, TIME-AND-MATERIAL, OR LABOR-HOUR CONTRACTS) (JAN 1986)

(a) Government-furnished property.

(1) The term "Contractor's managerial personnel," as used in paragraph (g) of this clause, means any of the Contractor's directors, officers, managers, superintendents, or equivalent representatives who have supervision or direction of--

(i) All or substantially all of the Contractor's business;

(ii) All or substantially all of the Contractor's operation at any one plant, or separate location at which the contract is being performed; or

(iii) A separate and complete major industrial operation connected with performing this contract.

(2) The Government shall deliver to the Contractor, for use in connection with and under the terms of this contract, the Government-furnished property described in the Schedule or specifications, together with such related data and information as the Contractor may request and as may be reasonably required for the intended use of the property (hereinafter referred to as "Government-furnished property").

(3) The delivery or performance dates for this contract are based upon the expectation that Government-furnished property suitable for use will be delivered to the Contractor at the times stated in the Schedule or, if not so stated, in sufficient time to enable the Contractor to meet the contract's delivery or performance dates.

(4) If Government-furnished property is received by the Contractor in a condition not suitable for the intended use, the Contractor shall, upon receipt, notify the Contracting

Officer, detailing the facts, and, as directed by the Contracting Officer and at Government expense, either effect repairs or modification or return or otherwise dispose of the property. After completing the directed action and upon written request of the Contractor, the Contracting Officer shall make an equitable adjustment as provided in paragraph (h) of this clause.

(5) If Government-furnished property is not delivered to the Contractor by the required time or times, the Contracting Officer shall, upon the Contractor's timely written request, make a determination of the delay, if any, caused the Contractor and shall make an equitable adjustment in accordance with paragraph (h) of this clause.

(b) Changes in Government-furnished property.

(1) The Contracting Officer may, by written notice, (i) decrease the Government-furnished property provided or to be provided under this contract or (ii) substitute other Government-furnished property for the property to be provided by the Government or to be acquired by the Contractor for the Government under this contract. The Contractor shall promptly take such action as the Contracting Officer may direct regarding the removal, shipment, or disposal of the property covered by this notice.

(2) Upon the Contractor's written request, the Contracting Officer shall make an equitable adjustment to the contract in accordance with paragraph (h) of this clause, if the Government has agreed in the Schedule to make such property available for performing this contract and there is any--

(i) Decrease or substitution in this property pursuant to subparagraph (b)(1) above; or

(ii) Withdrawal of authority to use property, if provided under any other contract or lease.

(c) Title.

(1) The Government shall retain title to all Government-furnished property.

(2) Title to all property purchased by the Contractor for which the Contractor is entitled to be reimbursed as a direct item of cost under this contract shall pass to and vest in the Government upon the vendor's delivery of such property.

(3) Title to all other property, the cost of which is reimbursable to the Contractor, shall pass to and vest in the Government upon--

(i) Issuance of the property for use in contract performance;

(ii) Commencement of processing of the property or use in contract performance; or

(iii) Reimbursement of the cost of the property by the Government, whichever occurs first.

(4) All Government-furnished property and all property acquired by the Contractor, title to which vests in the Government under this paragraph (collectively referred to as "Government property"), are subject to the provisions of this clause. Title to Government property shall not be affected by its incorporation into or attachment to any property not owned by the Government, nor shall Government property become a fixture or lose its identity as personal property by being attached to any real property.

(d) Use of Government property.

The Government property shall be used only for performing this contract, unless otherwise provided in this contract or approved by the Contracting Officer.

(e) Property administration.

(1) The Contractor shall be responsible and accountable for all Government property provided under this contract and shall comply with Federal Acquisition Regulation (FAR) Subpart 45.5 and DOE Acquisition Regulation Subpart 945.5 as in effect on the date of this contract.

(2) The Contractor shall establish and maintain a program for the use, maintenance, repair, protection, and preservation of Government property in accordance with sound business practice and the applicable provisions of FAR Subpart 45.5 and DOE Acquisition Regulation Subpart 945.5.

(3) If damage occurs to Government property, the risk of which has been assumed by the Government under this contract, the Government shall replace the items or the Contractor shall make such repairs as the Government directs. However, if the Contractor cannot effect such repairs within the time required, the Contractor shall dispose of the property as directed by the Contracting Officer. When any property for which the Government is responsible is replaced or repaired,

the Contracting Officer shall make an equitable adjustment in accordance with paragraph (h) of this clause.

(f) Access.

The Government and all its designees shall have access at all reasonable times to the premises in which any Government property is located for the purpose of inspecting the Government property.

(g) Limited risk of loss.

(1) The Contractor shall not be liable for loss or destruction of, or damage to, the Government property provided under this contract or for expenses incidental to such loss, destruction, or damage, except as provided in subparagraphs (2) and (3) below.

(2) The Contractor shall be responsible for loss or destruction of, or damage to, the Government property provided under this contract (including expenses incidental to such loss, destruction, or damage)--

(i) That results from a risk expressly required to be insured under this contract, but only to the extent of the insurance required to be purchased and maintained or to the extent of insurance actually purchased and maintained, whichever is greater;

(ii) That results from a risk that is in fact covered by insurance or for which the Contractor is otherwise reimbursed, but only to the extent of such insurance or reimbursement;

(iii) For which the Contractor is otherwise responsible under the express terms of this contract;

(iv) That results from willful misconduct or lack of good faith on the part of the Contractor's managerial personnel; or

(v) That results from a failure on the part of the Contractor, due to willful misconduct or lack of good faith on the part of the Contractor's managerial personnel, to establish and administer a program or system for the control, use, protection, preservation, maintenance, and repair of Government property as required by paragraph (e) of this clause.

(3) (i) If the Contractor fails to act as provided by subdivision (g)(2)(v) above, after being notified (by certified mail addressed to one of the Contractor's managerial personnel)

of the Government's disapproval, withdrawal of approval, or nonacceptance of the system or program, it shall be conclusively presumed that such failure was due to willful misconduct or lack of good faith on the part of the Contractor's managerial personnel.

(ii) In such event, any loss or destruction of, or damage to, the Government property shall be presumed to have resulted from such failure unless the Contractor can establish by clear and convincing evidence that such loss, destruction, or damage--

(A) Did not result from the Contractor's failure to maintain an approved program or system; or

(B) Occurred while an approved program or system was maintained by the Contractor.

(4) If the Contractor transfers Government property to the possession and control of a subcontractor, the transfer shall not affect the liability of the Contractor for loss or destruction of, or damage to, the property as set forth above. However, the Contractor shall require the subcontractor to assume the risk of, and be responsible for, any loss or destruction of, or damage to, the property while in the subcontractor's possession or control, except to the extent that the subcontract, with the advance approval of the Contracting Officer, relieves the subcontractor from such liability. In the absence of such approval, the subcontract shall contain appropriate provisions requiring the return of all Government property in as good condition as when received, except for reasonable wear and tear or for its use in accordance with the provisions of the prime contract.

(5) Upon loss or destruction of, or damage to, Government property provided under this contract, the Contractor shall so notify the Contracting Officer and shall communicate with the loss and salvage organization, if any, designated by the Contracting Officer. With the assistance of any such organization, the Contractor shall take all reasonable action to protect the Government property from further damage, separate the damaged and undamaged Government property, put all the affected Government property in the best possible order, and furnish to the Contracting Officer a statement of--

(i) The lost, destroyed, or damaged Government property;

(ii) The time and origin of the loss, destruction, or damage;

(iii) All known interests in commingled property of which the Government property is a part; and

(iv) The insurance, if any, covering any part of or interest in such commingled property.

(6) The Contractor shall repair, renovate, and take such other action with respect to damaged Government property as the Contracting Officer directs. If the Government property is destroyed or damaged beyond practical repair, or is damaged and so commingled or combined with property of others (including the Contractor's) that separation is impractical, the Contractor may, with the approval of and subject to any conditions imposed by the Contracting Officer, sell such property for the account of the Government. Such sales may be made in order to minimize the loss to the Government, to permit the resumption of business, or to accomplish a similar purpose. The Contractor shall be entitled to an equitable adjustment in the contract price for the expenditures made in performing the obligations under this subparagraph (g)(6) in accordance with paragraph (h) of this clause. However, the Government may directly reimburse the loss and salvage organization for any of their charges. The Contracting Officer shall give due regard to the Contractor's liability under this paragraph (g) when making any such equitable adjustment.

(7) The Contractor shall not be reimbursed for, and shall not include as an item of over head, the cost of insurance or of any reserve covering risk of loss or destruction of, or damage to, Government property, except to the extent that the Government may have expressly required the Contractor to carry such insurance under another provision of this contract.

(8) In the event the Contractor is reimbursed or otherwise compensated for any loss or destruction of, or damage to, Government property, the Contractor shall use the proceeds to repair, renovate, or replace the lost, destroyed, or damaged Government property or shall otherwise credit the proceeds to, or equitably reimburse, the Government, as directed by the Contracting Officer.

(9) The Contractor shall do nothing to prejudice the Government's rights to recover against third parties for any loss or destruction of, or damage to, Government property. Upon the request of the Contracting Officer, the Contractor shall, at the Government's expense, furnish to the Government all reasonable assistance and cooperation (including the prosecution of suit and the execution of instruments of assignment in favor of the Government) in obtaining recovery. In addition, where a subcontractor has not been relieved from

liability for any loss or destruction of, or damage to, Government property, the Contractor shall enforce for the benefit of the Government the liability of the subcontractor for such loss, destruction, or damage.

(h) Equitable adjustment.

When this clause specifies an equitable adjustment, it shall be made to any affected contract provision in accordance with the procedures of the Changes clause. When appropriate, the Contracting Officer may initiate an equitable adjustment in favor of the Government. The right to an equitable adjustment shall be the Contractor's exclusive remedy. The Government shall not be liable to suit for breach of contract for--

(1) Any delay in delivery of Government-furnished property;

(2) Delivery of Government-furnished property in a condition not suitable for its intended use;

(3) A decrease in or substitution of Government-furnished property; or

(4) Failure to repair or replace Government property for which the Government is responsible.

(i) Final accountingagraph (h) of this clause may properly include restoration or rehabilitation costs.

(k) Communications.

All communications under this clause shall be in writing.

(l) Overseas contracts.

If this contract is to be performed outside the United States of America, its territories, or possessions, the words "Government" and "Government-furnished" (wherever they appear in this clause) shall be construed as "United States Government" and "United States Government-furnished," respectively.

72. FAR 52.246-5 INSPECTION OF SERVICES - COST-REIMBURSEMENT (APR 1984)

(a) Definition. "Services" as used in this clause, includes services performed, workmanship, and material furnished or used in performing services.

(b) The Contractor shall provide and maintain an inspection system acceptable to the Government covering the services under this contract. Complete records of all inspection work performed by the Contractor shall be maintained and made available to the Government during contract performance and for as long afterwards as the contract requires.

(c) The Government has the right to inspect and test all services called for by the contract, to the extent practicable at all places and times during the term of the contract. The Government shall perform inspections and tests in a manner that will not unduly delay the work.

(d) If any of the services performed do not conform with contract requirements, the Government may require the Contractor to perform the services again in conformity with contract requirements, for no additional fee. When the defects in services cannot be corrected by reperformance, the Government may (1) require the Contractor to take necessary action to ensure that future performance conforms to contract requirements and (2) reduce any fee payable under the contract to reflect the reduced value of the services performed.

(e) If the Contractor fails to promptly perform the services again or take the action necessary to ensure future performance in conformity with contract requirements, the Government may (1) by contract or otherwise, perform the services and reduce any fee payable by an amount that is equitable under the circumstances or (2) terminate the contract for default.

73. FAR 52.246-25 LIMITATION OF LIABILITY-SERVICES (APR 1984)

(a) Except as provided in paragraphs (b) and (c) below, and except to the extent that the Contractor is expressly responsible under this contract for deficiencies in the services required to be performed under it (including any materials furnished in conjunction with those services), the Contractor shall not be liable for loss of or damage to property of the Government that (1) occurs after Government acceptance of services performed under this contract and (2) results from any defects or deficiencies in the services performed or materials furnished.

(b) The limitation of liability under paragraph (a) above shall not apply when a defect or deficiency in, or the Government's acceptance of, services performed or materials furnished results from willful misconduct or lack of good faith on the part of any of the Contractor's managerial personnel. The term "Contractor's managerial personnel," as used in this

clause, means the Contractor's directors, officers, and any of the Contractor's managers, superintendents, or equivalent representatives who have supervision or direction of--

(1) All or substantially all of the Contractor's business;

(2) All or substantially all of the Contractor's operations at any one plant, laboratory, or separate location at which the contract is being performed; or

(3) A separate and complete major industrial operation connected with the performance of this contract.

(c) If the Contractor carries insurance, or has established a reserve for self-insurance, covering liability for loss or damage suffered by the Government through the Contractor's performance of services or furnishing of materials under this contract, the Contractor shall be liable to the Government, to the extent of such insurance or reserve, for loss of or damage to property of the Government occurring after Government acceptance of, and resulting from any defects and deficiencies in, services performed or materials furnished under this contract.

(d) The Contractor shall include this clause, including this paragraph (d), supplemented as necessary to reflect the relationship of the contracting parties, in all subcontracts over $25,000.

74. FAR 52.247-34 F.O.B. DESTINATION (NOV 1991)

(a) The term "f.o.b. destination," as used in this clause means:

(1) Free of expense to the Government, on board the carrier's conveyance, at a specified delivery point where the consignee's facility (plant, warehouse, store, lot, or other location to which shipment can be made) is located; and

(2) Supplies shall be delivered to the destination consignee's wharf (if destination is a port city and supplies are for export), warehouse unloading platform, or receiving dock, at the expense of the Contractor. The Government shall not be liable for any delivery, storage, demurrage, accessorial, or other charges involved before the actual delivery (or "constructive placement" as defined in carrier tariffs) or the supplies to the destination, unless such charges are caused by an act or order of the Government acting in its contractual capacity. If rail carrier is used, supplies shall be delivered to the specified unloading platform of the

consignee. If motor carrier (including "piggyback") is used, supplies shall be delivered to truck tailgate at the unloading platform of the consignee, except when the supplies delivered meet the requirements of Item 568 of the Material Motor Freight Classification for "heavy or bulky freight". When supplies meeting the requirements of the referenced Item 568 are delivered, unloading (including movement to the tailgate) shall be performed by the consignee, with assistance from the truck driver, if requested. If the Contractor uses rail carrier or freight forwarder for less than carload shipments, the Contractor shall assure that the carrier will furnish tailgate delivery, when required, if transfer to truck is required to complete delivery to consignee.

(b) The Contractor shall--

(1) (i) Pack and mark the shipment to comply with contract specifications; or

(ii) In the absence of specifications, prepare the shipment in conformance with carrier requirements;

(2) Prepare and distribute commercial bills of lading;

(3) Deliver the shipment in good order and condition to the point of delivery specified in the contract;

(4) Be responsible for any loss of and/or damage to the goods occurring before receipt of the shipment by the consignee at the delivery point specified in the contract;

(5) Furnish a delivery schedule and designate the mode of delivering carrier; and

(6) Pay and bear all charges to the specified point of delivery.

75. FAR 52.249-6 TERMINATION (COST-REIMBURSEMENT) (MAY 1986)

(a) The Government may terminate performance of work under this contract in whole or, from time to time, in part, if--

(1) The Contracting Officer determines that a termination is in the Government's interest; or

(2) The Contractor defaults in performing this contract and fails to cure the default within 10 days (unless extended by the Contracting Officer) after receiving a notice specifying the default. "Default" includes failure to make progress in the work so as to endanger performance.

(b) The Contracting Officer shall terminate by delivering to the Contractor a Notice of Termination specifying whether termination is for default of the Contractor or for convenience of the Government, the extent of termination, and the effective date. If, after termination for default, it is determined that the Contractor was not in default or that the Contractor's failure to perform or to make progress in performance is due to causes beyond the control and without the fault or negligence of the Contractor as set forth in the Excusable Delays clause, the rights and obligations of the parties will be the same as if the termination was for the convenience of the Government.

(c) After receipt of a Notice of Termination, and except as directed by the Contracting Officer, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due under this clause:

(1) Stop work as specified in the notice.

(2) Place no further subcontracts or orders (referred to as subcontracts in this clause), except as necessary to complete the continued portion of the contract.

(3) Terminate all subcontracts to the extent they relate to the work terminated.

(4) Assign to the Government, as directed by the Contracting Officer, all right, title, and interest of the Contractor under the subcontracts terminated, in which case the Government shall have the right to settle or to pay any termination settlement proposal arising out of those terminations.

(5) With approval or ratification to the extent required by the Contracting Officer, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts, the cost of which would be reimbursable in whole or in part, under this contract; approval or ratification will be final for purposes of this clause.

(6) Transfer title (if not already transferred) and, as directed by the Contracting Officer, deliver to the Government (i) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced or acquired for the work terminated, (ii) the completed or partially completed plans, drawings, information, and other property that, if the contract had been completed, would be

required to be furnished to the Government, and (iii) the jigs, dies, fixtures, and other special tools and tooling acquired or manufactured for this contract, the cost of which the Contractor has been or will be reimbursed under this contract.

(7) Complete performance of the work not terminated.

(8) Take any action that may be necessary, or that the Contracting Officer may direct, for the protection and preservation of the property related to this contract that is in the possession of the Contractor and in which the Government has or may acquire an interest.

(9) Use its best efforts to sell, as directed or authorized by the Contracting Officer, any property of the types referred to in subparagraph (6) above; provided, however, that the Contractor (i) is not required to extend credit to any purchaser and (ii) may acquire the property under the conditions prescribed by, and at prices approved by, the Contracting Officer. The proceeds of any transfer or disposition will be applied to reduce any payments to be made by the Government under this contract, credited to the price or cost of the work, or paid in any other manner directed by the Contracting Officer.

(d) After expiration of the plant clearance period as defined in Subpart 45.6 of the Federal Acquisition Regulation, the Contractor may submit to the Contracting Officer a list, certified as to quantity and quality, of termination inventory not previously disposed of, excluding items authorized for disposition by the Contracting Officer. The Contractor may request the Government to remove those items or enter into an agreement for their storage. Within 15 days, the Government will accept the items and remove them or enter into a storage agreement. The Contracting Officer may verify the list upon removal of the items, or if stored, within 45 days from submission of the list, and shall correct the list, as necessary, before final settlement.

(e) After termination, the Contractor shall submit a final termination settlement proposal to the Contracting Officer in the form and with the certification prescribed by the Contracting Officer. The Contractor shall submit the proposal promptly, but no later than 1 year from the effective date of termination, unless extended in writing by the Code.

(8) Take any action that may be necessary, or that the Contracting Officer may direct, for the protection and preservation of the property related to this contract that is in the possession of the Contractor and in which the Government has or may acquire an interest.

(9) Use its best efforts to sell, as directed or authorized by the Contracting Officer, any property of the types referred to in subparagraph (6) above; provided, however, that the Contractor (i) is not required to extend credit to any purchaser and (ii) may acquire the property under the conditions prescribed by, and at prices approved by, the Contracting Officer. The proceeds of any transfer or disposition will be applied to reduce any payments to be made by the Government under this contract, credited to the price or cost of the work, or paid in any other manner directed by the Contracting Officer.

(d) After expiration of the plant clearance period as defined in Subpart 45.6 of the Federal Acquisition Regulation, the Contractor may submit to the Contracting Officer a list, certified as to quantity and quality, of termination inventory not previously disposed of, excluding items authorized for disposition by the Contracting Officer. The Contractor may request the Government to remove those items or enter into an agreement for their storage. Within 15 days, the Government will accept the items and remove them or enter into a storage agreement. The Contracting Officer may verify the list upon removal of the items, or if stored, within 45 days from submission of the list, and shall correct the list, as necessary, before final settlement.

(e) After termination, the Contractor shall submit a final termination settlement proposal to the Contracting Officer in the form and with the certification prescribed by the Contracting Officer. The Contractor shall submit the proposal promptly, but no later than 1 year from the effective date of termination, unless extended in writing by the Contracting Officer upon written request of the Contractor within this 1-year period. However, if the Contracting Officer determines that the facts justify it, a termination settlement proposal may be received and acted on after 1 year or any extension. If the Contractor fails to submit the proposal within the time allowed, the Contracting Officer may determine, on the basis of information available, the amount, if any, due the Contractor because of the termination and shall pay the amount determined.

(f) Subject to paragraph (e) above, the Contractor and the Contracting Officer may agree on the whole or any part of the amount to be paid (including an allowance for fee) because of the termination. The contract shall be amended, and the Contractor paid the agreed amount.

(g) If the Contractor and the Contracting Officer fail to agree in whole or in part on the amount of costs and/or fee to be paid because of the termination of work, the Contracting

Officer shall determine, on the basis of information available, the amount, if any, due the Contractor, and shall pay that amount, which shall include the following:

(1) All costs reimbursable under this contract, not previously paid, for the performance of this contract before the effective date of the termination, and part of those costs that may continue for a reasonable time with the approval of or as directed by the Contracting Officer; however, the Contractor shall discontinue those costs as rapidly as practicable.

(2) The cost of settling and paying termination settlement proposals under terminated subcontracts that are properly chargeable to the terminated portion of the contract if not included in subparagraph (1)above.

(3) The reasonable costs of settlement of the work terminated, including--

(i) Accounting, legal, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data;

(ii) The termination and settlement of subcontracts (excluding the amounts of such settlements); and

(iii) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection, or disposition of the termination inventory. If the termination is for default, no amounts for the preparation of the Contractor's termination settlement proposal maybe included.

(4) A portion of the fee payable under the contract, determined as follows:

(i) If the contract is terminated for the convenience of the Government, the settlement shall include a percentage of the fee equal to the percentage of completion of work contemplated under the contract, but excluding subcontract effort included in subcontractors' termination proposals, less previous payments for fee.

(ii) If the contract is terminated for default, the total fee payable shall be such proportionate part of the fee as the total number of articles (or amount of services) delivered to and accepted by the Government is to the total number of articles (or amount of services) of a like kind required by the contract.

(5) If the settlement includes only fee, it will be determined under subparagraph (g)(4) above.

(h) The cost principles and procedures in Part 31 of the Federal Acquisition Regulation, in effect on the date of this contract, shall govern all costs claimed, agreed to, or determined under this clause.

(i) The Contractor shall have the right of appeal, under the Disputes clause, from any determination made by the Contracting Officer under paragraph (e) or (g) above or paragraph (k) below, except that if the Contractor failed to submit the termination settlement proposal within the time provided in paragraph (e) and failed to request a time extension, there is no right of appeal. If the Contracting Officer has made a determination of the amount due under paragraph (e), (g) or (k), the Government shall pay the Contractor (1) the amount determined by the Contracting Officer if there is no right of appeal or if no timely appeal has been taken, or (2) the amount finally determined on an appeal.

(j) In arriving at the amount due the Contractor under this clause, there shall be deducted--

(1) All unliquidated advance or other payments to the Contractor, under the terminated portion of this contract;

(2) Any claim which the Government has against the Contractor under this contract; and

(3) The agreed price for, or the proceeds of sale of materials, supplies, or other things acquired by the Contractor or sold under this clause and not recovered by or credited to the Government.

(k) The Contractor and Contracting Officer must agree to any equitable adjustment in fee for the continued portion of the contract when there is a partial termination. The Contracting Officer shall amend the contract to reflect the agreement.

(l) (1) The Government may, under the terms and conditions it prescribes, make partial payments and payments against costs incurred by the Contractor for the terminated portion of the contract, if the Contracting Officer believes the total of these payments will not exceed the amount to which the Contractor will be entitled.

(2) If the total payments exceed the amount finally determined to be due, the Contractor shall repay the excess to the Government upon demand, together with interest computed at

the rate established by the Secretary of the Treasury under 50 U.S.C. App. 1215(b)(2). Interest shall be computed for the period from the date the excess payment is received by the Contractor to the date the excess is repaid. Interest shall not be charged on any excess payment due to a reduction in the Contractor's termination settlement proposal because of retention or other disposition of termination inventory until 10 days after the date of the retention or disposition, or a later date determined by the Contracting Officer because of the circumstances.

(m) The provisions of this clause relating to fee are inapplicable if this contract does not include a fee.

76. FAR 52.249-14 EXCUSABLE DELAYS (APR 1984)

(a) Except for defaults of subcontractors at any tier, the Contractor shall not be in default because of any failure to perform this contract under its terms if the failure arises from causes beyond the control and without the fault or negligence of the Contractor. Examples of these causes are (1) acts of God or of the public enemy, (2) acts of the Government in either its sovereign or contractual capacity, (3) fires, (4) floods, (5) epidemics, (6) quarantine restrictions, (7) strikes, (8) freight embargoes, and (9) unusually severe weather. In each instance, the failure to perform must be beyond the control and without the fault or negligence of the Contractor. "Default" includes failure to make progress in the work so as to endanger performance.

(b) If the failure to perform is caused by the failure of a subcontractor at any tier to perform or make progress, and if the cause of the failure was beyond the control of both the Contractor and subcontractor, and without the fault or negligence of either, the Contractor shall not be deemed to be in default, unless--

(1) The subcontracted supplies or services were obtainable from other sources;

(2) The Contracting Officer ordered the Contractor in writing to purchase these supplies or services from the other source; and

(3) The Contractor failed to comply reasonably with this order.

(c) Upon request of the Contractor, the Contracting Officer shall ascertain the facts and extent of the failure. If the Contracting Officer determines that any failure to perform results from one or more of the causes above, the

delivery schedule shall be revised, subject to the rights of the Government under the termination clause of this contract.

77. DEAR 952.250-70 NUCLEAR HAZARDS INDEMNITY AGREEMENT (NOV 1991)

(a) Authority. This clause is incorporated into this contract pursuant to the authority contained in subsection 170d. of the Atomic Energy Act of 1954, as amended (hereinafter called the Act).

(b) Definitions. The definitions set out in the Act shall apply to this clause.

(c) Financial protection. Except as hereafter permitted or required in writing by DOE, the contractor will not be required to provide or maintain, and will not provide or maintain at Government expense, any form of financial protection to cover public liability, as described in paragraph (d)(2) below. DOE may, however, at any time require in writing that the contractor provide and maintain financial protection of such a type and in such amount as DOE shall determine to be appropriate to cover such public liability, provided that the costs of such financial protection are reimbursed to the contractor by DOE.

(d) Indemnification.

(1) To the extent that the contractor and other persons indemnified are not compensated by any financial protection permitted or required by DOE, DOE will indemnify the contractor and other persons indemnified against (i) claims for public liability as described in subparagraph (d)(2) of this clause; and (ii) such legal costs of the contractor and other persons indemnified as are approved by DOE, provided that DOE's liability, including such legal costs, shall not exceed the amount set forth in section 170e.(1)(B) of the Act in the aggregate for each nuclear incident or precautionary evacuation occurring within the United Staes or $100 million in the aggregate for each nuclear incident occurring outside the United States, irrespective of the number of persons indemnified in connection with this contract.

(2) The public liability referred to in subparagraph (d)(1) of this clause is public liability as defined in the Act which (i) arises out of or in connection with the activities under this contract, including transportation; and (ii) arises out of or results from a nuclear incident or precautionary evacuation, as those terms are defined in the Act.

(e) Waiver of Defenses.

(1) In the event of a nuclear incident, as defined in the Act, arising out of nuclear waste activities, as defined in the Act, the contractor, on behalf of itself and other persons indemnified, agrees to waive any issue or defense as to charitable or governmental immunity.

(2) In the event of an extraordinary nuclear occurrence which:

(i) Arises out of, results from, or occurs in the course of the construction, possession, or operation of a production or utilization facility; or

(ii) Arises out of, results from, or occurs in the course of transportation of source material, by-product material, or special nuclear material to or from a production or utilization facility; or

(iii) Arises out of or results from the possession, operation, or use by the contractor or a subcontractor of a device utilizing special nuclear material or by-product material, during the course of the contract activity; or

(iv) Arises out of, results from, or occurs in the course of nuclear waste activities, the contractor, on behalf of itself and other persons indemnified, agrees to waive:

(A) Any issue or defense as to the conduct of the claimant (including the conduct of persons through whom the claimant derives its cause of action) or fault or persons indemnified, including, but not limited to:

1. Negligence;
2. Contributory negligence;
3. Assumption of risk; or
4. Unforeseeable intervening causes; whether involving the conduct of a third person or an act of God;

(B) Any issue or defense as to charitable or governmental immunity; and

(C) Any issue or defense based on any statute of limitations, if suit is instituted within 3 years from the date on which the claimant first knew, or reasonably could have known, of his injury or damage and the cause thereof. The waiver of any such issue or defense shall be effective regardless of whether such issue or defense may otherwise be

deemed jurisdictional or relating to an element in the cause of action. The waiver shall be judicially enforceable in accordance with its terms by the claimant against the person indemnified.

(v) The term extraordinary nuclear occurrence means an event which DOE has determined to be an extraordinary nuclear occurrence as defined in the Act. A determination of whether or not there has been an extraordinary nuclear occurrence will be made in accordance with the procedures in 10 CFR part 840.

(vi) For the purposes of that determination, "offsite" as that term is used in 10 CFR part 840 means away from "the contract location" which phrase means any DOE facility, installation, or site at which contractual activity under this contract is being carried on, and any contractor-owned or controlled facility, installation, or site at which the contractor is engaged in the performance of contractual activity under this contract.

(3) The waivers set forth above:

(i) Shall be effective regardless of whether such issue or defense may otherwise be deemed jurisdictional or relating to an element in the cause of action;

(ii) Shall be judicially enforceable in accordance with its terms by the claimant against the person indemnified;

(iii) Shall not preclude a defense based upon a failure to take reasonable steps to mitigate damages;

(iv) Shall not apply injury or damage to a claimant or to a claimant's property which is intentionally sustained by the claimant or which results from a nuclear incident intentionally and wrongfully caused by the claimant;

(v) Shall not apply to injury to a claimant who is employed at the site of and in connection with the activity where the extraordinary nuclear occurrence takes place, if benefits therefor are either payable or required to be provided under any workmen's compensation or occupational disease law;

(vi) Shall not apply to any claim resulting from a nuclear incident occurring outside the United States;

(vii) Shall be effective only with respect to those obligations set forth in this clause and in insurance policies, contracts or other proof of financial protection; and

(viii) Shall not apply to, or prejudice the prosecution or defense of, any claim or portion of claim which is not within the protection afforded under (A) the limit of liability provisions under subsection 170e. of the Act, and (B) the terms of this agreement and the terms of insurance policies, contracts, or other proof of financial protection.

(f) Notification and litigation of claims. The contractor shall give immediate written notice to DOE of any known action or claim filed or made against the contractor or other person indemnified for public liability as defined in paragraph (d)(2). Except as otherwise directed by DOE, the contractor shall furnish promptly to DOE, copies of all pertinent papers received by the contractor or filed with respect to such actions of claims. DOE shall have the right to, and may collaborate with, the contractor and any other person indemnified in the settlement or defense of any action or claim and shall have the right to (1) require the prior approval of DOE for the payment of any claim that DOE may be required to indemnify hereunder; and (2) appear through the Attorney General on behalf of the contractor or other person indemnified in any action brought upon any claim that DOE may be required to indemnify hereunder, take charge of such action, and settle or defend any such action. If the settlement of defense of any such action or claim is undertaken by DOE, the contractor or other person indemnified shall furnish all reasonable assistance in effecting a settlement or asserting a defense.

(g) Continuity of DOE obligations. The obligations of DOE under this clause shall not be affected by any failure on the part of the contractor to fulfill its obligation under this contract and shall be unaffected by the death, disability, or termination of existence of the contractor, or by the completion, termination or expiration of this contract.

(h) Effect of other clauses. The provisions of this clause shall not be limited in any way by, and shall be interpreted without reference to, any other clause of this contract, including the clause entitled Contract Disputes, provided, however, that this clause shall be subject to the clauses entitled Covenant Against Contingent Fees, Officials Not to Benefit, and Examination of Records by the Comptroller General, and any provisions that are later added to this contract as required by applicable Federal law, including statutes, executive orders and regulations, to be included in Nuclear Hazards Indemnity Agreements.

(i) Civil penalties. The contractor and its subcontractors and suppliers who are indemnified under the provisions of this clause are subject to civil penalties, pursuant to 234A of the Act, for violations of applicable DOE nuclear-safety related rules, regulations, or orders.

(j) Criminal penalties. Any individual director, officer, or employee of the contractor or of its subcontractors and suppliers who are indemnified under the provisions of this clause are subject to criminal penalties, pursuant to 223c. of the Act, for knowing and willful violation of the Atomic Energy Act of 1954, as amended, and applicable DOE nuclear safety-related rules, regulations or orders which violation results in, or, if undetected, would have resulted in a nuclear incident.

(k) Inclusion in subcontracts. The contractor shall insert this clause in any subcontract which may involve the risk of public liability, as that term is defined in the Act and further described in paragraph (d)(2) above. However, this clause shall not be included in subcontracts in which the subcontractor is subject to Nuclear Regulatory Commission (NRC) financial protection requirements under section 170b. of the Act or NRC agreements of indemnification under section 170c. or k. of the Act for the activities under the subcontract.

78. FAR 52.251-1 GOVERNMENT SUPPLY SOURCES (APR 1984)

The Contracting Officer may issue the Contractor an authorization to use Government supply sources in the performance of this contract. Title to all property acquired by the Contractor under such an authorization shall vest in the Government unless otherwise specified in the contract. Such property shall not be considered to be "Government-furnished property," as distinguished from "Government property." The provisions of the clause entitled "Government Property," except its paragraphs (a) and (b), shall apply to all property acquired under such authorization.

79. FAR 52.251-2 INTERAGENCY FLEET MANAGEMENT SYSTEM VEHICLES AND RELATED SERVICES (JAN 1991)

The Contracting Officer may issue the Contractor an authorization to obtain interagency fleet management system vehicles and related services for use in the performance of this contract. The use, service, and maintenance of interagency fleet management system vehicles and the use of related services by the Contractor shall be in accordance with 41 CFR 101-39 and 41 CFR 101-38.301-1.

80. DEAR 952.251-70 CONTRACTOR EMPLOYEE TRAVEL DISCOUNTS (APR 1989)

(a) Contracted airlines. Airlines participating in travel discounts are listed in the Federal Travel Directory (FTD), published monthly by the General Services Administration (GSA). Regulations governing the use of contracted airlines are contained in the Federal Property Management Regulation (FPMR), Temporary Regulation A-30. Temporary Regulation A-30 stipulates that cost- reimbursable contractor employees may obtain discount air fares by use of a Government Transportation Request (GTR), Standard Form 1169, cash or personal credit cards. When the GTR is used, contracting officers may issue a blanket GTR for a period of not less than two weeks nor more than one month. In unusual circumstances, such as prolonged or international travel, the contracting officer may extend the period for which a blanket GTR is effective to a maximum of three months. Contractors will ensure that their employees traveling under GTR's provide the GTR number to the contracted airlines for entry on individual tickets and on month-end billings to the contractor.

(b) Hotels/motels. Participating hotels and motels which extend discounts are listed in the FTD, which shows rates, facilities, and identifies by code those which offer reduced rates to cost-reimbursable contractor employees while traveling on official contract business.

(c) Car rentals. The Military Traffic Management Command (MTMC) Department of Defense, negotiates rate agreements with car rental companies for special flat rates and unlimited mileage. Participating car rental companies which offer these terms on to cost-reimbursable contractor employees while traveling on official contract business are listed in the FTD.

(d) Procedures for obtaining service.

(1) Identification and method of payment requirements for participating Federal contracted airlines are listed in the FTR. Travel discount air fares may be ordered by the issuance of a GTR either directly to the contractor, or to a Scheduled Airline Travel Office (SATO) or Federal Travel Management Center (FTMC), provided the letter of identification signed by the cognizant contracting officer accompanies the order. In appropriate instances, such as geographical proximity, contractors may obtain discount air fares through a DOE office or a cooperating local travel agency when neither a SATO or FTMC is available. Some airlines allow the purchase of discounted air fares with cash or credit card.

(2) In the case of hotel and motel accommodations, reservations may be made by the contractor employee directly with the hotel or motel but the employee must display, on arrival, the letter of identification and any other identification required by the hotel or motel proprietorship.

(3) For car rentals, generally the same procedures as in (d)(2) above will be followed in arranging reservations and obtaining discounts.

(e) Standard letter of identification. Contractors shall prepare for the authorizing contracting officer a letter of identification based on the following format:

Format for Government Contractors to Qualify for Travel Discounts (To be typed on agency official letterhead)

To: (Source of ticketing, accommodations or rental)

Subject: Official Travel of Government Contractor

(Full name of traveler), bearer of this letter, is an employee of (company name) which is under contract to this agency under the Government contract (contract number). During the period of the contract (give dates), the employee is eligible and authorized to use available discount rates for contract-related travel in accordance with your contract and/or agreement with the Federal Government.

(Signature, title and telephone number of the contracting officer)

81. FAR 52.252-6 AUTHORIZED DEVIATIONS IN CLAUSES (APR 1984)

(a) The use in this solicitation or contract of any Federal Acquisition Regulation (48 CFR Chapter 1) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the clause.

(b) The use in this solicitation or contract of any Department of Energy Acquisition Regulation (48 CFR Chapter 9) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

82. DEAR 970.5204-2 SAFETY AND HEALTH (GOVERNMENT-OWNED OR LEASED) (APR 1984)

The Contractor shall take all reasonable precautions in the performance of the work under this contract to protect the safety and health of employees and of members of the public and shall comply with all applicable safety and health regulations

and requirements (including reporting requirements) of DOE. The Contracting Officer shall notify the Contractor, in writing, of any noncompliance with the provisions of the clause and the corrective action to be taken. After receipt of such notice, the Contractor shall immediately take corrective action. The Contractor shall submit a management program and implementation plan to the Contracting Officer for review and approval within 30 days after the date of award of this contract. In the event that the Contractor fails to comply with said regulations or requirements of DOE, the Contracting Officer may, without prejudice to any other legal or contractual rights of DOE, issue an order stopping all or any part of the work; thereafter, a start order for resumption of the work may be issued at the discretion of the Contracting Officer. The Contractor shall make no claim for an extension of time or for compensation or damages by reason of, or in connection with, such work stoppage.

83. CLAUSE DOE PR 9-9.110(C) - REPORTING OF ROYALTIES

If this contract is in an amount which exceeds $25,000 and if any royalty payments are directly involved in the contract or are reflected in the contract price to the Government, the Contractor agrees to report in writing to the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) during the performance of this contract and prior to its completion or final settlement, the amount of any royalties or other payments paid or to be paid by it directly to others in connection with the performance of this contract together with the names and addresses of licensors to who such payments are made and either the patent numbers involved or such other information as will permit the identification of the patents or other basis on which the royalties shall not estop the Government at any time from contesting the enforceability, validity or scope of, or title to, any patent under which a royalty or payments are made.

84. FAR 52.222-4 CONTRACT WORK HOURS AND SAFETY STANDARDS ACT - OVERTIME COMPENSATION (MAR 1986)

(a) Overtime requirements. No Contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics (see Federal Acquisition Regulation [FAR] 22.300) shall require or permit any such laborers or mechanics in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than 1 1/2 times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(b) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the provisions set

forth in paragraph (a) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic employed in violation of the provisions set forth in paragraph (a) of this clause in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in paragraph (a) of this clause.

(c) Withholding for unpaid wages and liquidated damages. The Contracting Officer shall upon his or her own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same Prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same Prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in paragraph (b) of this clause.

(d) Payrolls and basic records.

(1) The Contractor or subcontractor shall maintain payrolls and basic payroll records during the course of contract work and shall preserve them for a period of 3 years from the completion of the contract for all laborers and mechanics working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Nothing in this paragraph shall require the duplication of records required to be maintained for construction work by Department of Labor regulations at 29 CFR 5.5(a)(3) implementing the Davis-Bacon Act.

(2) The records to be maintained under paragraph (d)(1) of this clause shall be made available by the Contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the Contracting Officer or the Department of Labor. The Contractor or subcontractor shall permit such representatives to interview employees during work hours on the job.

(e) Subcontracts. The Contractor or subcontractor shall insert in any subcontracts the provisions set forth in paragraphs (a) through (e) of this clause and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the provisions set forth in paragraphs (a) through (e) of this clause.

85. DEAR 970.5204-58 WORKPLACE SUBSTANCE ABUSE PROGRAMS AT DOE SITES (AUG 1992)

(a) Program Implementation. The Contractor shall, consistent with 10 CFR part 707, Workplace Substance Abuse Programs at DOE Sites, incorporated herein by reference with full force and effect, develop, implement and maintain a workplace substance abuse program.

(b) Remedies. In addition to any other remedies available to the Government, the Contractor's failure to comply with the requirements of 10 CRF Part 707 or to perform in a manner consistent with its approved program may render the Contractor subject to: the suspension of contract payments, or where applicable, a reduction in award fee; termination for default; and suspension or debarment.

(c) Subcontracts.

(1) The Contractor agrees to notify the Contracting Officer reasonably in advance of, but not later than 30 days prior to the award of any subcontract the Contractor believes may be subject to the requirements of 10 CFR part 707.

(2) The DOE Prime Contractor shall require all subcontracts subject to the provisions of 10 CFR part 707 to agree to develop and implement a workplace substance abuse program that complies with the requirements of 10 CFR part 707, Workplace Substance Abuse Programs at DOE Sites, as a condition for award of the subcontract. The DOE Prime Contractor shall review and approve each subcontractor's program and shall periodically monitor each subcontractor's implementation of the program for effectiveness and compliance with 10 CFR part 707.

(3) The Contractor agrees to include, and require the inclusion of, the requirements of this clause in all subcontracts, at any tier, that are subject to the provisions of 10 CFR part 707.

Part III

List of Documents, Exhibits and Other Attachments

Section J

Description	Attachment	Pages
Statement of Work	A	38
Capital Equipment, Noncapital Equipment and Sensitive Items	B	1
Facilities, Real Property	C	7
Los Alamos Fire Department, Fire Service Area	D	1
Listing of DOE-Owned and Leased Structures	E	2
Small Business and Small Disadvantaged Business Subcontracting Plan	F	8
Special Bank Account Agreement for Use with the Checks-Paid Method of Letter of Credit Financing	G	7
Billing Instructions	H	6
Wage Determination, U. S. Department of Labor	I	14
Contract Notifications and Submittals	J	4

Department of Energy
Field Office, Albuquerque
Los Alamos Area Office
Los Alamos, New Mexico 87544

NOV 3 0 1992

CONTRACT DISTRIBUTION

Contract No. DE-AC32-93AL64100

	Executed	Conformed
Incorporated County of Los Alamos ATTN: County Administrator P.O. Box 30 Los Alamos, NM 87544	1	
James Gourdoux, LANL, MS-M718		1
Office of the Counsel, LAAO		1
Fire Department Official File	1	
Eloy M. Nunez, Fire Dept Contract Mgr., LAAO		1
Alfred Geoffrion, Administrative Branch, LAAO		1
ES&H BRANCH, LAAO		1
AMG/JLB FIRE SUPPRESSION, EMERGENCY MEDICAL AND RESCUE SERVICES, LOS ALAMOS, NEW MEXICO		
Financial Management Division, AL ATTN: Rosemary Herrera	1	

Received Date

Administrative Branch

LA

INDEX FOR STATEMENT OF WORK

Clause	Topic	Page
I.	Services To Be Provided	SW - 1
A.	Work Scope	SW - 1
B.	Fire suppression services	SW - 1
C.	Emergency medical and rescue	SW - 2
D.	Communications	SW - 6
II.	Organization & Management	SW - 8
III.	Budgeting & Cost Management	SW - 9
IV.	Personnel Management	SW - 12
V.	Security Plan	SW - 13
VI.	Property Management	SW - 13
VII.	Training and Professional Development	SW - 17
VIII.	Emergency Management	SW - 21
IX.	Continuity of Operations	SW - 23
X.	Pre Fire Planning for Fire Suppression	SW - 25
XI.	Mutual Aid Agreements	SW - 26
XII.	Non Emergency Services	SW - 28
XIII.	Operational Procedures	SW - 30
XIV.	Self Assessment Program	SW - 31
	Annex A	AP - 1/4

INDSOW2

ATTACHMENT A

STATEMENT OF WORK

I. SERVICES TO BE PROVIDED

A. Work Scope

1. The Contractor shall provide personnel to operate the Department of Energy-owned Los Alamos Fire Department to provide fire suppression, emergency medical, fire prevention, and rescue services for the Los Alamos Fire Department Service Area.

B. Fire Suppression Services

1. The Contractor shall provide fire suppression services for the Los Alamos National Laboratory Fire Service Area (LANL-FSA) and the Municipal Development Area-Municipal Fire Services Area, and for brush and forest fires within the Los Alamos Fire Department Service Area. (See Attachment D). The Contractor shall not provide these services to areas outside the above-mentioned areas unless required by mutual-aid agreements to which the County or the DOE is, or becomes a party.

2. The Contractor shall provide these fire suppression services to meet the requirements of this contract, Federal Aviation Administration (FAA) regulations at 14 CFR Part 139 and 1500, as modified in Annex A to the Statement of Work, and NFPA Standards as applicable to emergency response.

3. The Contractor shall develop and submit to the Contracting Officer for approval personnel and equipment response procedures for all areas within the LANL-FSA within 30 calendar days after award of contract. The response procedures shall include a minimum of five (5) SCBA-equipped personnel and designated equipment to incidents within the LANL-FSA, except as otherwise approved by the Contracting Officer. The response procedures should take into account facility programmatic importance and hazards. In developing the response procedures, the Contractor shall take into account available personnel and equipment, overall needs throughout the Fire Department Service Area, and efficient use of personnel and equipment.
4. Response levels to incidents outside the LANL-FSA shall be determined by the Contractor or as set forth in mutual-aid agreements with local, Federal, State, other recognized agencies or communities.

C. Emergency Medical and Rescue Services

1. LANL-FSA Area - The Contractor shall provide emergency medical and rescue services, as set forth herein.

Medical services related to ambulance service shall be under the program direction of the ambulance service Medical Director. These services shall meet all standards required by DOE and as further outlined in New Mexico State General Order No. 35, and State Regulation No. 85-4 (HSED) may be amended from time to t time. Statutory authority for these regulations is contained in the Emergency Medical Services Act, Section 24-10B-1 to 10B-11, New Mexico Statutes Annotated, 1978, and Section 9-7-6, New Mexico Statutes Annotated, 1978.

2. All Other Areas - The Contractor shall provide a level of service which at a minimum complies with applicable federal and state laws, and local ordinances.
3. Personnel and Equipment Response - Responses to medical emergencies shall be based on requirements of the ambulance service Medical Director and comply with the requirements of the State of New Mexico license requirements. Responses to the LANL-FSA shall include at least two persons, one possessing qualifications of EMT-B and one EMT-I. Compliance with the EMT-B requirement shall be required upon award of the contract. Compliance with EMT-I

requirement shall be accomplished no later than one year after approval by the Contracting Officer of the implementation plan as described below. The Contractor shall submit a proposed plan for accomplishment of the EMT-I implementation requirement. The plan shall include tasks and milestones for accomplishment thereof. The plan shall be submitted to the Contracting Officer for approval no later than 30 calendar days after award of the contract. The Contractor shall submit a monthly report to the Contracting Officer reporting the status of actions taken to accomplish tasks in the plan.

4. Non-Emergency Services - The Contractor may provide medical transport services between treatment facilities in Los Alamos and nearby communities subject to the following restrictions:

   a. Services can be provided by standby equipment and off-duty personnel.

   b. The use of on-line equipment and on-duty personnel is authorized only when requested by medical authorities and the situation is life-threatening.

c. When on-line equipment and personnel are used for medical transport, it will be the responsibility of the Fire Department's senior person on duty to assure that adequate personnel remain on duty or are called to duty to provide the minimum manning levels set forth in the response procedures for fire suppression, emergency medical and rescue services.

5. Emergency Medical and Rescue Services Operating Procedures -

a. The Contractor shall develop and implement written operating procedures for emergency medical and rescue services to be provided by the Fire Department. The procedures shall cover equipment assignment to stations, personnel training; response manning, including personnel qualifications; guidelines for equipment dispatching within and outside the Los Alamos Fire Department Service Area; and billing and collection of ambulance and rescue services revenues. The operating procedures shall be submitted to the Contracting Officer within 90 calendar days after award of the contract and

shall be updated as required or as directed by the Contracting Officer.

D. Communications and Dispatch

1. The Contractor shall be responsible for the operation of all radio and telephone systems provided by the Government under this contract. In addition, the Contractor shall be responsible for the dispatch of equipment and personnel to emergencies. Written procedures shall be developed and implemented setting forth procedures to be followed by Fire Department personnel for receiving alarms, dispatching of equipment, and tracking and coordinating of the equipment after dispatching. The Contractor shall assure that communications equipment utilized by the Fire Department has the ability to contact other agencies within the Los Alamos Fire Department Service Area, and areas covered by mutual-aid agreements, including the ability to contact off-duty personnel. Communication and dispatch procedures shall be submitted to the Contracting Officer for approval within 120 calendar days after award of the contract.

2. The DOE will allow the Contractor the use of the LANL trunked radio system for responses to emergencies that fall within the scope of the contract.
3. The Contractor shall comply with the requirements of NFPA 1221, Installation, Maintenance and Use of Public Fire Service Communications Systems, and NFPA 72F, Installation, Maintenance and Use of Emergency Voice/Alarm Communications Systems in providing services as required by this contract.
4. The DOE will provide the Contractor with a temporary communications/dispatch facility to be located at Fire Station No. 2 or other mutually agreed location. The Contractor will be responsible for providing trained personnel to operate the facility. The DOE and the Contractor hereby agree to continue negotiations for the development of a plan for a combined Fire Department/Police dispatch center. The negotiations will address the location, staffing, equipment, facility, and funding required for the operation of each facility and the transition of the dispatch function from the temporary to the permanent facility.

II. ORGANIZATION AND MANAGEMENT

A. The Contractor shall develop and maintain an organization to efficiently and effectively meet the staffing requirements of the contract.

B. The Contractor shall prepare an organization chart that shows lines of authority and relationships of the Contractor's organizational structure that provide direct and indirect support to the Fire Department The chart should also include outside organizations such as other fire departments which provide support pursuant to mutual-aid agreements, other DOE contractors such as the University of California, and the Forest Service. Additionally, the Contractor shall prepare an organization chart which depicts the line functions of each position, and lines of authority of all positions assigned to the Fire Department. The organization chart shall be supported by a narrative statement which describes the function, responsibility, and authority of each position assigned to the Fire Department.

C. Prior to implementing any permanent changes to the Fire Department organization, the Contractor will submit for the Contracting Officer's approval, any proposed revisions to the approved organizational structure, organization chart and narrative and obtain written Contracting Officer approval for the proposed revisions.

D. In order to maintain authorized staffing levels, the Contractor can request approval from the Contracting Officer to exceed the authorized FTE levels at the time recruitment is made to fill vacant positions. The numbers of personnel to be recruited which exceed the authorized FTE levels will be based on projections based on attrition rates or other factors as authorized by the Contracting Officer.

III. BUDGETING AND COST MANAGEMENT

A. BUDGET -

1. Annually the Contractor shall prepare and submit for Contracting Officer approval a budget consistent with the Government's fiscal year, which begins on October 1 and ends on September 30 of the following calendar year. The budget shall be submitted to the Contracting Officer no later than September 30th of each year and shall cover the fiscal year starting on October 1 of the next fiscal year and the two following fiscal years. For example, the submission for FY 1994 will include FY 1995 and FY 1996 and would be submitted by September 30, 1993. The budget shall be prepared in a line-item type of format as approved by the Contracting Officer. Each line-item in the budget shall be supported by a narrative description for each type of cost item that makes up each

individual line of the budget. The budget shall include all work to be performed which will be funded by for operating expense, capital equipment and capital plant type funding. The requirements of Order DOE 5100.3, Planning, Programming and Budgeting, shall be followed in preparing the budget.

2. The budget shall be updated by the Contractor as requested by the Contracting Officer. The updates shall reflect the actual costs incurred by the Contractor for each of the previous periods of the fiscal year and the Contractor's projections for the remainder of the fiscal year.

   Increases or decreases of the amounts for any of the line-items shall be supported by reasons causing the variances. Projected overruns or any of the line-items that exceed 10% of the line-item amount or $50,000, whichever is less, shall be reported to the Contracting Officer in writing immediately upon discovery of the projected overrun. The Contractor shall establish a system that will enable the development of budget projections and tracking of costs for each line-item in the budget on a minimum of a monthly basis or as required to provide budget and cost control of funds.

B. COST MANAGEMENT -

1. The Contractor shall implement a cost management system that will enable each Contractor element or organization to charge costs for expenditure of funds to each applicable line-item of the budget. The system shall be submitted to the Contracting Officer for approval within 180 calendar days after award of this contract.
2. The cost management system shall allow coding by an originator of a fund expenditure request, such as purchase and work orders, contract, etc., and approval of the coding and fund expenditure by a person designated by the Contractor to approve the expenditure. The cost management system shall have a tracking system that can account for all funds expended on a given order. The Contractor shall provide the Contracting Officer a monthly report which shows the fund status on a predetermined cut-off date of each month. The report shall show a description of the expenditure, amount of funds committed, and funds costed or paid out. Costs shall be reported for each line-item and sub-item in the approved budget. The report shall be submitted to the Contracting Officer no later than 30 calendar days following the end of each month.

3. The Contracting Officer will provide the Contractor with budget and cost information on Government-furnished property and services. The type and frequency of information to be provided will be mutually determined by Contracting Officer and the Contractor.

IV. PERSONNEL MANAGEMENT

The Contractor shall develop and implement a plan for personnel management of all Fire Department personnel which, at a minimum, covers the following areas:

1. Organization for personnel management
2. Position classification and job analysis
3. Compensation and benefits
4. Human resource planning
5. Equal employment and affirmative action
6. Recruitment and selection
7. Personnel assignments
8. Performance appraisal
9. Personnel development

In development of the personnel plan, the Contractor shall incorporate applicable requirements of this contract. Submission of the plan for Contracting Officer approval shall be 60 calendar days after award of the contract.

V. SECURITY PLAN-

The Contractor shall develop a Security Plan to assure that persons not possessing a DOE "Q" clearance are not allowed access to classified matter or special nuclear material. See Contract Clauses entitled DEAR 952-204.2 , Security Requirements and DEAR 952.204-70, Classification. The Security Plan shall set forth the procedures that will be used by the Contractor to comply with the requirements of the referenced clauses. The Plan shall be submitted to the Contracting Officer for approval 30 calendar days after award of the contract.

VI. PROPERTY MANAGEMENT

A. Property Management System - The Contractor shall develop and implement a system to track, inventory, report, and maintain all Government property as defined by the Contract clause entitled "Government Property (Cost Reimbursement, Time-and Materials, or Labor-Hour Contracts)" to be used by the Contractor in performing work as required by the contract. The system shall be in writing and shall as a minimum set forth procedures for:

1. Accountability of property
2. Inventory management
3. Responsibility for protection and safeguarding

4. Utilization/Disposal

5. Identification

6. Maintenance

7. Records/reporting

8. Inspection

9. Loan policy

B. Property Management Program Plan - A Property Management Plan which sets forth the Contractor's property management system shall be submitted to the Contracting Officer for approval within 180 calendar days after award of this contract.

C. Personal Property Controls -

1. Non-capital equipment

a. Non-capital equipment is defined as those items of nonexpendable personal property with a unit acquisition cost of between $1,000 and $4,999 and having a life of one year or more.

b. Property management information is to be maintained to support interrelated systems and programs such as maintenance, calibration, equipment pools, inventory, loans, storage, and excess reporting.

c. Acquisition value shall be available to support reporting of the equipment through the disposal process.

d. Each item of equipment shall be identified as U. S. Government property by a tag or marking and shall be assigned a specific property control number.

2. Sensitive Items

a. Sensitive items are those items of property, regardless of value, which are considered to be susceptible to being appropriated for personal use or which can be readily converted to cash; for example: firearms, portable photographic equipment, binoculars, portable tape recorders, portable calculators, and portable power tools.

b. The Contractor shall evaluate items in the $1,000-$4,999 range which should be added to the sensitive items list. Examples of these items include personal computer units and associated components, computer software, radios, electronic equipment, etc.

c. Non-sensitive property management record data similar to that used for non-capital equipment shall be established.

d. Each item of equipment shall be identified as U.S. Government property by a tag or marking and shall be assigned a specific property control number.

3. Capital Equipment

a. Capital equipment is defined as those items of nonexpendable property with a unit acquisition cost of $5,000 or more.

b. The Contractor shall include in the property management system procedures to record information, system data, property accountability, policies, etc., to meet the requirements set forth in the AL Property Management Instructions.

c. Each item of equipment shall be identified as U.S. Government property by a tag or marking and shall be assigned a specific property control number.

4. Motor Equipment (Vehicles)

a. The Contractor shall develop policies and procedures for economical and efficient management and control of Government-owned motor vehicles and motor vehicles rented or leased to the Government, including report-registration, official use, and identification to comply with the applicable requirements of Federal Property Management Regulations, Part 101.38, Sub-chapter G, and Department of Energy Property Management Regulations, Subchapter G, Transportation and Motor Vehicles.

b. Each vehicle shall be identified as U.S. Government property by a tag or marking and shall be assigned a specific property control number.

C. Real Property

1. The terms real property and real estate are synonymous and are defined as land and anything permanently affixed to the land such as buildings, fences, and those things attached to buildings such as lighting fixtures, plumbing and heating fixtures, etc.
2. The Contractor shall develop and implement a real property management system to administer, inventory, and report real property provided by DOE to the Contractor, to meet the requirements of Order DOE 4300.1B, Real Property and Site Development Planning.
3. The Contractor shall develop and implement a maintenance management program to meet the requirements of Order DOE 4330.4A, Real Property Maintenance Management and Order DOE AL 4330.4A, Maintenance of Property.

VII. TRAINING AND PROFESSIONAL DEVELOPMENT

A. Training Program

1. The Contractor shall develop, implement, and administer training programs that will include a new hire

training program, an in-service training program, qualification levels, and a certification program for all levels of training.

2. The Contractor shall appoint a full-time Training Officer responsible for overseeing all training and training-related qualifications, certifications, records, and reports required by this contract.
3. The Contractor shall develop the following training programs to maintain the minimum required level of service:
   a. Management training for supervisory officers in accordance with NFPA 1021.
   b. Training for firefighters levels 1 and 2 shall meet NFPA 1001, Fire Fighter Professional Qualifications and requirements for Emergency Medical Technician, Basic (EMT-B), as set forth in the State of New Mexico Regulations Governing the Licensing of Emergency Medical Technicians.
   c. Fire Officer training which complies with the requirements of NFPA 1021, Standards for Fire Officer Professional Qualification, will be required prior to promotion into the officer ranks or before completion of the probationary period of the position.

d. Company training which includes fire fighting tactics and strategy, hose evolutions, salvage techniques, ladder drills, hazardous materials, live fire drills, mountain rescue, relay operations, aircraft crash fire rescue training, apparatus pump operators training, and familiarization with fire suppression and detection systems. Fire apparatus driver/operator professional qualifications shall in accordance with NFPA 1002. Airport firefighter professional qualifications shall be in accordance with NFPA 1003, and Federal Aviation Administration, regulations at 14 CFR Part 139.

e. Pre-incident training which provides a comprehensive working knowledge of building protection, including technical indoctrination of nuclear criticality, radiation protection, explosives, large electrical installations, and LANL experimental facilities. Approved pre-fire plans shall augment this training.

f. Emergency medical services training shall comply with requirements set forth in the State of New Mexico Regulations Governing the Licensing of Emergency Medical Technicians. Training level of Emergency Medical Technician-Basic (EMT-B) and/or

Emergency Medical Technician-Intermediate (EMT-I) as required.

g. Training on the safe and proper operation of vehicles by all personnel during normal and emergency use. As a major objective, a training program shall be established to minimize the incidence of injuries, vehicle accidents, and abuse of vehicles. Training shall comply with NFPA 1002 requirements.

h. Training for hazardous-materials response shall be in accordance with NFPA 471 and 472; and OSHA 29 CFR 1910.120. All Fire Department personnel who will respond to emergencies shall receive training to meet the OSHA first responder awareness and first responder operational levels as a minimum. The DOE will provide training, as required, for those responses to the LANL-FSA that involve specific types of hazardous materials that are unique to LANL operations.

i. Training for administrative and technical support personnel assigned to the Fire Department.

4. The Training Program shall be submitted to the Contracting Officer for approval within 60 calendar days after award of contract.

B. Training Records-

The Contractor shall establish and maintain training records and a certification program that will document specific qualifications and proficiency levels maintained for all personnel involved in fire suppression, emergency medical, and rescue operations.

C. Training Exercises-

The Contractor shall conduct exercises to assure competency in all assigned responsibilities, training, and qualification levels. In addition, the Contractor shall participate in exercises conducted by DOE for purposes of evaluating fire suppression, emergency medical, and rescue services response effectiveness. These exercises shall be conducted on at least a yearly basis and should cover all types of emergencies that the Fire Department responds to.

III. EMERGENCY MANAGEMENT

A. Incident Command System (ICS)

1. In connection with providing the services described herein, the Contractor shall implement an ICS. For incidents involving the LANL-FSA, the Contractor's ICS shall follow the basic fundamentals set forth in the LANL Emergency Response Plan which shall be based on and

consistent with the National Interagency Incident Management System. The Department of Energy will provide the necessary basic training and coordination with other DOE contractors at the LANL to allow the Contractor for the development of an ICS that will be consistent with all LANL organizations. The Contractor shall participate in the development and review; and concur with the approval of the LANL Emergency Response Plan.

2. In connection with responding to incidents within the LANL-FSA, if the Fire Department is the first responder on the scene, the Fire Department's ranking officer shall be the Incident Commander. Upon arrival at the scene of a higher ranking officer, Incident Command will be transferred as set forth in the Fire Department's ICS. The Fire Department's Incident Commander will remain in charge of an incident as long as the incident remains a fire, rescue or medical incident. If the incident involves hazards or requires resources other than those possessed by the Fire Department, then the Fire Department shall request that the LANL's Emergency Manager assume Incident Command. The Fire Department's ranking officer at the scene will remain in command of all the Fire Department's elements at the incident scene and will provide fire suppression,

emergency medical and rescue services as requested by the Incident Commander.

3. A written procedure to implement an ICS shall be developed to apply to all Contractor personnel involved in emergency operations. The procedures shall, as a minimum, identify training for emergency situations, safety, chain-of-command, and special hazards. The ICS procedures shall be submitted to the Contracting Officer for approval within 60 calendar days after award of the contract.

B. Occurrence Reporting -

The Contractor shall develop and implement occurrence reporting procedures that comply with the requirements of Order DOE 5000.3A, Occurrence Reporting and Processing of Operations Information. This requirement is applicable to all Fire Department facilities and operations covered by this contract. Submittal of the procedures is required 30 calendar days after award of contract.

IX. CONTINUITY OF OPERATIONS

A. In addition to complying with the requirements of the contract clauses entitled "Continuity of Services" and "Notice to the Government of Labor Disputes," the

Contractor shall take the actions required herein to assure a continuation of services under this contract. Any threat to the maintenance of required personnel staffing as a result of a potential or threatened work stoppage or other collective personnel actions shall be promptly reported to the Contracting Officer. The Contractor shall take all reasonable steps to minimize potential threats to operational continuity by providing for adequate planning and execution of emergency services.

B. The Contractor shall prepare a written Contingency Plan within 90 calendar days after award of contract and submit it to the Contracting Officer for approval. The Contingency Plan shall recognize all joint resources available to the parties of this contract, and shall address the Contractor's approach to providing critical services in the event of a work stoppage or labor dispute. In addition, the Contractor shall coordinate resources that could be provided by the DOE's contractors at the Los Alamos National Laboratory in preparation of the Contingency Plan. This Contingency Plan shall be updated periodically as deemed necessary or prudent by the contracting parties, and any changes to the Plan will be subject to the approval of the Contracting Officer.

C. When a strike or work stoppage is threatened or appears likely, the Contractor shall immediately provide the notice required above, and with the approval of the Contracting Officer, commence implementing necessary elements of the approved Contingency Plan.

X. PRE-FIRE PLANNING FOR FIRE SUPPRESSION

A. LANL-FSA Area. The Contractor shall implement a Pre-Fire Planning Program to develop and maintain pre-fire plans for incidents which the Fire Department responds to. A list of LANL Key facilities, in priority order, shall be provided to the Contractor by the Contracting Officer for development of pre-fire plans within the LANL-FSA.
The pre-fire planning shall include development of plans for wild-land fires and support provided by Fire Department to explosive or other LANL test programs.

B. All Other Areas. The Contractor shall develop pre-fire plans on a scope and frequency to be developed by the Contractor.

C. Two copies of all approved pre-fire plans and revisions thereto, for the LANL-FSA, shall be provided to the Contracting Officer for DOE use.

D. Each pre-fire plan within the LANL-FSA developed by the Contractor shall be submitted to the Contracting Officer for review. The Contractor shall protect all pre-fire plans as required by the assigned classification. All pre-fire plans within the LANL-FSA will, as a minimum, be handled as "Official Use Only" or Unclassified Controlled Nuclear Information (UCNI) documents.

E. A Pre-Fire Planning Program Plan shall be developed by the Contractor and submitted to the Contracting Officer for approval within 30 calendar days after award of the contract. The Contractor shall update the Plan as required to reflect any proposed changes to the Plan or as directed by the Contracting Officer.

XI. MUTUAL-AID AGREEMENTS

A. DOE is a party to one mutual-aid agreement--Memorandum of Agreement for Mutual Fire Protection, MOU DE-GB32-89AL57296. The Contractor shall be responsible for complying with DOE's commitments of this mutual-aid agreement as they apply to the services provided by the Fire Department.

B. During the term of this Contract, DOE may enter into additional mutual-aid agreements for which responsibility will be assigned to the Contractor under this contract, or the Contractor may, with DOE's approval, enter into

mutual-aid agreements which will be carried out as part of the contract work. The parties will determine, at the time such agreements are entered into, whether they constitute a change to the contract requiring an adjustment in the estimated price of the Contract.

C. It is contemplated by the parties that the Contractor will enter into mutual-aid agreements with local governments, federal agencies, Indian Pueblos, or other entities whose jurisdictional authority is adjacent to the Los Alamos Fire Department Service Area, when DOE determines that such mutual-aid agreements will enhance the services required under this contract and will not interfere with the performance of services to the LANL-FSA.

D. In connection with any existing or future mutual-aid agreement, which may involve work whose costs are allowable under this contract, the Contractor shall obtain the prior written approval of the Contracting Officer before carrying out any of the following actions:

1. Conducting discussions or negotiating with the objective of entering into an agreement;
2. Executing an agreement; or
3. Providing any services pursuant to an existing, DOE-approved agreement which are not expressly required by the agreement.

XII. NON-EMERGENCY SERVICES

A. Fire Hydrant Flow Testing

1. LANL-FSA Area - The Contractor shall provide annual flow testing of all fire hydrants located on DOE property, and those used to protect property which DOE leases within Los Alamos County, in accordance with NFPA 291, latest edition. The reports of these flow tests shall be delivered to the Contracting Officer within 30 calendar days of completion of the tests.
2. All other areas of Los Alamos County - The Contractor shall determine the scope for testing of fire hydrants on Los Alamos County property, and comply with those requirements as necessary.
3. The Contractor shall develop and implement written procedures for fire-hydrant testing to be used by the Fire Department to comply with this requirement and submit to the Contracting Officer for approval within 45 calendar days after award of the contract.

B. Standby Services

1. Los Alamos Airport - The Contractor shall comply with applicable Federal Aviation Administration (FAA), 14 CFR PART 139, Regulations for General Aviation

Activities and shall comply with applicable FAA, DOE, or Department of Defense (DOD) directives and regulations for specialized support for special cargo flights to suppress any fire or accomplish any rescue from take-off or landing operations.

2. LANL-FSA Area - The Contractor shall provide stand-by personnel and equipment for specific activities as deemed necessary and requested by the Contracting Officer.

3. All Other Areas - The Contractor shall provide standby personnel and equipment for specific activities as deemed necessary by the Contracting Officer.

C. Non-Emergency Alarms - The Contractor shall respond to non-emergency alarms (automatic fire protection system supervisory and trouble alarms), within a reasonable period of time, normally not to exceed fifteen (15) minutes.

D. Fire Evacuation Exercises - The Contractor shall provide personnel and equipment for building evacuation exercises at the LANL-FSA on an on-call basis subject to availability of personnel and equipment when authorized by the Contracting Officer.

E. Fire Prevention Services - The Contractor shall provide fire prevention services for the Municipal Development Area and shall ensure that this service is provided in accordance with applicable federal and state and local ordinances; provided, however, that with respect to local ordinances, it is understood and agreed that DOE will not reimburse the Contractor for the salaries of any personnel whose sole function is that of inspection pursuant to existing local ordinances, but that within the staffing levels agreed to, these personnel may carry out inspection duties to fulfill the requirements of existing local ordinances as adjunct duties to the duties required under this contract.

OPERATIONAL PROCEDURES

A. GENERAL - The Contractor shall develop and implement procedures to be used for the daily operations of the Fire Department. These procedures shall set forth how the Fire Department operations will be managed, organized, and conducted to assure compliance with requirements of this contract.

B. In the development of these operational procedures, the Contractor shall utilize specific procedures developed by the Contractor in meeting the requirements of this

contract. In addition, applicable requirements of Order DOE 5480.19, Conduct of Operations Requirements for Facilities, shall be used as a guideline to assure that the conduct of operations meets DOE guidelines and that adequate written documentation exists to demonstrate the Contractor's conformance to these requirements.

C. Procedures developed to meet the requirements of this section shall follow a standard format. The procedures shall be placed in a loose-leaf type binder so that revisions or additions may be made as they occur. Each procedures manual shall be controlled. A procedure shall be established to keep track of manuals and distribution of changes thereto.

D. Electronic versions of the manual that can be used by MS-DOS personal computers will be developed by the Contractor at the earliest time possible.

IV SELF-ASSESSMENT PROGRAM

A. The Contractor shall develop and implement a self-assessment program to provide a means for the assessment of the overall performance of the Fire Department and the Contractor's support functions as they apply to the Fire Department.

B. The Contractor shall establish, document, and implement a self-assessment program which includes a description of

each major fire department function to include managerial and operational functions. For each function, a list of criteria upon which an assessment can be based shall be developed. Criteria are to be objective and contain measurements which can be tracked over time. The Contractor shall develop an annual schedule of periodic evaluations, at least one per quarter, covering each function during the year. The Contractor shall review and modify, as needed, functions and criteria prior to producing the upcoming year's schedule. Each functional area shall contain measurements; however, each individual criteria does not necessarily have to include measurements. The Contractor shall perform and document evaluations in accordance with the annual schedule, including problems not covered by a specific criteria. In carrying out evaluations, the Contractor shall utilize internal personnel not directly responsible for the given function, and shall rate overall performance in each function in accordance with the results. The Contractor shall gather managerial and affected operational representatives together following the evaluation to formulate corrective actions and look for opportunities for continual improvement. The Contractor shall document and perform corrective actions.

C. The proposed upcoming yearly program, and goals and accomplishments from the previous year shall be discussed with the Contracting Officer on a yearly basis.

ANNEX A TO STATEMENT OF WORK

DOE IMPLEMENTATION OF NFPA 1500, FIRE DEPARTMENT OCCUPATIONAL SAFETY AND HEALTH PROGRAM

The following sets forth the DOE requirements to be followed in implementing the requirements of NFPA 1500 to DOE facilities:

Section 2-1.1 The documents required by this Section need not be consolidated into a single document. In particular, Policy, Organization, and functional statements should be available for audit and be up to date. Training documents may consist of manuals, films, and other materials prepared by others and merely referenced in a training plan, or in functional statements.

Section 2-3. Where the fire department, or other fire-fighting organization, is part of a larger organization that provides the requisite "research, development, implementation, and enforcement of an OS&H program," the fire department program needs
may be included within the larger program.

Section 2-4. A Safety Officer shall be designated for each organization. Where safety services, monitoring, training, etc., are provided by another on-site organization, or the parent organization, the person designated as the Safety Officer shall be responsible to coordinating the services required by the department.

Responsibility for safety at the first-response level shall be incorporated in the department's emergency procedures manual.

The fire department Safety Officer can be anyone in the organization who can show up on the scene, not necessarily with the first response, but must be someone other than the incident commander as the Safety Officer is intended to be an independent voice, advising the incident commander.

Section 2-5. The OS&H Committee may include representatives from other organizations when the department is part of a larger organization or at a site where safety services are provided by others. The required safety meetings may be joint meetings with others if the department's safety needs are amenable to joint meetings.

Section 2-6. The records required in this Section may be maintained by a parent or service organization as long as they are auditable and are available to the department.

Section 2-6.2. The department shall have a procedure for reflecting possible exposures in the incident files and individual medical records.

Section 3-1.4. The requirement for training and education is considered to require that all firefighters must be trained in the hazards to be encountered at the scene of an incident before they can participate in active operations requiring such training.

Section 3-1.5. The individuals providing the training and education need not be members of the fire department, but they should be knowledgeable in the area of instruction as it relates to the fire service.

Section 3-1.6. Training Officer qualifications may be met by either compliance with the stated NFPA 1041, or by obtaining local or state certification.

Section 3-3.2. All personnel assigned to structural firefighting positions shall receive training adequate to meet the Firefighter I qualification of NFPA 1001.

Section 3-3.3. Training programs for drivers/operators shall be designed to meet the intent of the referenced standard. It is understood that some licensing requirements will vary by states and/or type of equipment.

Section 3-3.4. All specialized training programs, i.e., fire officer, driver/operator, airport firefighter, shall be developed and implemented within each organization. This shall be so accomplished as to meet the intent of the appropriate NFPA Standard.

Section 3-4. Training in fire ground operations shall be based on accredited systems, such as those provided by the International Fire Service Training Association manuals, official state training manuals, etc.

Section 3-5. Because of the specialized operations and hazards peculiar to most DOE sites, these "special hazards" training requirements are of prime importance. Training should include not only the nature of the hazards, but familiarization with the protective systems employed, the monitoring and alarm systems peculiar to the operation, and the support services provided by other parts of the site organization in monitoring or alleviating an emergency situation.

Section 4-2.1. Drivers of fire department vehicles shall receive special training in the operation of the vehicle and must be certified and/or licensed, as appropriate, or as required by the State to operate fire department vehicles.

Section 4-2.4. An exception to the requirement is the rear attendant of an ambulance when actively attending to a patient. This exception shall stand until such time as acceptable safety restraints are available for the rear ambulance attendant.

Section 4-3.1. An exemption may be granted for some site-specific vehicles, such as golf cart-type vehicles used within building to deliver supplies and equipment and automatically restricted in maximum speed. However, any such exemptions must be reviewed and approved by the Safety Officer and documented in the department files.

All present and future acquisitions of used apparatus shall be brought up to the minimum standards for safety seating requirements.

Section 4-5.4. For ladders, see the Interpretation Note on NFPA 1932. (All test conditions are required except that the annual test requirement may be changed to not less than every five years. All other conditions noted as requiring the test are unchanged).

Section 5-1.1. As a clarification, all equipment must be available and donned before the individual participates in any evolutions requiring protective clothing use. It is not necessary for each member of a department or brigade to have a full set of all protective clothing as long as supplies for the anticipated needs can be delivered to the point of use in adequate quantities and sizes for anticipated needs and without incurring undue delay in the emergency response.

All new equipment needed to fulfill the requirements of this Section shall be procured by the end of FY 1990.

Section 5-2.7. The fire resistance of work station uniforms should be considered in applying this Section. Where firefighting is provided by personnel who have other primary jobs, such as in most fire brigades, the provisions of NFPA 1975 need not be applied to their work clothing. However, any exceptions to the requirement should be reviewed by the Safety Officer and exception documented in the department records. Training needs and turnout gear provisions should take into account the clothing normally worn by responders.

Section 5-3.4.2. SCBA cylinders need not be emptied quarterly if not a requirement by the manufacturer/supplier.

Section 5-4.1. Personal Alert Safety Systems (PASS) need be provided only for people involved in interior firefighting or hazardous responses.

Section 5-5.3. Life safety ropes used for rescue shall be previously unused and shall be thoroughly examined upon completion of rescue in accordance with the manufacturer's recommendations. Ropes used for rescue shall remain in the custody of the original purchasing engine company or fire department. Records shall be kept, documenting the use, inspection, and inspector, immediately after each use and prior to any future use. The date and officer in charge will also be indicated on the records. All ropes leaving

the custody of the fire department must be destroyed, or otherwise prevented from being reused in life safety operations. Any indication of wear or shock loading will be justification to destroy said rope. Life safety ropes shall be completely dry and clean prior to restoring for use as life safety lines.

Section 6-1. Some of the requirements pertaining to emergency operations may be covered by a parent organization or be provided by other on-site organizations at DOE facilities. Health physics, for example, may provide the basic personnel required by Section 6-1.7 for radiological emergencies. All of the elements of Chapter 6, however, should be in place in the overall site plan. All emergency plans should clearly identify the incident commander for each type of emergency.

Section 6-2. The minimum response requiring interior firefighting or other operations requiring the entrance of SCBA-equipped people shall be 5 persons. When less personnel are available, interior operations shall not be attempted.

Section 6-3.2. Clarification. The requirement for personnel "standing by" does not mean the required people cannot be performing some other function, but they must be able to suspend what they are doing to provide the immedicate rescue efforts.

Section 6-3. The "standing by" requirement for qualified life support personnel may be relaxed if, in the Chief's opinion," qualified personnel are readily available and are dedicated to the site. (At a small site, it should not be necessary for medical/ ambulance personnel to respond on every incident).

CAPITAL EQUIPMENT

NON-CAPITAL EQUIPMENT AND

SENSITIVE ITEMS

(Incorporated here by reference is the "Semi-Annual Summary Report of DOE-Owned Plant and Capital Equipment - DOE Form 4300.3" for the period ending February 28, 1992.)

FACILITIES

REAL PROPERTY

(Incorporated here by reference is the "Semi-Annual Summary Report of DOE-Owned Plant and Capital Equipment - DOE Form 4300.3" for the period ending February 28, 1992.) In addition, attached are DOE/LAAO Fire Station Survey Maps, pages 1 - 7.

ATTACHMENT C

BASIS OF BEARINGS
FIRE STATION 1: N12° 23' 47"W AS ESTABLISHED
BY FOUND CONTROL POINTS DIAMOND 1 & DIAMOND 2 N.M.S.P. GRID
BEARING

FIRE STATION 2: BEARING OF N14° 57' 06"E AS ESTABLISHED BY THE FOUND SOUTHWEST CORNER AND FOUND NORTHWEST ANGLE POINT OF TRACT DD EASTERN AREA NO.2, SAID PLAT ON FILE AT THE LOS ALAMOS COUNTY COURTHOUSE.

FIRE STATION #3 PLAT BEARING AS ESTABLISHED BY FOUND CORNERS OF TRACT J.A. WHITE ROCK NEW MEXICO SAID PLAT BEING ON FILE AT THE LOS ALAMOS COUNTY COURT HOUSE.

FIRE STATION #4 PLAT BEARING AS ESTABLISHED BY FOUND CORNERS OF TRACT G, NORTH COMMUNITY NO.2: SAID PLAT BEING ON FILF AT THE LOS ALAMOS COUNTY COURT HOUSE.

FIRE STATION NO.5: GRID BEARING OF N43° 56' 52"E AS ESTABLISHED BY FOUND BRASS CAPS 1440 AND 1441 OF THE LOS ALAMOS TECHNICAL AREAS.

NOTES: WALKS SHOWN ON ENG-C-7108 HAVE BEEN OVERLAID WITH ASPHALT.

UTILITIES SHOWN ARE BASED ON EXISTING SURFACE FEATURES AND ARE APPROXIMATE ONLY. ALL UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO ANY EXCAVATION OR CONSTRUCTION.

NOTE: UNDERGROUND UTILITIES ARE SHOWN FOR INFORMATION ONLY. FIELD VERIFY PRIOR TO ANY EXCAVATION OR CONSTRUCTION.

Pan Am World Services, Inc. P.O. Box 50 Los Alamos, N.M 87544-0050

PROJECT DOE/LAAO FIRE STATION SURVEY

SHEET 2 OF 7

DATE 3 / 15 / 88

DESCRIPTION LEGEND

JOB NO 88-022

BY APPR

LEGEND

—E—	OVERHEAD ELEC.		GAS VALVE
—SS—	SEWER		ASPHALT
	PROPERTY		CONCRETE
	VALVE	VCP	VITRIFIED CLAY PIPE
	SET PROP. BOUNDARY		FLAG POLE
	CLEANOUT	EP	ELEC. PANEL
	PROPERTY BOUNDARY	DR	DRAIN
	TEL RISER	C.O.	CLEANOUT
	PINON OR PINE	G.M.	GAS METER
	MANHOLE		ANTENNA MAST
—W—	WATER	R. W.	RETAINING WALL
—UE—	UNDERGROUND ELEC.	M.P.	METER PIT
—PP—	POWER POLE	STM	STEAM
—G—	GAS	S.D.	STORM DRAIN
	FENCE	T	TELEPHONE LINE
	FIRE HYDRANT		

Pan Am World Services, Inc. P.O. Box 5 Los Alamos, N.M. 87544-0050

PROJECT DOE/LAAO FIRE STATION SURVEY

SHEET 3 OF 7

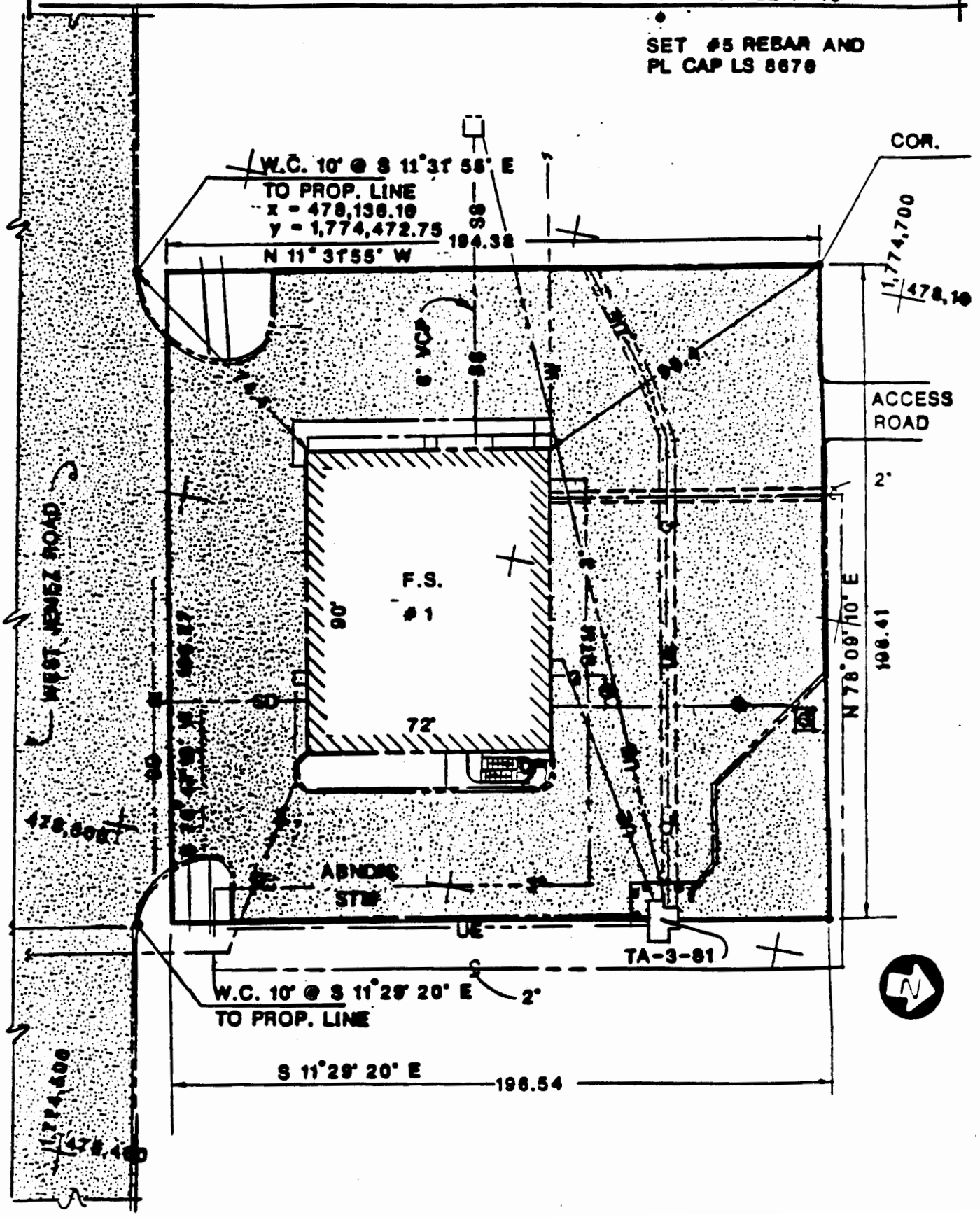
DATE 3 / 15 / 88

DESCRIPTION FIRE STATION # 1 TA-3

JOB NO. 88-022

BY MASCAREÑAS APPR. CT

SCALE 1"=40'



Pan Am World Services, Inc. P.O. Box [illegible] Los Alamos, N.M. 87544-0050

PROJECT DOE/LAAO FIRE STATION SURVEY

SHEET 4 OF 7

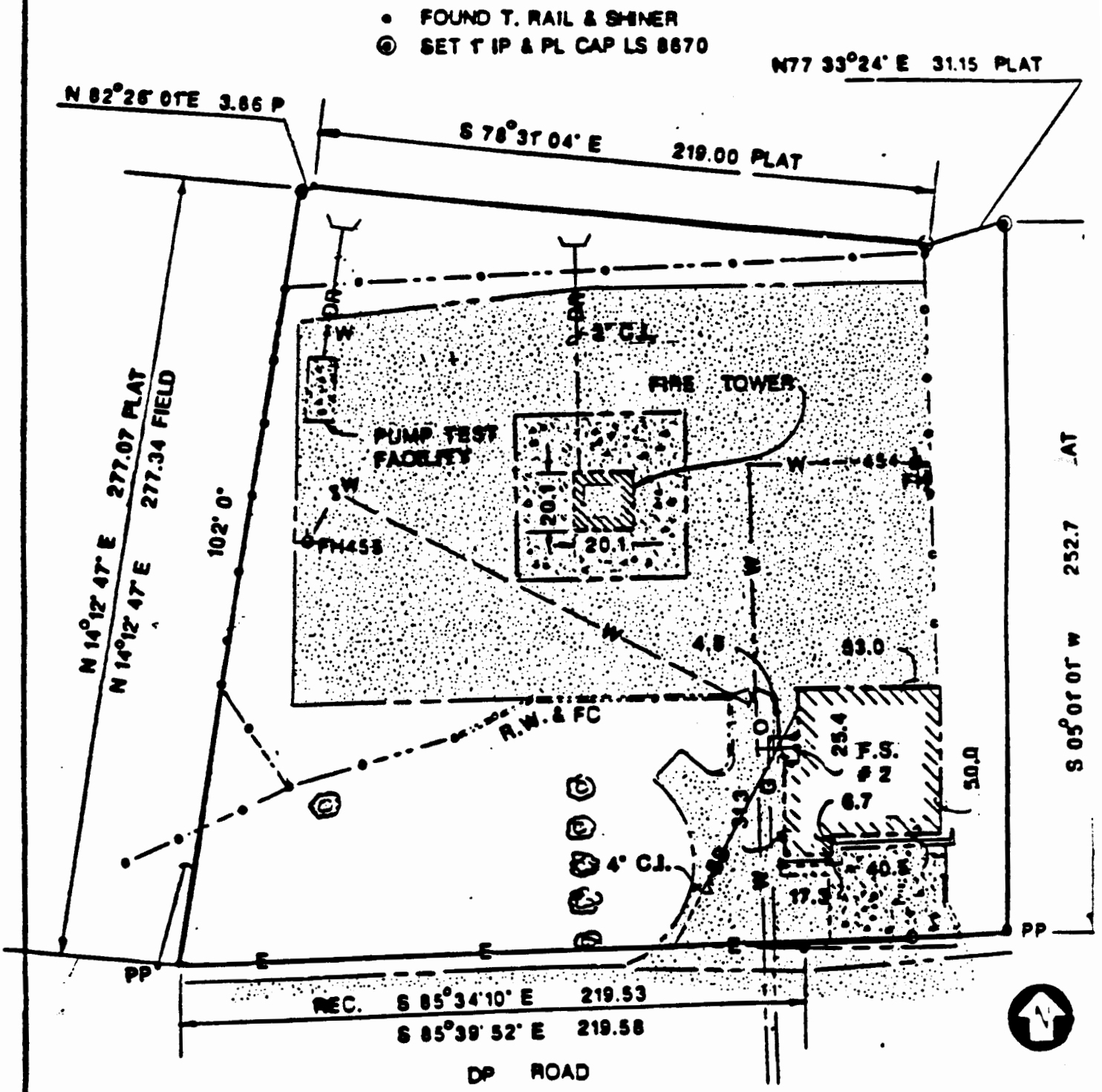
DATE 3 / 15 / 8

DESCRIPTION FIRE STATION # 2 DP ROAD

JOB NO 88-022

BY [illegible] APPR C.T.

SCALE 1" = 50'



CURVE DATA
A= 04 15' 34" LT
R= 1021.74
T= 38.00
e= 75.96

Pan Am World Servic Inc. P.O. Box 5 Los Alamos, N.M. 87544-0050

PROJECT DOE/LAAO FIRE STATION SURVEY

DESCRIPTION FIRE STATION #4 4401 DIAMOND DRIVE

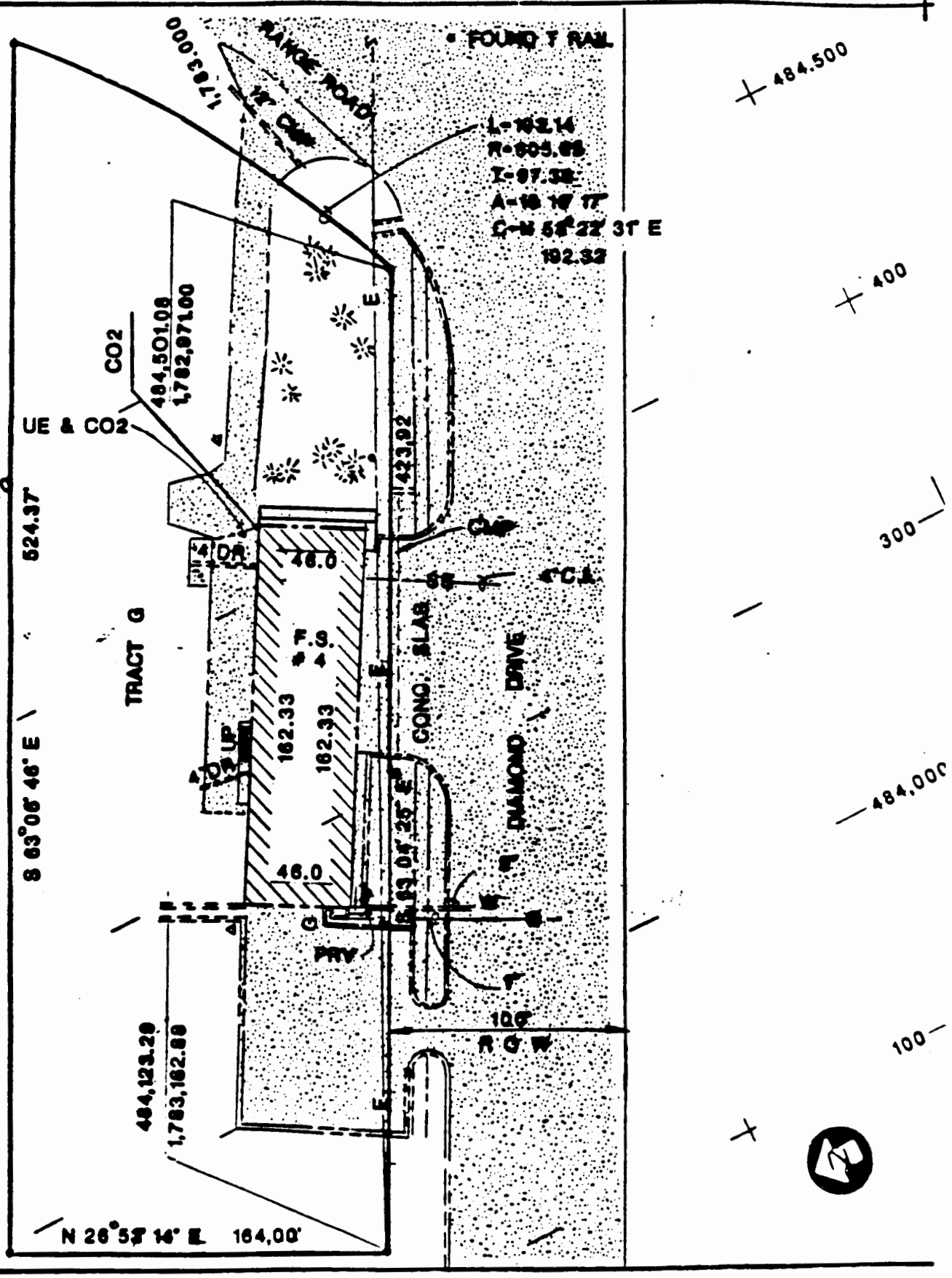
SHEET 5 OF 7

DATE 3 / 15 / 88

JOB NO. 88-022

BY Moscarelli APPR. L.

SCALE 1"=60'



Pan Am World Servi , Inc. P.O. Box Los Alamos, N.M. 87544-0050

PROJECT DOE/LAAO FIRE STATION SURVEY

SHEET 6 OF 7

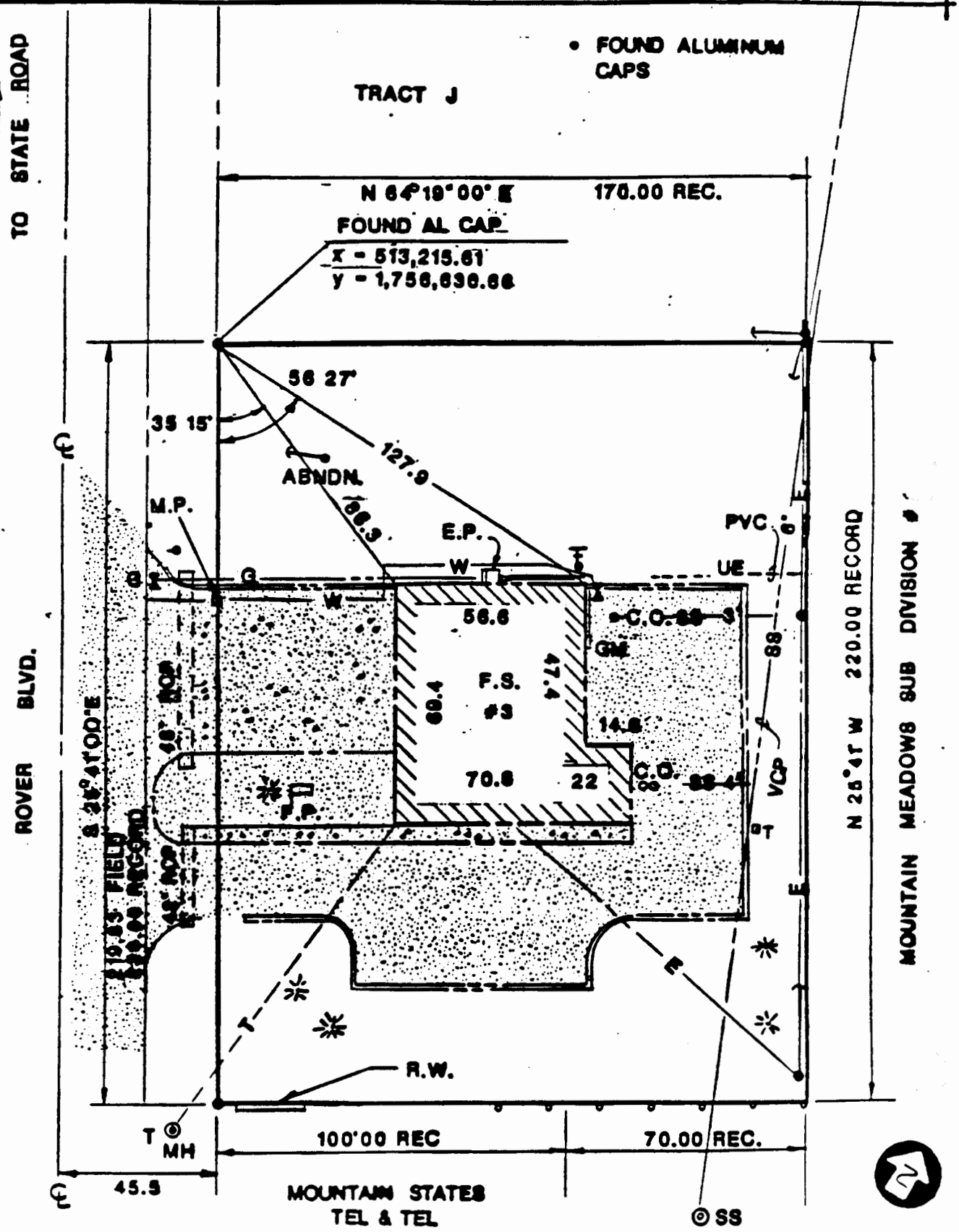
DATE 3 / 15 / 88

DESCRIPTION FIRE STATION #3 WHITE ROCK

JOB NO. 88-022

BY Mascarenas APPR. CT

SCALE 1"=40'



Pan Am World Service Inc. P.O. Box 5 Los Alamos, N.M. 87544-0050

PROJECT DOE/LAAO FIRE STATION SURVEY

SHEET 7 OF 7

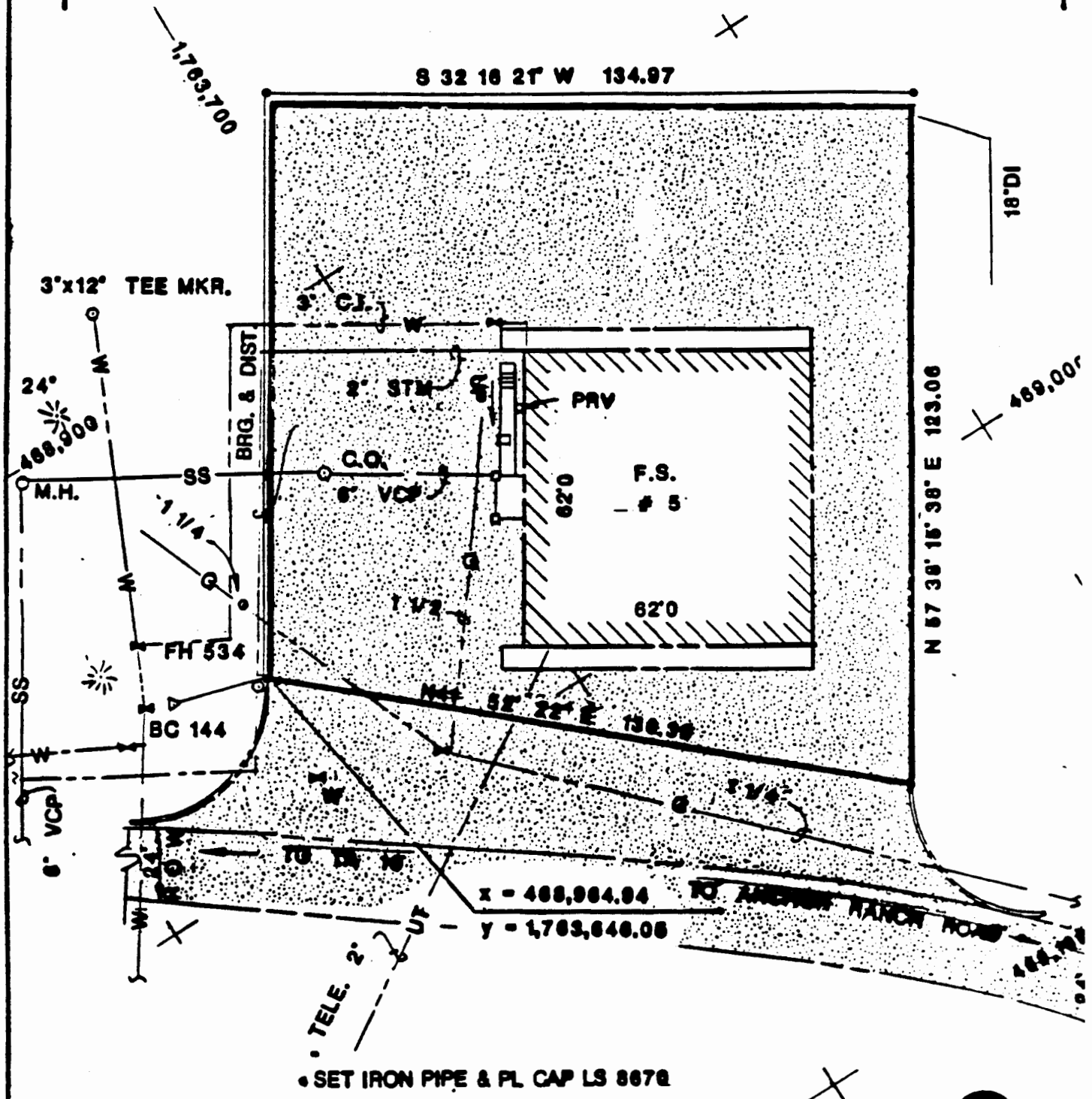
DATE 3 / 15 / 88

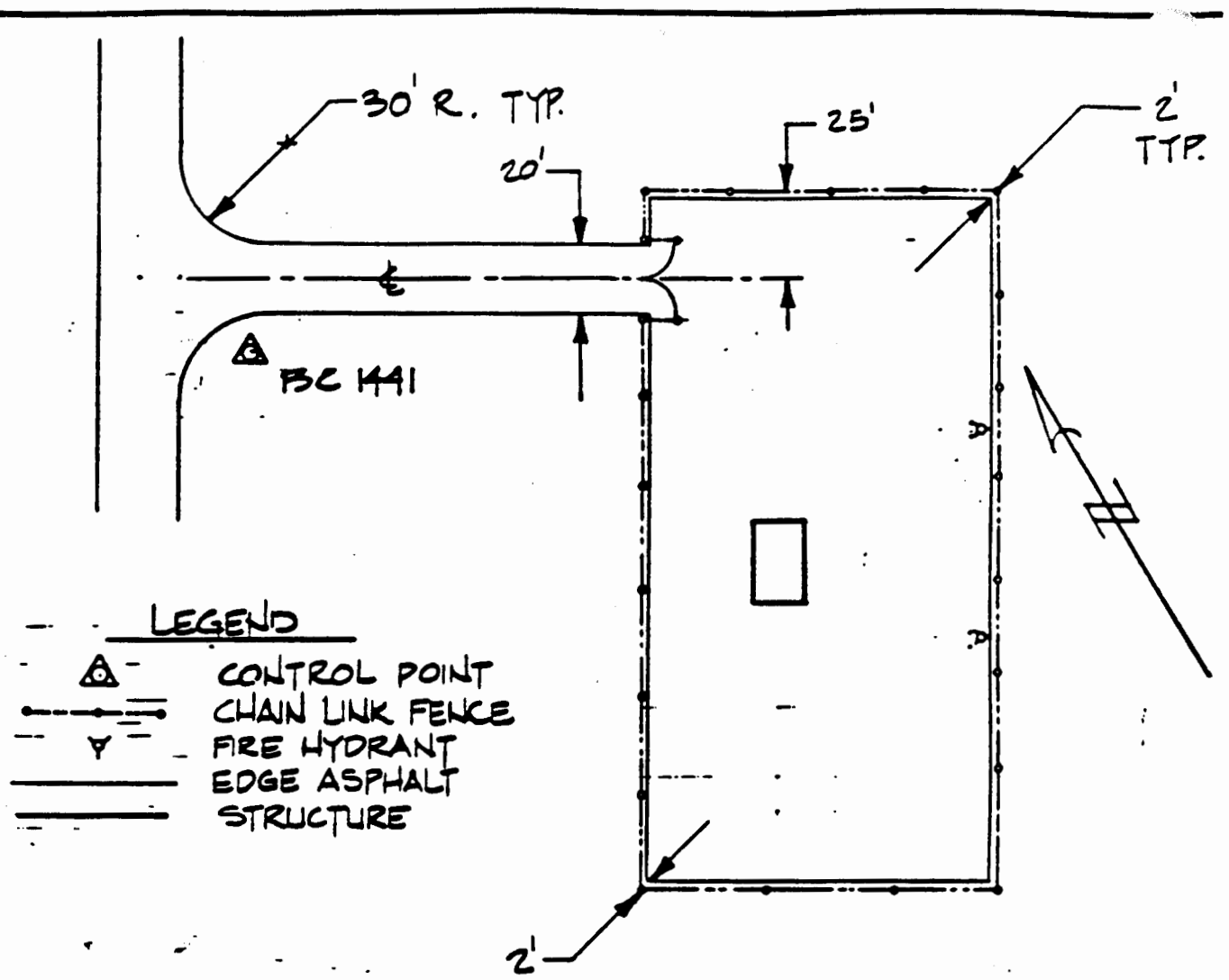
DESCRIPTION FIRE STATION # 5 TA-16

JOB NO. 88-022

BY M. ASCARENAS APPR. C.T

SCALE 1"=50'





NOTES

1) BASIS OF BEARING
N 43° 56' 51.5" E AS ESTABLISHED ⊿ CONTROL POINT BY FOUND BRASS CAPS 1440 & 1441.

2) LOCATION OF BUILDING & FIRE HYDRANTS ESTABLISHED FROM AS BUILT DRAWING SINCE ACCESS TO SITE WAS LIMITED AT TIME OF SURVEY.

PAN-AM SURVEY DEPARTMENT

TA-16
FIRE TRAINING CENTER

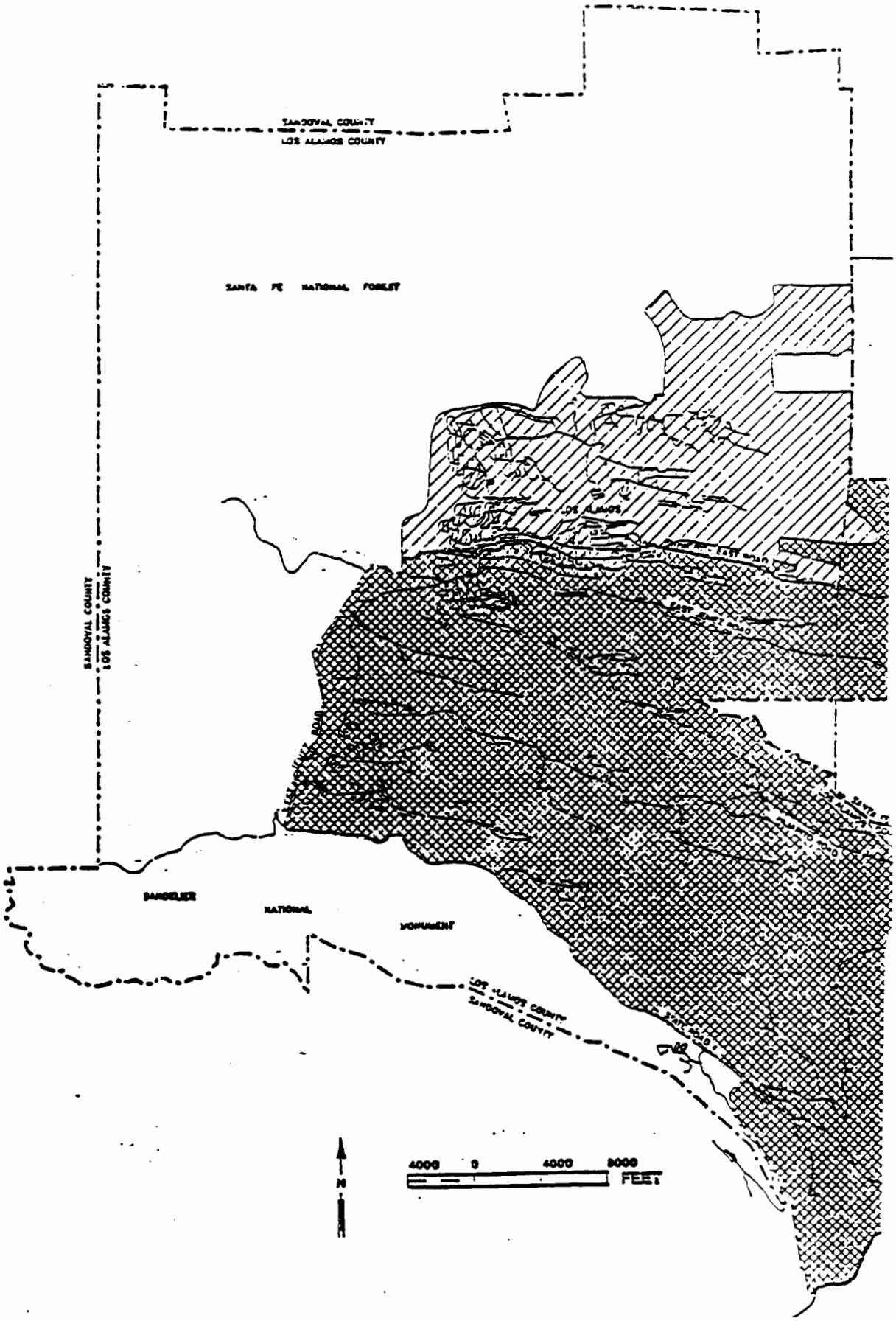
W.O. # 7314-99
DRAWN BY: JAMES A. CATA
SCALE: 1" = 50"

SHT 1 OF

LOS ALAMOS FIRE DEPARTMENT

FIRE SERVICE AREA

ATTACHMENT D

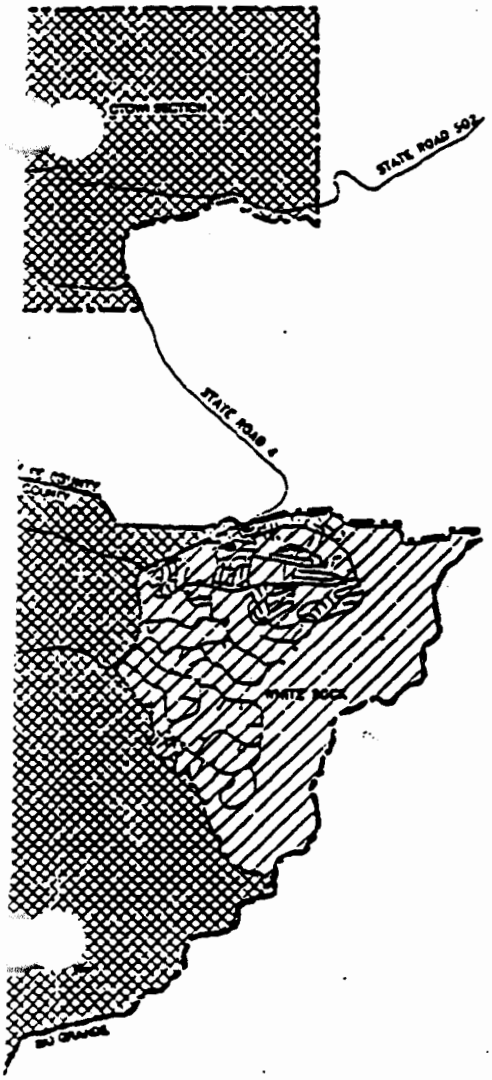

SANDOVAL COUNTY
LOS ALAMOS COUNTY
SANTA FE NATIONAL FOREST
LOS ALAMOS
EAST MESA
EAST ROAD
SANDOVAL COUNTY
LOS ALAMOS COUNTY
BANDELIER
NATIONAL
MONUMENT
LOS ALAMOS COUNTY
SANDOVAL COUNTY
4000 0 4000 8000
FEET
N

LEGEND

- MUNICIPAL DEVELOPMENT AREA - MUNICIPAL FIRE SERVICES
- LOS ALAMOS NATIONAL LABORATORY - FIRE SERVICE AREA
- LOS ALAMOS FIRE DEPARTMENT, EMERGENCY MEDICAL AND RESCUE SERVICE AREA

RIO ARRIBA COUNTY

SANTA FE COUNTY



NO.	DATE	CLASS REV.	REVISIONS	DRN	DES	CHKD	SUB	APP
1	3/1/89		REVISE TITLE					

FACILITIES ENGINEERING DIVISION

LOS ALAMOS FIRE DEPARTMENT SERVICE AREA

DRAWN

DESIGNED

CHECKED

RELEASED

DATE

BLDG.

SUBMITTED | RECOMMENDED | APPROVED

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

CLASSIFICATION | REVIEWER

LAC JOB NO. | DRAWING NO. | REV.

ENGR

LISTING OF DOE OWNED STRUCTURES

LISTING OF DOE LEASED STRUCTURES

The attached is a list of DOE owned structures and leased facilities outside of the main boundary of the Laboratory. This listing is subject to change.

DOE OWNED STRUCTURES

TA	BLDG	NAME	ADDRESS
0	71	Pumphouse, Water	Western Area, Los Alamos
0	1054	Well House #1	Guaje Canyon
0	1055	WellHouse #1	Guaje Canyon
0	1051	Steam Plant	3750 Finch St., Los Alamos
0	1056	Metering Station	1805 Diamond, Los Alamos
0	1058	Well House	Rendija Canyon
0	1061	Transmitter Bldg.	Star Lake
0	1062	Laborers Shack	SE Side TA-3, SM-36
0	1078	Sportsman Club	Rendiji & Gauje Canyon
0	1079	Valve House	1805 Diamond, Los Alamos
0	1080	Pump House	600 48th Street, Los Alamos
0	1082	Maintenance Bldg.	Gas Line, San Juan County
0	1084	Valve Bldg.	Gas Line, Sandoval County
0	1085	Valve Bldg.	Gas Line, Sandoval County
0	1086	Valve Bldg.	Gas Line, Sandoval County
0	1087	Valve Bldg.	Gas Line, Sandoval County
0	1088	Valve Bldg.	Gas Line, San Juan County
0	1089	Gas Valve House	691 East Road, Los Alamos
0	1090	Pumping Station	99 Gancho, Los Alamos
0	1091	Guard Tower	2471 East Rd., Los Alamos
0	1092	Booster Station	Guaje Canyon
0	1093	Booster Station	State Road 4
0	1094	Fire Station #4	White Rock
0	1095	Fire Station #2	132 DP Road, Los Alamos
0	1096	Fire Station #3	4401 Diamond, Los Alamos
0	1099	Booster Station	State Route 4
0	1100	Sand Basin Bldg.	Guaje Canyon
0	1101	Well House	Guaje Canyon
0	1102	Well House	Guaje Canyon
0	1103	Well House	Guaje Canyon
0	1104	Well House	Guaje Canyon
0	1105	Well House	Guaje Canyon
0	1107	Filter Building	4040 Diamond, Los Alamos
0	1108	Pumping Station	4084 Trinity, Los Alamos
0	1109	Booster Station	1801 Diamond, Los Alamos
0	1110	Valve House	601 48th, Los Alamos
0	1111	Pumping Station	600 48th, Los Alamos
0	1112	Booster Station	Guaje Canyon
0	1113	Booster Station	Guaje Canyon
0	1114	Booster Station	Guaje Canyon
0	1115	Metering Station	691 East Road, Los Alamos
0	1116	Drill Tower FS#2	132 DP Road, Los Alamos
0	1117	Well House	Guaje Canyon
0	1118	Well House	Guaje Canyon
0	1119	Well House	Guaje Canyon
0	1120	Well House	Guaje Canyon
0	1121	Well House	Guaje Canyon
0	1122	Valve House	Guaje Canyon
57		All Buildings	Fenton Hill

SMALL BUSINESS AND SMALL DISADVANTAGED

BUSINESS SUBCONTRACTING PLAN

ATTACHMENT F

SMALL BUSINESS AND SMALL DISADVANTAGED

BUSINESS SUBCONTRACTING PLAN

(Final November 12, 1992)

Los Alamos Fire Department
Incorporated County of Los Alamos
2300 Trinity Drive
Los Alamos, New Mexico 87544

Solicitation No. RP 32-91AL64100

The agreement between the Department of Energy (DOE) and the Incorporated County of Los Alamos (contractor or County)) provides for the County to be responsible for fire suppression, emergency medical and rescue services in the Los Alamos Fire Service Area, as defined in the contract, which includes Los Alamos National Laboratory.

The County and the DOE originally entered into a contract on February 9, 1988, to initiate the proposed transfer of the Los Alamos Fire Department from the DOE to the County. Phase II of this agreement, operation of the Fire Department, began September 24, 1989. Phase II, including current extensions, expires December 31, 1991. The DOE's request for proposal, RP 32-91AL64100, contemplates a subsequent five year contract with the County.

****

In accordance with Section 8(d) of Public Law 95-507, as implemented by OFPP Policy Letter 80-2, there are six mandatory elements that must be in every subcontracting plan. The six elements are:

I. **GOALS**

Goals for subcontracting with Small Businesses (SB) and with Small Disadvantaged Businesses (SDB) are expressed in both dollars and percentages. The percentage goal is a percentage of the total dollars planned for subcontracting, not the total dollar amount of the contract. The definition of a subcontract is any agreement the County (contractor) enters into for supplies and/or services required for contractor performance that will not be conducted with their own labor forces. (This includes agreements with Large Businesses [LB] as well as SB and SDB concerns.) Indirects and Overhead were not included in the amounts to be subcontracted.

Percentage Goals and Estimated Amounts:

A. 1. The total estimated cost of the proposed five year contract is $39,853,077.

2. The total estimated dollar value of all planned subcontracting under this contract is $3,327,718.

3. The following dollar and percentage goals (expressed in relation to the total planned subcontract dollars in A.2) are applicable to the contract cited above or to the contract awarded as a result of the solicitation cited.

(a) Small Business concerns: Total dollars planned to be subcontracted to small business concerns: $1,663,859. Fifty percent (50%) of the total planned subcontracting dollars under this contract goal will go to subcontractors who are SB concerns.

(b) Small Disadvantaged Business concerns: Total dollars planned to be subcontracted to SDB concerns: $399,326. This dollar amount is included in the amount shown under A.3(a), above, as a subset. Of the total planned subcontracting goal dollars under this contract, 12% will go to subcontractors who are SDB concerns owned and controlled by socially and economically disadvantaged individuals. This percentage is included in the percentage shown under A.3(a), above, as a subset.

B. 1. Subcontracting Summary: The following is a summary of subcontracting under this contract, with the distribution among SB, SDB and LB concerns as follows (SBP is the total dollar amount estimated for subcontracting):

Category	100% SBP	50% SB	12% SDB	50% LB
Services	$1,560,989	780,495	187,319	780,495
Supplies	1,428,945	701,437	168,345	701,407
Capital	363,855	181,927	43,662	181,927
Total	$3,327,718	$1,663,859	$399,326	$1,663,859

2. Possible Subcontractors: The following is a list of possible SB and SDB subcontractors for the Services, Supplies/Materials and Capital Equipment referenced in B.1. and B.2.:

Small Business Concerns:
A-1 Signs
Allied School and Office Products
ALS Medical Products
Armstrong Medical
Artesia Fire Equipment
Becker Fire Equipment
Bill's Computer Shop
Brownell's Hallmark Shop
Business Machines Center
C.J. Enterprises
Camelot World Travel
Camera and Darkroom
Central Motive Power
Clarey's Safety Equipment
Clement, Benner and Fox
Coffelt's Family Footwear
Computer Works (Las Cruces)
Dane Myers
Delta Uniform
Don Taylor's Photo
Dr. Victor Zalma
Finishing Touch
G.C. Video
Glovers Auto Parts
Hunter Lumber Company
Independent Fire Company
J & J Safety
Johnson Southwest Moving (Santa Fe)
Knecht Automotive
Kurts Camera Corral
Los Alamos Parts Company
Los Alamos Stationers
Metzger Stores
Michael W. Baxter, PH.D.
Microsage
Mobile Apparatus
Monarch Fire Equipment
Pajarito Travel Agency
Peak and Plains Outfitters
Precise Graphic Impressions
Rapids Air, Inc.
Red Barn Screen Prints
Simon's Uniforms
Thunderbird Shoe Store
United Fire Equipment

Small Disadvantaged Business Concerns:

Advanced Copy Systems (Santa Fe)
Agua Fria Wrecker Service
Ask Mr. Foster Travel
Capitol City Uniforms
Destinations, Inc.

Healy-Matthews Stationers
Holman's Inc.
Joann's Floral
Lobo Team Sales
Mr. Carpet
N.M. Office Products
N.M. Pest Control
Santa Fe World Travel
Sierra Vista Office Products

II. ADMINISTRATOR

The subcontracting plan is to be administered by the County (contractor) to assure that the provisions of the contract and the plan are implemented and performed.

The following individual will administer the subcontracting plan:

Name: Roger Bagley
Title: Support Services Director
Telephone: 662-8054

This individual's specific duties, as they relate to the County's (contractor's) subcontracting plan, are as follows:

A. General overall responsibility for the County's Small Business Program, the development, preparation, and execution of individual subcontracting plans and for monitoring performance relative to contractual subcontracting requirements contained in this plan, including but not limited to:

B. Developing and maintaining bidders lists of small and small disadvantaged business concerns from all possible sources;

C. Ensuring that procurement packages are structured to permit small and small disadvantaged to participate to the maximum extent possible;

D. Assuring inclusion of SB and SDB concerns in all solicitations for products or services that they are capable of providing;

E. Reviewing solicitations to remove statements, clauses,etc. that may tend to restrict or prohibit SB and SDB participation;

F. Ensuring that the bid proposal review board documents its reasons for not selecting low bids submitted by small and small disadvantaged business concerns;

G. Ensuring the establishment and maintenance of records of solicitations and subcontract award activity;

H. Attending or arranging for attendance of company counselors at Business Opportunity Workshops, Minority Business Enterprise Seminars, Trade Fairs, etc.;

I. Conducting or arranging for motivational training for purchasing personnel pursuant to the intent of P.L. 95-507;

J. Monitoring attainment of proposed goals;

K. Preparing and submitting periodic subcontracting reports as required;

L. Coordinating County activities during the conduct of compliance reviews by Federal agencies; and

M. Coordinating the conduct of County activities involving its small and small disadvantaged business subcontracting program.

III. OUTREACH EFFORTS

The following efforts will be taken to assure that small and small disadvantaged business concerns will have an equitable opportunity to compete for subcontracts:

A. Outreach efforts will be made as follows:

1. Contacts with minority and small business trade associations;

2. Contacts with business and development organizations;

3. Attendance at small and minority business procurement conferences and trade fairs; and

4. Sources will be requested from SBA's PASS system.

B. The following internal efforts will be made to guide and encourage buyers:

1. Workshops, seminars, and training programs will be conducted; and

2. Activities will be monitored to evaluate compliance with this subcontracting plan.

C. Small and small disadvantaged business concerns source lists, guides and other data identifying small and small disadvantaged business concerns will be maintained and utilized by buyers in soliciting subcontracts.

IV. SUBCONTRACTING PLAN FLOWDOWN

The subcontracting plan must include the County's (contractor's) explicit statement that the two standard subcontracting clauses will be included in all relevant subcontracts. The clauses must be included by title and the County guarantees that a "subcontracting plan" will be required of every subcontractor (except small businesses) meeting the dollar thresholds of $500,000 or $1,000,000 for the construction of a public facility as appropriate. The County (the prime contractor) cannot alter this requirement. Any subcontractor issuing subcontracts exceeding the thresholds must acquire a subcontracting plan and flowdown the provisions of their subcontracting plan to their lower-tier subcontractors. The following "standard" language shall be included in the plan with the understanding that the contract administrator will be responsible for assuring that the standard clauses are incorporated into appropriate subcontracts and that the subcontractors are obtaining further subcontracting plans as required:

Flowdown of Provisions

The County (contractor) agrees that the clause entitled "Utilization of Small Business Concerns and Small Disadvantaged Business Concerns" will be included in all subcontracts that offer further subcontracting opportunities, and all subcontractors except small business concerns who receive subcontracts in excess of $500,000 or $1,000,000 for construction of a public facility will be required to adopt and comply with a subcontracting plan similar to this one. Such plans will be reviewed by comparing them with the provisions of the clause, "Small Business and Small Disadvantaged Business Subcontracting Plan" (FAR 52.219-9), and assuring that all minimum requirements of an acceptable subcontracting plan have been satisfied. The acceptability of percentage and dollar goals shall be determined on a case-by-case basis depending on the supplies/services involved, the availability of potential small and small disadvantaged subcontractors, and prior experience. Once approved and implemented, plans will be monitored through the submission of periodic reports, and/or, as time and availability of funds permit, periodic visits to subcontractors' facilities to review applicable records and subcontracting program progress.

V. REPORTS AND SURVEYS

The County (contractor) will submit Standard Form 294 on a semi-annual basis and Standard Form 295 on an annual basis and agrees to submit such periodic reports and cooperate in any studies or surveys as may be required by the contracting agency (DOE) or the Small Business Administration in order to determine the extent of compliance by the bidder with the subcontracting plan and with the clause entitled "Utilization of Small Business Concerns and Small Disadvantaged Business Concerns" contained in the contract.

VI. RECORDS AND PROCEDURES

The County (contractor) agrees to maintain at least the following types of records to document compliance with this subcontracting plan:

A. Small and small disadvantaged business concerns source lists, guides and other data identifying SB/SDB vendors;

B. Organizations contacted for small and disadvantaged business sources;

C. On a subcontract-by-subcontract basis, records on all subcontract solicitations over $100,000, indicating on each solicitation (1) whether small business concerns were solicited, and if not, why not; (2) whether small disadvantaged business concerns were solicited, and if not, why not; and (3) reasons for the failure of solicited small or small disadvantaged business concerns to receive the subcontract award;

D. Records to support other outreach efforts: contacts with minority and small business trade associates, etc., attendance at small and minority business procurement conferences and trade fairs;

E. Records to support internal activities to guide and encourage buyers: workshops, seminars, training programs, etc., and monitoring activities to evaluate compliance; and

F. On a subcontract-by-subcontract basis records to support subcontract award data to include name and address of subcontractor.

SB/SDB Sub. Plan
County of Los Alamos
Final 11/12/92

SUBMITTED BY:

Signed: _____

Typed Name: James M. Flint

Title: County Administrator

Date: November 12, 1992

PLAN ACCEPTED BY:

_____
Contracting Officer

Date: _____

PLAN CONCURRED ON BY:

_____
Small and Disadvantaged Business Utilization Specialist

Date: _____

- END -

SPECIAL BANK ACCOUNT AGREEMENT

FOR USE WITH THE CHECKS - PAID METHOD

OF LETTER OF CREDIT FINANCING

ATTACHMENT G

SPECIAL BANK ACCOUNT AGREEMENT FOR USE WITH THE
CHECKS-PAID METHOD OF LETTER OF CREDIT FINANCING

This Agreement entered into this _____ day of _____, 19__, between the United States of America (hereinafter called the Government), represented herein by the Department of Energy (hereinafter called the DOE), and [Name of contractor] (hereinafter called the Contractor), a corporation under the laws of the State of [State] and [Name of Bank] (hereinafter called the Bank), a banking corporation under the laws of the State of [State], located at [City and State].

RECITALS

(a) On the date of _____ 19__, DOE and the Contractor entered into a Contract No. DE-AC04-89ALXXXXX providing for the making of advances of Government funds to the contractor. A copy of such advance provisions has been furnished to the Bank.

(b) DOE requires that amounts advanced to the Contractor under said Contract be deposited in a Special Bank Account or accounts with a bank designated by the Treasury Department as a depositary and financial agent of the Government (Section 10 of the Act of June 11, 1942, 56 Stat. 356; 12 U.S.C. 265), separate from any of the Contractor's general or other funds; and, the Bank being such a bank, the parties are agreeable to so depositing said amounts with the Bank.

(c) This Special Bank Account(s) shall be designated "[Name of contractor], Contract DE-AC04-89ALXXXXX, Department of Energy Special Bank Account."

COVENANTS

In consideration of the foregoing, and for other good and valuable consideration, it is agreed that:

(1) The Government shall have title to the credit balance in said Account(s) to secure the return of all advances made to the Contractor, which title shall be superior to any lien or claim of the Bank or others with respect to such Account(s).

(2) The Bank will be bound by the provisions of said contract between DOE and the Contractor relating to the deposit and withdrawal of funds in the above Special Bank Account(s), but shall not be responsible for the application of funds properly withdrawn from said Account(s). After receipt by the Bank of written directions from DOE, the Bank shall act thereon and shall be under no liability to any party hereto for any action taken in accordance with the said written directions.

(3) The Government, or its authorized representatives, shall have access to the books and records maintained by the Bank with respect to such Special Bank Account(s) at all reasonable times and for all reasonable purposes, including, without limitation, the inspection or copying of such books and records and any or all memoranda, checks, correspondence, or documents pertaining thereto. Except as agreed upon by the Government and the Bank, all books and records pertaining to the Special Bank Account(s) in the possession of the Bank relating to the Special Bank Account agreement shall be preserved by the Bank for a period of three (3) years after the final payment under the contract to which the Special Bank Account agreement pertains or otherwise disposed of in such manners as may agreed upon by the Government and the Bank.

(4) In the event of the services of any writ of attachment, levy of execution, or commencement of garnishment proceedings with respect to the Special Bank Account(s), the Bank will promptly notify DOE's Area Manager at [Address of Area Office].

(5) DOE will issue a Letter of Credit (irrevocable to the extent obligations have been incurred in good faith thereunder by the Contractor) to the Bank for the benefit of the Special Bank Account(s). The Bank agrees to honor upon presentation for payment all checks issued by the Contractor and to restrict its Letter of Credit withdravals to an amount sufficient to maintain the account balance as close to zero as administratively possible each day.

The Bank will comply with the provisions contained in the Treasury Department Fiscal Requirements Manual (I TFRM 6-2000) which states that ordinarily, payment vouchers (FS-5401) should not be dravn more frequently than daily or for amounts less than $5,000, and in no case more than $5,000,000 unless so stated in the Letter of Credit. A copy of said Manual is in the Bank's possession.

The Bank agrees to service the Special Bank Account(s) in consideration of payment by the Contractor for its actual account activity at the "Per Item Cost" shown on the form entitled "Schedule of Bank Processing Charges" incorporated into this Agreement as Attachment A. The Bank agrees that the "Per Item Cost" will remain constant during the term of this Agreement.

(6) It is anticipated that the bank balance will be zero (-0-). However, if a balance occurs, the Treasury Tax and Loan rate (TT&L) will be used to compute the amount due as follows:

(a) Assuming a positive balance:

Positive Average Daily Collected Balance times TT&L will be the amount due and payable to the Contractor/DOE.

(b) Assuming a negative balance:

Negative Average Daily Balance times TT&L will be the amount due and payable to the Bank.

(7) This Agreement shall be effective from _____, 19__ through _____, 19__, unless earlier terminated as provided in this Agreement.

(8) The Government, the Contractor, or the Bank may terminate this Agreement at any time upon submitting written notification to the other parties 90 days prior to the desired termination date.

(9) The Government and the Contractor may terminate this Agreement at any time upon 30 days' notice to the Bank if the Government and/or the Contractor find that the Bank has failed to substantially perform its obligations under this Agreement.

(10) Notwithstanding the provisions of paragraphs (8) and (9), in the event the contract (referenced in Recital (a)) between the DOE and the Contractor is not renewed or is terminated, this Agreement between the Government, the Contractor and the Bank will automatically be terminated upon the delivery of written notice to the Bank.

(11) In the event of termination, the Bank agrees to retain the Contractor's Special Bank Account(s) for a 90-day period to allow for clearance of outstanding checks. During this 90-day period, DOE will place on deposit in the Account(s) sufficient funds to cover all outstanding checks presented for payment. During this 90-day period, it is further understood that all bank service charges will be consistent with the amounts reflected in Attachment A to this Agreement.

IN WITNESS WHEREOF the parties hereto have caused this Agreement to be executed as of the day and year first above written.

THE UNITED STATES OF AMERICA
BY: U.S. DEPARTMENT OF ENERGY

DATE: _____ BY: _____

[Name of Contractor]

DATE: _____ BY: _____

TITLE: _____

[Name of Bank]

DATE: _____ BY: _____

TITLE: _____

CONTRACTOR CORPORATE CERTIFICATE

I, _____, certify that I am the _____ of the [Name of contractor] named herein, that _____, who signed this Agreement on behalf of said corporation, was then _____ of said corporation; that this Agreement was duly signed for and in behalf of said corporation by authority of its governing body and is within the scope of its corporate powers; and that I have set my hand and the seal of the said corporation hereto on this _____ day of _____, 19__.

_____

TITLE: _____

(SEAL)

BANK CORPORATE CERTIFICATE

[Name of Bank]

I, _____, certify that I am the _____ of the _____ Bank named herein, that _____, who signed this Agreement on behalf of said corporation, was then _____ of said Bank; that this Agreement was duly signed for and in behalf of said Bank by authority of its governing body and is within the scope of its corporate powers; and that I have set my hand and the seal of the said Bank hereto on this _____ day of _____, 19__.

_____

TITLE: _____

(SEAL)

ATTACHMENT A TO SPECIAL BANK ACCOUNT AGREEMENT

SCHEDULE OF BANK PROCESSING CHARGES

		Per Item Cost
1.	Checks Debited	@_____
2.	Stop Payment Orders	@_____
3.	Account Maintenance (Monthly)	@_____
4.	Deposits:	@_____
	a. Deposit Tickets	@_____
	b. Local Items	@_____
	c. Out-of-Town Items	@_____
5.	Reconciliation Services:	
	a. Tapes Supplied	@_____
	b. Check Sorting	@_____
	Reconciliation and statement required monthly. Checks supporting each statement to be sorted in numerical sequence by serial number that is magnetically encoded on each check. Monthly bank analyses showing number and amount of transactions with daily ending balances.	
6.	Currency Shipments of $_____ weekly to be transported by [contractor].	@_____

BILLING INSTRUCTIONS

ATTACHMENT H

BILLING INSTRUCTIONS
U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE OPERATIONS OFFICE

I. These instructions are provided for the use by the Contractor in its preparation and submission of vouchers or invoices requesting reimbursement for costs incurred on negotiated cost-type contracts. Reimbursement procedures related to negotiated cost-type contracts involve the preparation and submission by the Contractor of adequately prepared vouchers to the Government. The submission of vouchers as prescribed herein will reduce correspondence and other causes for delay to a minimum and will thus assure prompt payments to the contractor.

II. In requesting reimbursement, contractors shall use the Government voucher SF-1034, Public Voucher for Purchases and Services Other Than Personal, or an acceptable substitute which provides the same necessary information as found in Attachment Nos. 1 and 2 to these instructions.

III. Each SF-1034 voucher will be prepared in an original and three copies. The voucher will be completed in accordance with the following numerical designations: (See Attachment No. 1.)

(1) All spaces numbered (1) should be left blank.

(2) Date voucher prepared and voucher number. It is suggested that vouchers be sequentially numbered for each contract.

(3) Contractor's name and mailing address and phone number.

(4) Contract number and date of contract.

(5) Where work assignments or task orders are involved in the billing, the number and date of the applicable order will be shown in this space, otherwise leave blank.

(6) Identify the period billing covers (i.e., month of January or January-March, 19__).

(7) Contract number cited must be the same as the number in the contract document and in item 4 above.

(8) Show the dollar amount of this billing. The amount claimed must agree with amount reflected in the detailed summary statement. The amount should be rounded to the nearest whole dollar.

(9) Place an X in the appropriate block for the type of payment for which reimbursement is requested.

IV. Submit an original SF-1034 and three copies with one copy of support documents for travel, nonexpendable equipment and direct labor by category (see Attachment No. 3 for sample format). If, however, the contract specifies a "Principal Ivestigator" or "Project Manager" by name(s), their time will be reported by the individual name(s). The Certification on Attachment No. 2 must be signed by an authorized official.

V. Payment of fixed fee. The fixed fee, if any, shall be paid in installments based on the percentage of completion of work, as determined by the Contracting Officer. Fixed fee will not be paid in less than monthly increments. Each voucher containing fixed fee will include a supporting document justifying the fixed fee amount in terms of the percentage of work completed. For level of effort contracts, the hours expended during the period shall be reported.

VI. At the option of the contractor, payments in excess of $25,000 can be made using the Treasury Financial Communications System (TFCS). Otherwise, payments will be made by a check mailed to the contractor. The TFCS provides on-line access to the Federal Reserve Communications System (FRCS), enabling your payment to be made to financial institutions that have access to the FRCS. Your payment can also be made to financial institutions that do not have access to the FRCS through correspondent financial institutions or Federal Reserve Banks. If the contractor opts to use the TFCS method of payment, the Payment Information Data Form (Attachment No. 4) should be completed and returned to the DOE to ensure that the DOE has correct TFCS information for making payments to the contractor's financial institution.

VII. The original voucher and all copies will be mailed to the following address:

U. S. Department of Energy
Albuquerque Operations Office
ATTN: Office Operations Section/FMD
P. O. Box 5400
Albuquerque, NM 87115

An additional copy of each voucher shall be sent to:
Contracting Officer

U. S. Department of Energy
Los Alamos Area Office
528 35th Street
Los Alamos, NM 87544

4 Attachments
1. Standard Form 1034
2. Detailed Backup for SF 1034
3. Instructions for Support Documents
4. TFCS Payment Information Data Form

Standard Form 1034
Revised January 1980
Department of the Treasury
I TFRM 4-2000
1034-118

PUBLIC VOUCHER FOR PURCHASES AND SERVICES OTHER THAN PERSONAL

VOUCHER NO (2)

U.S. DEPARTMENT, BUREAU, OR ESTABLISHMENT AND LOCATION
U. S. Department of Energy
Albuquerque Operations Office
Attn: Office Operations Section/FMD
P. O. Box 5400
Albuquerque NM 87115

DATE VOUCHER PREPARED (2)

CONTRACT NUMBER AND DATE (4)

REQUISITION NUMBER AND DATE (1)

SCHEDULE NO.

PAID BY (1)

PAYEE'S NAME AND ADDRESS (3)

DATE INVOICE RECEIVED (1)

DISCOUNT TERMS (1)

PAYEE'S ACCOUNT NUMBER (1)

SHIPPED FROM (1) TO (1) WEIGHT (1)

GOVERNMENT B/L NUMBER (1)

NUMBER AND DATE OF ORDER	DATE OF DELIVERY OR SERVICE	ARTICLES OR SERVICES (Enter description, item number of contract or Federal supply schedule, and other information deemed necessary)	QUANTITY	UNIT PRICE COST	UNIT PRICE PER	AMOUNT
(5)	(6)	(7) FOR REIMBURSEMENT OF COSTS INCURRED UNDER CONTRACT NO. AS DETAILED IN ATTACHED SUMMARY.	(1)	(1)	(1)	(8)

(Use continuation sheet(s) if necessary) (Payee must NOT use the space below) TOTAL (8)

PAYMENT:
- ☐ PROVISIONAL
- ☐ COMPLETE
- ☐ PARTIAL
- ☐ FINAL (9)
- ☐ PROGRESS
- ☐ ADVANCE

APPROVED FOR =$ (1)

EXCHANGE RATE (1) =$1.00

DIFFERENCES (1)

BY [2] (1)

Amount verified, correct for

TITLE (1)

(Signature or initials) (1)

Pursuant to authority vested in me, I certify that this voucher is correct and proper for payment.

(1) (Date) (1) (Authorized Certifying Officer)[3] (1) (Title)

ACCOUNTING CLASSIFICATION

(1)

PAID BY

CHECK NUMBER (1) ON ACCOUNT OF U.S. TREASURY (1) CHECK NUMBER (1) ON (Name of bank) (1)

CASH $ (1) DATE (1) PAYEE [3] (1)

[1] When stated in foreign currency, insert name of currency
[2] If the ability to certify and authority to approve are combined in one person, one signature only is necessary; otherwise the approving officer will sign in the space provided, over his official title
[3] When a voucher is receipted in the name of a company or corporation, the name of the person writing the company or corporate name, as well as the capacity in which he signs, must appear. For example "John Doe Company, per John Smith, Secretary", or "Treasurer", as the case may be

PER (1)

TITLE

Previous edition usable

☆ U.S. GOVERNMENT PRINTING OFFICE : 1983 O - 381-526 (9132)

NSN 7540-00-634-4208

PRIVACY ACT STATEMENT

The ABC Company
Anywhere, U. S. A. 01234

Contract No. DE-AC04-88ALXXXXX

Obligations: $XXX,XXX

Voucher No.
Date

Period of Performance:

Cost Categories (as applicable)	Previous Payments	Current Voucher No.	Cumulative Payments
Direct Labor			
Fringe Benefits @ %			
Overhead @ %			
Nonexpendable Items			
Materials & Supplies			
Travel			
Subcontract #1 (Jones)			
Subcontract #2 (Smith)			
Other Direct Costs			
Adjustments (Explain)			
G&A @ %			
Subtotal			
Fee @ %			
Fee Withheld			
Contractor's Portion (if applicable)			
Government's Share (if applicable)			

Current Contract Value:

Cost	$XXX,XXX
Fee	X,XXX
Total	$XXX,XXX

NOTE: A separate break-out shall be provided for each task if contract is a task order type.

CERTIFICATION: I certify that this invoice is correct and in accordance with the terms of the contract and that the costs included herein have been incurred, represent the payments made by the Contractor except as otherwise authorized in the payments provisions of the contract, and properly reflect the work performed.

_____ (Signature)

_____ (Title)

(NOTE: Attach one copy of support documents as instructed in Attachment No. 3.)

INSTRUCTIONS FOR SUPPORT DOCUMENTS

The purpose of the Support Documents is to allow the DOE technical representative to relate the progress achieved by the contractor to the cost incurred and ehnance his ability to manage the program and to enable the Contracting Officer to approve payment in a timely manner. The Support Documents should be presented in enough detail to meet these objectives.

Travel

(1) a copy of the detailed travel expense report without copies of receipts, tickets, etc.; or

(2) a listing reflecting the name of the individual, destination, date of departure and return, purpose of trip, and total travel costs incurred.

Nonexpendable Equipment

(1) listing of nonexpendable equipment purchased to reflect name of vendor, description of item purchased, date purchased, cost and DOE property tag number; or

(2) a copy of the invoice received from the vendor with the DOE property tag number reflected.

Direct Labor

(1) listing by name and hours charged to this contract during the billed period; or

(2) listing by labor category, i.e., Senior Research Scientist, Chemical Engineer, Technician, Draftsman and hours charged to this contract during the billed period.

Subcontracts

(1) for fixed priced subcontracts, provide a copy of the paid voucher.

(2) for cost reimbursement subcontracts, provide detail consistent with the prime contract requirements.

Payment Information Data Form
Treasury Financial Communications System

Payments under Department of Energy (DOE) contracts may be made by use of electronic funds transfers. The information requested herein concerning your financial institution will be used for that purpose. The information should be available through your company's Treasurer or financial institution.

If your financial institution has access to the Federal Reserve Communications System, please do not complete items 10-13. If your financial institution does not have access to the Federal Reserve Communications System, please complete all items, except item 7.

1. Name of Contractor Company:

2. Contractor Address:

3. Contractor Contact Person:

4. Contractor Contact Person Telephone Number: Area Code ( )

5. Name of Financial Institution:

6. Address of Financial Institution:

7. Financial Institution's nine-digit American Bankers Association (ABA) Identifying Number for Routing Transfer of Funds: _____. (Complete only if your Financial Institution has access to the Federal Reserve Communications System.)

8. Telegraphic Abbreviation of Financial Institution:

9. Account Number at your Financial Institution to be credited with the funds:

10. Name of Correspondent Financial Institution your Financial Institution receives electronic funds transfer messages through, if it does not have access to the Federal Reserve Communications System:

11. Address of Correspondent Financial Institution:

12. Correspondent Financial Institution's nine-digit ABA Identifying Number for Routing Transfer of Funds: _____.

13. Telegraphic Abbreviation of Correspondent Financial Institution:

14. Signature and Title of Authorizing Company Official:

_____	_____	_____
Signature	Title	Date

Comments:

WAGE DETERMINATION

U. S. DEPARTMENT OF LABOR

86-0105 (Revision No. 16)
86-0108 (Revision No. 12)
86-0116 (Revision No. 13)

ATTACHMENT I

U.S. DEPARTMENT OF LABOR
IPLOYMENT STANDARDS ADMINISTRATION
WAGE AND HOUR DIVISION
WASHINGTON, D.C. 20210

EGISTER OF WAGE DETERMINATIONS UNDER
THE SERVICE CONTRACT ACT
r direction of the Secretary of Labor

Alan L. Moss
Alan L. Moss Division of
irector Wage Determinations

LOCALITY	State: New Mexico Area: NM COUNTIES: BERNALILLO, CATRON CIBOLA, COLFAX, DE BACA, GUADALUPE, HARDING LOS ALAMOS, MCKINLEY, MORA, RIO ARRIBA SAN JUAN, SAN MIGUEL, SANDOVAL, SANTA FE SOCORRO, TAOS, TORRANCE, VALENCIA

Wage Determination No.: 86-0105 (Rev. 16) Date: 09/18/1991

Class of Service Employees	Minimum Hourly Wage	Fringe Benefit Payments			
		Health & Welfare	Vacation	Holiday	Other

tomatic Data Processing Occupations, Information and
ts Occupations, Library and Archive Occupations, and
chnical Occupations:

1. Computer Data Librarian	$ 8.82
2. Computer Operator I	$ 7.69
3. Computer Operator II	$ 9.86
4. Computer Operator III	$ 12.61
5. Computer Operator IV 1/	$ 13.41
6. Computer Programmer I 1/	$ 10.10
7. Computer Programmer II 1/	$ 12.12
8. Computer Programmer III 1/	$ 15.18
9. Computer Programmer IV 1/	$ 18.36
0. Computer Systems Analyst I 1/	$ 13.26
1. Computer Systems Analyst II 1/	$ 15.34
2. Computer Systems Analyst III 1/	$ 18.09
3. Computer Systems Analyst IV 1/	$ 21.69
4. Key Entry Operator I	$ 6.08
5. Key Entry Operator II	$ 8.03
6. Peripheral Equipment Operator	$ 9.27
7. Exhibits Specialist I	$ 9.01
8. Exhibits Specialist II	$ 11.00
9. Exhibits Specialist III	$ 13.76
0. Illustrator I	$ 9.01

U.S. DEPARTMENT OF LABOR
PLOYMENT STANDARDS ADMINISTRATION
WAGE AND HOUR DIVISION
WASHINGTON, D.C. 20210

GISTER OF WAGE DETERMINATIONS UNDER
THE SERVICE CONTRACT ACT
direction of the Secretary of Labor

Alan L. Moss

an L. Moss
rector

Division of
Wage Determinations

LOCALITY

State: New Mexico

Area: NM COUNTIES: BERNALILLO, CATRON
CIBOLA, COLFAX, DE BACA, GUADALUPE, HARDING
LOS ALAMOS, MCKINLEY, MORA, RIO ARRIBA
SAN JUAN, SAN MIGUEL, SANDOVAL, SANTA FE
SOCORRO, TAOS, TORRANCE, VALENCIA

Wage Determination No.: 86-0105 (Rev. 16) Date: 09/18/1991

Class of Service Employees	Minimum Hourly Wage	Fringe Benefit Payments			
		Health & Welfare	Vacation	Holiday	Other
. Illustrator II	$ 11.00				
. Illustrator III	$ 13.76				
. Photographer I	$ 9.01				
. Photographer II	$ 11.00				
. Photographer III	$ 13.76				
. Librarian	$ 12.78				
. Library Technician	$ 8.34				
. Technical Information Specialist I	$ 9.01				
. Technical Information Specialist II	$ 11.00				
. Technical Information Specialist III	$ 13.76				
. Laboratory Tester	$ 9.99				
. Technical Writer	$ 10.58				
. Drafter I	$ 6.16				
. Drafter II	$ 8.10				
. Drafter III	$ 9.01				
. Drafter IV	$ 11.00				
. Drafter V	$ 13.70				
. Technician I 5/	$ 9.91				
. Technician II 5/	$ 11.63				
. Technician III 5/	$ 13.36				
. Instructor	$ 11.18				

U.S. DEPARTMENT OF LABOR
MPLOYMENT STANDARDS ADMINISTRATION
WAGE AND HOUR DIVISION
WASHINGTON, D.C. 20210

EGISTER OF WAGE DETERMINATIONS UNDER
THE SERVICE CONTRACT ACT
y direction of the Secretary of Labor

lan L. Moss
irector

Division of
Wage Determinations

LOCALITY	State: New Mexico Area: NM COUNTIES: BERNALILLO, CATRON CIBOLA, COLFAX, DE BACA, GUADALUPE, HARDING LOS ALAMOS, MCKINLEY, MORA, RIO ARRIBA SAN JUAN, SAN MIGUEL, SANDOVAL, SANTA FE SOCORRO, TAOS, TORRANCE, VALENCIA

Wage Determination No.: 86-0105 (Rev. 16) Date: 09/18/1991

Class of Service Employees	Minimum Hourly Wage	Fringe Benefit Payments			
		Health & Welfare	Vacation	Holiday	Other

Fringe benefits applicable to all classes of service employees
engaged in contract performance: 2/ 3/ 4/

1/ Does not apply to employees employed in a bona fide executive, administrative, or professional
apacity as defined and delineated in 29 CFR 541. (See 29 CFR 4.156)

2/ HEALTH & WELFARE: $.74 an hour or $29.60 a week or $128.26 a month.

3/ VACATION: 2 weeks paid vacation after 1 year of service with a contractor or successor; 3 weeks
fter 10 years; 4 weeks after 15 years. Length of service includes the whole span of continuous
ervice with the present (successor) contractor, wherever employed, and with predecessor
ontractors in the performance of similar work at the same Federal facility. (Reg. 4.173)

4/ HOLIDAYS: 10 paid holidays per year: New Year's Day, Martin Luther King Jr.'s Birthday,
ashington's Birthday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans' Day,
hanksgiving Day, and Christmas Day. (A contractor may substitute for any of the named holidays
nother day off with pay in accordance with a plan communicated to the employees involved.)

5/ The Technician classification includes all of the following: Electronics, Electromechanical,
nvironmental, Instrumentation, Mathematical, Mechanical, and Photo-Optics

: The contracting officer shall require that any class of service employee which is not listed in and which is to be employed under the contract (i.e., the work to be performed is not ormed by any classification listed in the wage determination), be classified by the contractor s to provide a reasonable relationship (i.e., appropriate level of skill comparison) between . unlisted classifications and the classifications listed in the wage determination. Such ormed classes of employees shall be paid the monetary wages and furnished the fringe benefits re determined. Such conforming procedures shall be initiated by the contractor prior to the ormance of contract work by such unlisted class(es) of employees. A written report of the osed conforming action, including information regarding the agreement or disagreement of the orized representative of the employees involved or, where there is no authorized esentative, the employees themselves, shall be submitted by the contractor to the contracting cer no later than 30 days after such unlisted class(es) of employees performs any contract . The contracting officer shall review the proposed action and promptly submit a report of the on, together with the agencys' recommendation and all pertinent information including the ition of the contractor and the employees, to the Wage and Hour Division, Employment Standards inistration, U.S. Department of Labor, for review. (See section 4.6 (b)(2) of Regulations 29 4)

FORM ALLOWANCE: If employees are required to wear uniforms in the performance of this contract ther by the terms of the Government contract, by the employer, by the state or local law, etc.), cost of furnishing such uniforms and maintaining (by laundering or dry cleaning) such uniforms an expense that may not be borne by an employee where such cost reduces the hourly rate below t required by the wage determination. The Department of Labor will accept payment in accordance h the following standards as compliance:

contractor or subcontactor is required to furnish all employees with an adequate number of forms without cost or to reimburse employees for the actual cost of the uniforms. In addition, re uniform cleaning and maintenance is made the responsibility of the employee, contractors and subcontractors subject to this wage determination shall (in the absence of a a fide collective bargaining agreement providing for a different amount, or the furnishing of trary affirmative proof as to the actual cost), reimburse all employees for such cleaning and ntenance at a rate of $3.80 a week (or 76 cents a day); and effective April 1, 1991, the note 11 be $4.25 per week (or $.85 cents per day). However, in those instances where the uniforms nished are made of "wash and wear" materials, may be routinely washed and dried with other sonal garments, and do not require any special treatment such as dry cleaning, daily washing, or mercial laundering in order to meet the cleanliness or appearance standards set by the terms of Government contract, by the contractor, by law, or by the nature of the work, there is no uirement that employees be reimbursed for uniform maintenance costs.

E: The duties of employees under job titles listed are those described in the Service Contract Directory of Occupations, Second Edition, July 1986, unless otherwise indicated. See also 29 Part 4 Section 4.152.

U.S. DEPARTMENT OF LABOR
EMPLOYMENT STANDARDS ADMINISTRATION
WAGE AND HOUR DIVISION
WASHINGTON, D.C. 20210

REGISTER OF WAGE DETERMINATIONS UNDER
THE SERVICE CONTRACT ACT
By direction of the Secretary of Labor

Alan L. Moss
Director

Division of
Wage Determinations

LOCALITY	State: New Mexico Area: NM COUNTIES: BERNALILLO, CATRON CIBOLA, COLFAX, DE BACA, GUADALUPE, HARDING LOS ALAMOS, MCKINLEY, MORA, RIO ARRIBA SAN JUAN, SAN MIGUEL, SANDOVAL, SANTA FE SOCORRO, TAOS, TORRANCE, VALENCIA

Wage Determination No.: 86-0108 (Rev. 12) Date: 09/18/1991

Class of Service Employees	Minimum Hourly Wage	Fringe Benefit Payments			
		Health & Welfare	Vacation	Holiday	Other
Administrative Support and Clerical Occupations:					
1. Accounting Clerk I	$ 6.35				
2. Accounting Clerk II	$ 7.37				
3. Accounting Clerk III	$ 8.86				
4. Accounting Clerk IV	$ 9.92				
5. Dispatcher, Motor Vehicle	$ 6.94				
6. Driver Messenger	$ 8.52				
7. File Clerk I	$ 5.49				
8. File Clerk II	$ 6.25				
9. File Clerk III	$ 7.50				
10. Audiovisual Services Clerk (Film/Tape Librarian)	$ 7.37				
11. Inventory Clerk	$ 6.94				
12. Mail Clerk	$ 5.49				
13. Messenger	$ 5.86				
14. Order Clerk I	$ 6.96				
15. Order Clerk II	$ 9.55				
16. Payroll Clerk	$ 8.48				
17. Production Control Clerk	$ 9.92				
18. Receptionist	$ 6.64				
19. Scheduler, Maintenance	$ 8.20				
20. Secretary I	$ 8.20				
21. Secretary II	$ 8.48				

U.S. DEPARTMENT OF LABOR
EMPLOYMENT STANDARDS ADMINISTRATION
WAGE AND HOUR DIVISION
WASHINGTON, D.C. 20210

REGISTER OF WAGE DETERMINATIONS UNDER
THE SERVICE CONTRACT ACT
By direction of the Secretary of Labor

Alan L. Moss
Director

Division of
Wage Determinations

LOCALITY

State: New Mexico

Area: NM COUNTIES: BERNALILLO, CATRON
CIBOLA, COLFAX, DE BACA, GUADALUPE, HARDING
LOS ALAMOS, MCKINLEY, MORA, RIO ARRIBA
SAN JUAN, SAN MIGUEL, SANDOVAL, SANTA FE
SOCORRO, TAOS, TORRANCE, VALENCIA

Wage Determination No.: 86-0108 (Rev. 12) Date: 09/18/1991

Class of Service Employees	Minimum Hourly Wage	Fringe Benefit Payments			
		Health & Welfare	Vacation	Holiday	Other
22. Secretary III	$ 10.72				
23. Secretary IV	$ 12.39				
24. Secretary V	$ 12.94				
25. Service Order Dispatcher	$ 6.94				
26. Stenographer I	$ 8.02				
27. Stenographer II	$ 9.24				
28. Supply Clerk/Storeworker/ Shelf Stocker/Store Clerk	$ 6.94				
29. Supply Technician	$ 10.72				
30. Switchboard Operator	$ 6.64				
31. Switchboard Operator-Receptionist	$ 6.64				
32. Transcribing-Machine Typist	$ 8.20				
33. Typist I	$ 6.68				
34. Typist II	$ 7.59				
35. Word Processor I	$ 6.71				
36. Word Processor II	$ 8.36				
37. Reservation Agent-in-charge	$ 12.94				
38. Lead Reservation Clerk	$ 12.39				
39. Reservation Clerk	$ 10.72				

U.S. DEPARTMENT OF LABOR
EMPLOYMENT STANDARDS ADMINISTRATION
WAGE AND HOUR DIVISION
WASHINGTON, D.C. 20210

REGISTER OF WAGE DETERMINATIONS UNDER
THE SERVICE CONTRACT ACT
By direction of the Secretary of Labor

Alan L. Moss
Director

Division of
Wage Determinations

LOCALITY	State: New Mexico Area: NM COUNTIES: BERNALILLO, CATRON CIBOLA, COLFAX, DE BACA, GUADALUPE, HARDING LOS ALAMOS, MCKINLEY, MORA, RIO ARRIBA SAN JUAN, SAN MIGUEL, SANDOVAL, SANTA FE SOCORRO, TAOS, TORRANCE, VALENCIA

Wage Determination No.: 86-0108 (Rev. 12) Date: 09/18/1991

Class of Service Employees	Minimum Hourly Wage	Fringe Benefit Payments			
		Health & Welfare	Vacation	Holiday	Other

Fringe benefits applicable to all classes of service employees engaged in contract performance: 1/ 2/ 3/

1/ HEALTH & WELFARE: Life, accident, and health insurance plans, sick leave, pension plans, civic nd personal leave, severance pay, and savings and thrift plans: Employer contributions costing an verage of $2.07 per hour computed on the basis of all hours worked by service employees employed n the contract.

2/ VACATION: 2 weeks paid vacation after 1 year of service with a contractor or successor; 3 weeks fter 10 years; 4 weeks after 15 years. Length of service includes the whole span of continuous ervice with the present (successor) contractor, wherever employed, and with predecessor ontractors in the performance of similar work at the same Federal facility. (Reg. 4.173)

3/ HOLIDAYS: 10 paid holidays per year: New Year's Day, Martin Luther King Jr.'s Birthday, ashington's Birthday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans' Day, hanksgiving Day, and Christmas Day. (A contractor may substitute for any of the named holidays nother day off with pay in accordance with a plan communicated to the employees involved.)

NOTE: The contracting officer shall require that any class of service employee which is not listed herein and which is to be employed under the contract (i.e., the work to be performed is not performed by any classification listed in the wage determination), be classified by the contractor so as to provide a reasonable relationship (i.e., appropriate level of skill comparison) between such unlisted classifications and the classifications listed in the wage determination. Such conformed classes of employees shall be paid the monetary wages and furnished the fringe benefits as are determined. Such conforming procedures shall be initiated by the contractor prior to the performance of contract work by such unlisted class(es) of employees. A written report of the proposed conforming action, including information regarding the agreement or disagreement of the authorized representative of the employees involved or, where there is no authorized representative, the employees themselves, shall be submitted by the contractor to the contracting officer no later than 30 days after such unlisted class(es) of employees performs any contract work. The contracting officer shall review the proposed action and promptly submit a report of the action, together with the agencys' recommendation and all pertinent information including the position of the contractor and the employees, to the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, for review. (See section 4.6 (b)(2) of Regulations 29 CFR 4)

UNIFORM ALLOWANCE: If employees are required to wear uniforms in the performance of this contract (either by the terms of the Government contract, by the employer, by the state or local law, etc.), the cost of furnishing such uniforms and maintaining (by laundering or dry cleaning) such uniforms is an expense that may not be borne by an employee where such cost reduces the hourly rate below that required by the wage determination. The Department of Labor will accept payment in accordance with the following standards as compliance:

The contractor or subcontactor is required to furnish all employees with an adequate number of uniforms without cost or to reimburse employees for the actual cost of the uniforms. In addition, where uniform cleaning and maintenance is made the responsibility of the employee, all contractors and subcontractors subject to this wage determination shall (in the absence of a bona fide collective bargaining agreement providing for a different amount, or the furnishing of contrary affirmative proof as to the actual cost), reimburse all employees for such cleaning and maintenance at a rate of $3.80 a week (or 76 cents a day); and effective April 1, 1991, the note shall be $4.25 per week (or $.85 cents per day). However, in those instances where the uniforms furnished are made of "wash and wear" materials, may be routinely washed and dried with other personal garments, and do not require any special treatment such as dry cleaning, daily washing, or commercial laundering in order to meet the cleanliness or appearance standards set by the terms of the Government contract, by the contractor, by law, or by the nature of the work, there is no requirement that employees be reimbursed for uniform maintenance costs.

NOTE: The duties of employees under job titles listed are those described in the Service Contract Act Directory of Occupations, Second Edition, July 1986, unless otherwise indicated. See also 29 CFR Part 4 Section 4.152.

********** OCCUPATIONS NOT INCLUDED IN THE SCA DIRECTORY OF OCCUPATIONS **********

RESERVATION AGENT-IN-CHARGE

Develops itineraries for worldwide travel regardless of complexity and, using an airline reservation computer system, arranges reservation and ticketing service to meet business requirements and schedules. Determines authorized and cost effective modes, carriers and routings and arranges rental car service. Is the working supervisor for a travel section consisting of two or more reservation clerks, or may be designated as a site supervisor at a small branch location.

LEAD RESERVATION CLERK

Develops more difficult and unique itineraries for worldwide travel and using an airline reservation computer system, arranges reservation and ticketing service to meet business requirements and schedules. Determines authorized and cost effective modes, carriers and routings and arranges rental car service. Acts as a "trouble shooter" for other reservation clerks and provides guidance and assistance with unusual or difficult routings.

RESERVATION CLERK

Develops relatively routine and less complicated itineraries for worldwide travel and, using an airline reservation computer system, arranges business requirements and schedules. Determines authorized and cost effective modes, carriers and routings and arranges rental car service.

U.S. DEPARTMENT OF LABOR
EMPLOYMENT STANDARDS ADMINISTRATION
WAGE AND HOUR DIVISION
WASHINGTON, D.C. 20210

REGISTER OF WAGE DETERMINATIONS UNDER
THE SERVICE CONTRACT ACT
By direction of the Secretary of Labor

Alan L. Moss
Director

Division of
Wage Determinations

LOCALITY

State: New Mexico

Area: NM COUNTIES: BERNALILLO, CATRON
CIBOLA, COLFAX, DE BACA, GUADALUPE, HARDING
LOS ALAMOS, MORA, RIO ARRIBA, SAN JUAN
SAN MIGUEL, SANDOVAL, SANTA FE, SOCORRO, TAOS
TORRANCE, VALENCIA

Wage Determination No.: 86-0116 (Rev. 13) Date: 09/18/1991

Class of Service Employees	Minimum Hourly Wage	Fringe Benefit Payments			
		Health & Welfare	Vacation	Holiday	Other
rotective Services:					
1. Court Security Officer	$ 6.49				
2. Detention Officer/Correction Officer	$ 6.49				
3. Firefighter	$ 6.49				
4. Guard I	$ 5.17				
5. Guard II	$ 6.49				
6. Police Officer	$ 6.49				

Fringe benefits applicable to all classes of service employees
engaged in contract performance: 1/ 2/ 3/

1/ HEALTH & WELFARE: Life, accident, and health insurance plans, sick leave, pension plans, civic nd personal leave, severance pay, and savings and thrift plans: Employer contributions costing an verage of $2.07 per hour computed on the basis of all hours worked by service employees employed n the contract.

2/ VACATION: 2 weeks paid vacation after 1 year of service with a contractor or successor; 3 weeks fter 10 years; 4 weeks after 15 years. Length of service includes the whole span of continuous ervice with the present (successor) contractor, wherever employed, and with predecessor ontractors in the performance of similar work at the same Federal facility. (Reg. 4.173)

U.S. DEPARTMENT OF LABOR
EMPLOYMENT STANDARDS ADMINISTRATION
WAGE AND HOUR DIVISION
WASHINGTON, D.C. 20210

REGISTER OF WAGE DETERMINATIONS UNDER
THE SERVICE CONTRACT ACT
By direction of the Secretary of Labor

Alan L. Moss
Director

Division of
Wage Determinations

LOCALITY	State: New Mexico Area: NM COUNTIES: BERNALILLO, CATRON CIBOLA, COLFAX, DE BACA, GUADALUPE, HARDING LOS ALAMOS, MORA, RIO ARRIBA, SAN JUAN SAN MIGUEL, SANDOVAL, SANTA FE, SOCORRO, TAOS TORRANCE, VALENCIA

Wage Determination No.: 86-0116 (Rev. 13) Date: 09/18/1991

Class of Service Employees	Minimum Hourly Wage	Fringe Benefit Payments			
		Health & Welfare	Vacation	Holiday	Other

/ HOLIDAYS: 10 paid holidays per year: New Year's Day, Martin Luther King Jr.'s Birthday, ıshington's Birthday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans' Day, ıanksgiving Day, and Christmas Day. (A contractor may substitute for any of the named holidays ıother day off with pay in accordance with a plan communicated to the employees involved.)

TE: The contracting officer shall require that any class of service employee which is not listed erein and which is to be employed under the contract (i.e., the work to be performed is not erformed by any classification listed in the wage determination), be classified by the contractor as to provide a reasonable relationship (i.e., appropriate level of skill comparison) between ch unlisted classifications and the classifications listed in the wage determination. Such onformed classes of employees shall be paid the monetary wages and furnished the fringe benefits are determined. Such conforming procedures shall be initiated by the contractor prior to the erformance of contract work by such unlisted class(es) of employees. A written report of the roposed conforming action, including information regarding the agreement or disagreement of the thorized representative of the employees involved or, where there is no authorized epresentative, the employees themselves, shall be submitted by the contractor to the contracting fficer no later than 30 days after such unlisted class(es) of employees performs any contract rk. The contracting officer shall review the proposed action and promptly submit a report of the tion, together with the agencys' recommendation and all pertinent information including the sition of the contractor and the employees, to the Wage and Hour Division, Employment Standards ministration, U.S. Department of Labor, for review. (See section 4.6 (b)(2) of Regulations 29 R 4)

IFORM ALLOWANCE: If employees are required to wear uniforms in the performance of this contract ither by the terms of the Government contract, by the employer, by the state or local law, etc.), e cost of furnishing such uniforms and maintaining (by laundering or dry cleaning) such uniforms an expense that may not be borne by an employee where such cost reduces the hourly rate below at required by the wage determination. The Department of Labor will accept payment in accordance th the following standards as compliance:

e contractor or subcontactor is required to furnish all employees with an adequate number of iforms without cost or to reimburse employees for the actual cost of the uniforms. In addition, ere uniform cleaning and maintenance is made the responsibility of the employee, l contractors and subcontractors subject to this wage determination shall (in the absence of a na fide collective bargaining agreement providing for a different amount, or the furnishing of ntrary affirmative proof as to the actual cost), reimburse all employees for such cleaning and intenance at a rate of $3.80 a week (or 76 cents a day); and effective April 1, 1991, the note all be $4.25 per week (or $.85 cents per day). However, in those instances where the uniforms rnished are made of "wash and wear" materials, may be routinely washed and dried with other rsonal garments, and do not require any special treatment such as dry cleaning, daily washing, or mmercial laundering in order to meet the cleanliness or appearance standards set by the terms of Government contract, by the contractor, by law, or by the nature of the work, there is no quirement that employees be reimbursed for uniform maintenance costs.

OTE: The duties of employees under job titles listed are those described in the Service Contract ct Directory of Occupations, Second Edition, July 1986, unless otherwise indicated. See also 29 FR Part 4 Section 4.152.

CONTRACT NOTIFICATIONS

AND SUBMITTALS

ATTACHMENT

*** CONTRACT NOTIFICATIONS AND SUBMITTALS ***

(FN-NOTSUB.WK1/LOTUS)

DESCRIPTION	REFERENCE	DUE SCHEDULE	NO. OF COPIES
Confidentiality of Information Agreement	Special Contract Requirements (SCR) H.03	Upon request	1 copy
Overtime Approval	SCR H.14	As required, each occurrence	1 copy
Overtime Use Report	SCR H.14	Each occurrence, weekly	1 copy
Cost Voucher, Indirect Costs	SCR H.16.(a) and Contract Clause (CC) 24	Monthly	1 copy
Cost Voucher, Direct Costs	SCR H.16.(d), CC 24	Monthly	1 copy
Fire Department Managment Team	SCR, H.18	30 days after award	1 copy
Certificate of Procurement Integrity	CC 7.(b)	Each modification	1 copy
Notification of Intent to Subcontract with Debarred Party	CC 14(c)	Each occurrence	1 copy
Organizational Conflict of Interests	CC 15(b) and SCR, H.21	Each occurrence	1 copy
Release of Information	SCR, H.22	Each occurrence	1 copy
Automatic Data Proc. Eq.	SCR, H.23	Each occurrence	1 copy
Acquisition of Real Property	CC 27	Each occurrence	1 copy
Subcontracting Plan	CC 29	As requested	1 copy
Notice of Labor Disputes	CC 34 and SOW IX.A	Each potential labor dispute	1 copy
Equal Opportunity Pre-award Clearance	CC 37	Each Subcontract over $1M	1 copy

*** CONTRACT NOTIFICATIONS AND SUBMITTALS ***

(FN-NOTSUB.WK1/LOTUS)

DESCRIPTION	REFERENCE	DUE SCHEDULE	NO. OF COPIES
Employment Report, Vietnam Era Veterans	CC 40	March 31 each year	1 copy Form VETS 100
Paperwork Reduction Act	CC 49(b)	Each occurrence	1 copy
Notice of Patent or Copyright Infringement	CC 53	Each occurrence	1 copy
Insurance-Liability to Third Parties	CC 54	Each occurrence	1 copy
Notice of Suit or Claim That Could be a Cost to Contract	CC 54(g)	Each occurrence	1 copy
Limitation of Funds	CC 59	When costs are expected to exceed 75% of allotted fund in next 60 days	1 copy
Disputes	CC 62	Each occurrence	1 copy
Key Personnel	CC 64	Each change of personnel	1 copy
Continuity of Operations Plan	CC 66	60 days after award of contract	5 copies draft, and final
Notice of Intent to Disallow Costs	CC 67(a)(2)	60 days or less after notice to not allow costs	1 copy
Changes-Cost-Reimbursement	CC 68(c)	30 days after receipt of order	1 copy
Subcontracts	CC 69	Each occurrence, as required	1 copy of all documents
Property Management Program Plan	CC 71 and SOW VI.A	180 days after award of contract	3 copies draft, 1 copy fin.
Nuclear Hazards Claim	CC 77	Each occurrence	1 copy
Safety and Health	CC 82	30 days after	1 copy draft

*** CONTRACT NOTIFICATIONS AND SUBMITTALS ***

(FN-NOTSUB.WK1/LOTUS)

DESCRIPTION	REFERENCE	DUE SCHEDULE	NO. OF COPIES
Management Program		award of contract	1 copy final
Workplace Substance Abuse Program	CC 85	30 days after award of contract	3 copies draft 1 copy final
Personnel and Equipment Response Procedures	Statement of Work, (SOW) I.B.3	30 days after award of contract	3 copies draft 1 copy final
EMT-I Implementation Plan	SOW I.C.3	30 days after award of contract	3 copies draft 1 copy final
Rescue Services Operating Procedures	SOW, I.C.5	90 days after award of contract.	3 copies draft 1 copy final
Communications and Dispatch Plan	SOW I.D.4	Continuing	3 copies draft 1 copy final
Communications and Dispatch Procedures	SOW I.D.1	120 days after award of contract	3 copies draft 1 copy of final
Contractor's Organization Structure Chart	SOW II.B and C	At award and each change	3 copies draft and final
FTE Levels Overstaffing	SOW II.D	Each occurrence	1 copy
Fire Department Organization Chart/Narrative	SOW II.B	Prior to contract award and as requested by C.O.	3 copies draft and final
Annual Fire Department Budget	SOW III.A	Sept. 30th of each year and updates as requested	1 copy
Budget Overruns	SOW III.A.2	Each occurrence	1 copy
Cost Management System	SOW III.B.1	180 days after award of contract	3 copies draft and final
Monthly Cost Reports	SOW III.B.3	30 calendar days after end of month	1 copy
Personnel Management Plan	SOW IV.	60 days after award of contract	3 copies draft and final
Security Plan	SOW V.	30 days after	3 copies draft

*** CONTRACT NOTIFICATIONS AND SUBMITTALS ***

(FN-NOTSUB.WK1/LOTUS)

DESCRIPTION	REFERENCE	DUE SCHEDULE	NO. OF COPIES
		award of contract	and final
Appointment of Training Officer	SOW VII.A.2	At time of award	1 copy
Fire Department Training Program	SOW VII.A.3.j	60 days after award of contract	3 copies draft 1 copy final
Incident Command System Procedures	SOW VIII.A.3	60 days after award of contract	3 copies draft 1 copy final
Occurrence Reporting Procedures	SOW VIII.B.4	30 days after award of contract	3 copies draft 1 copy final
Occurrence Reports	SOW VIII.B	Each incident within two hours telephone, 24 hr., 10 day and final reports	Telephone ORPS electron system.
Continuity of Operations Contingency Plan	SOW IX.B	90 days after award of contract	1 copy
Work Stoppage Notice	SOW IX.A	Each occurrence	3 copies draft and final
Pre-Fire Planning Program	SOW X.E	30 days after award of contract	3 copies
Pre-Fire Plans of Facilities	SOW X.D	At time of award and continuing	1 copy
Intent to Enter into Mutual-Aid Agreements	SOW XI.C	Each occurrence	3 copies draft and final
Mutual-Aid Agreements	SOW XI.D	Each occurrence	Copies of data to be provided as requested
Fire Hydrant Flow Testing	SOW XII.A	Reports to be delivered within 30 days of completions of the tests	3 copies draft and final
Procedures for Fire Hydrant Testing	SOW XII.A.3	45 days after award of contract	3 copies draft and final. One copy on PC disk
Operational Procedures	SOW XIII	As completed	

APPENDIX G

Memorandum of Understanding Between the U.S. Department of Energy Los Alamos Area Office and the Incorporated County of Los Alamos, New Mexico Concerning Mutual Aid and Emergency Response

MEMORANDUM OF UNDERSTANDING
BETWEEN THE
UNITED STATES DEPARTMENT OF ENERGY
LOS ALAMOS AREA OFFICE

AND THE

INCORPORATED COUNTY OF LOS ALAMOS, NEW MEXICO

CONCERNING

MUTUAL AID AND EMERGENCY RESPONSE

INTRODUCTION:

THIS MEMORANDUM OF UNDERSTANDING (MOU) is between the United States of America (the Government), Department of Energy (DOE), Los Alamos Area Office (LAAO), and the Incorporated County of Los Alamos, State of New Mexico (County).

WHEREAS, both parties have certain responsibilities for protecting the public; and

WHEREAS, both parties have developed and maintain capabilities to accomplish their respective responsibilities; and

PURPOSE:

WHEREAS, both parties recognize that developing and maintaining a program of mutual assistance will enhance each party's ability to accomplish its responsibilities in a more effective and efficient manner; and

WHEREAS, both parties are willing to enter into this MOU;

AUTHORITY:

WHEREAS, the DOE is authorized to enter into this MOU by Public Law 95-91; and DOE Order 1280.1A, dated November 15, 1991; and

WHEREAS, The County is authorized to enter into this MOU by Article I, Sections 100 and 103 of the Charter for the Incorporated County of Los Alamos, Sections 2.50.020, 2.48.020, 2.16.010 and 2.16.020 of the Los Alamos County Code, the New Mexico Constitution, Art. X, Section 6 and the Community Right to Know Act of 1986 (SARA Title III), Sections 301-303 and Section 12-10-6 NMSA, 1978.

NOW, THEREFORE, it is understood and agreed by the parties that the MOU will be as follows:

MANAGEMENT AND PROGRAM GUIDELINES:

1. The DOE will provide assistance to the County, when requested, for the following:

   a. Crisis negotiation efforts;
   b. Bomb threats, bomb and explosive incidents;
   c. Hazardous material emergencies or incidents; and
   d. Natural disasters, or "Acts of God," affecting the County.

   The County will provide assistance for emergencies to DOE, when requested, for Los Alamos police assistance, highway maintenance equipment, and use of County buildings and facilities on an as-needed basis.

   DOE and County assistance will be rendered to each entity within the incorporated boundary of Los Alamos County and areas outside the County to the extent provided for through other MOUs between the DOE, the County and other jurisdictions.

2. Both the DOE and the County reserve the right to determine the extent of the assistance either will render to the other in response to requests for assistance.

3. Mutual Aid Response Procedures will be developed and updated annually, specifying the policies and procedures to be followed in implementing this MOU.

4. The DOE and the County covenant and agree that no claim for compensation will be made against each other for any loss, damage, personal injury, or death occurring in consequence of bomb threat, natural disaster or hazardous material response assistance rendered under this agreement, and all such rights or claims are hereby expressly waived.

5. Notwithstanding any other term, condition or provision of this MOU, nothing contained in this MOU shall in any way alter the County's rights, privileges, immunities or protection under the New Mexico Tort Claims Act, Section 41-4-1, NMSA, 1978.

6. A copy of this MOU will be provided by LAAO to the Los Alamos Police and Fire Departments, the University of California Regents, the DOE Albuquerque Operations Office, the Los Alamos Medical Center, the Los Alamos Schools, and the State of New Mexico, after it has been signed by both parties.

7. This MOU shall not be used to obligate or commit funds or as the basis for the transfer of funds.

8. Subject to the Freedom of Information Act (5 U.S.C. 5520), decisions on disclosure of information to the public regarding this MOU shall be made by DOE following consultation with the County-designated representative.

9. This MOU shall become effective upon the latter date of signature of the parties. It shall remain in effect for a 5-year term from the effective date. It may be terminated by the mutual written agreement of DOE and the County or by either party upon 30-day written notice to the other party.

Accepted on Behalf of the DOE by the:

Acting Area Manager, Los Alamos Area Office — Date 12/1/94

Accepted on Behalf of the County by the:

Los Alamos County Administrator — Date 1-3-95

Approved as to form:

Acting County Attorney — Date 1/19/95

APPENDIX H

Memorandum of Understanding Between the U.S. Department of Energy and the Los Alamos Medical Center Concerning Mutual Assistance and Emergency Support

DE-SM:0-94AL96947

MEMORANDUM OF UNDERSTANDING BETWEEN THE UNITED STATES DEPARTMENT OF ENERGY AND THE THE LOS ALAMOS MEDICAL CENTER CONCERNING MUTUAL ASSISTANCE AND EMERGENCY SUPPORT

1. GENERAL: This Memorandum of Understanding (MOU), is between the United States Department of Energy (DOE), Los Alamos Area Office (LAAO), and Los Alamos Medical Center (the Hospital).

2. INTRODUCTION

a. Background

Emergency preparedness principles call for formalizing agreements with nearby medical institutions capable of rendering assistance in the event of a major catastrophe. The Planning Agreement signed on November 27, 1985, by Glen Bryant, Administrator of Los Alamos Medical Center, and on November 29, 1985, by Harold E. Valencia, Los Alamos Area Office (LAAO) Area Manager, is superseded by this document upon signature by both parties.

b. Purpose

This MOU establishes an agreement (Agreement) between the United States Department of Energy's Los Alamos Area Office (DOE/LAAO--hereinafter referred to as DOE) and Los Alamos Medical Center (hereinafter referred to as the Hospital), said Hospital to provide appropriate facilities for the treatment and care of patients from the DOE contractor, Los Alamos National Laboratory (LANL), in the event of an accident, emergency or other circumstance resulting in the release of radioactivity and subsequent contamination of said patients. Such accident, emergency, or circumstance is hereinafter referred to as an "incident."

c. Authority

(1) DOE Order 5500.3A, dated April 30, 1991, "Planning and Prepardness for Operational Emergencies," paragraph 11. c. (7) (c)/page 12, requires "documented arrangements with onsite and offsite medical facilities to accept and treat contaminated, injured personnel."

(2) DOE Order 1280.1, dated November 15, 1991, Memorandums of Understanding, provides format and policy guidance for constructing an MOU.

d. Policy

DOE will not call upon the Hospital for assistance except under emergency conditions or the DOE and its local contractors do not have the capability to resolve the crisis. When called upon, the hospital will make every effort to provide such support as it is able to render without compromising its ability to provide treatment to its patients.

3. MANAGEMENT AND PROGRAM GUIDELINES:

a. Management and Review

(1) Responsibilities of Participating Parties.

(a) DOE agrees to the following:

1. To participate in an educational program for physicians and nursing personnel at the Hospital, the particulars of which are to be determined by mutual agreement of the parties.

2. To participate in radiation emergency exercises covering LANL to evaluate the Hospital's and DOE's respective abilities to respond to an incident requiring treatment of contaminated personnel at the Hospital.

3. To provide a current list of DOE and Contractor (LANL) personnel who may be contacted for specific information and assistance in the event of an incident. DOE will provide updates to the list within a reasonable time as changes occur, but not less than annually.

4. To purchase and pre-position at the Hospital those contamination control supplies and equipment the parties agree are desirable to have on hand in the event of an incident. These supplies and equipment include, but are not limited to: Personal Protective Equipment (PPE), monitoring instrumentation,

plastic floor covering, tape, coveralls, respirators and other supplies and equipment to be used for the management of radiation emergencies.

5. To dispatch a decontamination team composed of radiation protection technologists and appropriate supervision in the event of an incident to assist the Hospital in the control of the contamination. The patient shall be decontaminated to the extent medically appropriate prior to transfer to the Hospital and a radiation protection technologist will accompany the patient to the Hospital.

6. To provide timely and accurate information to the Hospital in the event of an incident.

a. This shall include:

(1) A description of the nature of the incident;

(2) The type of radiation and extent of contamination of the patient;

(3) All available radiological information relative to a particular patient to the Hospital as soon as possible, but preferably not later than the patient's arrival at the Hospital for treatment. In the event hazardous materials are also involved, in the incident, information available with regard to those materials will also be provided.

b. If a patient is being sent to the Hospital as a result of an accident not involving radiation, the Hospital will be informed that no contamination is involved. If radiation contamination is involved, the LANL physician on call will be available for consultation to assist the hospital emergency room personnel, as needed.

c. This information will be conveyed by telephoning the nurse on duty at the Hospital Emergency Room or by some other mutually convenient mode.

7. To remove from the Hospital for disposal all waste material and equipment contaminated or potentially contaminated as a result of the Hospital's performance under this agreement.

(b) Los Alamos Medical Center agrees to the following:

1. To provide a current list of Hospital emergency preparedness personnel who are to be alerted in the event of an incident. Hospital will provide updates to the list within a reasonable time as changes occur, or by the first of January each year.

2. To provide adequate storage space at the Hospital for contamination control supplies, including but not limited to PPE, monitoring instrumentation, plastic floor covering, tape coveralls, respirators and other supplies necessary for the management of radiation emergencies.

3. To participate in radiation emergency exercises, including an annual one conducted with participation by the State of New Mexico, covering LANL to evaluate the Hospital's and DOE's respective abilities to respond to an incident requiring treatment of contaminated personnel at the Hospital.

4. To provide, in the event of an incident, such staff physicians, technicians, technologists, and related personnel (including Hospital's trauma team) as are required for the proper care and treatment of patients from the DOE, Contractor and subcontractors, even though contaminated with radioactive material, and also including the handling of expired victims.

5. To provide information to a DOE-designated representative regarding the medical condition of all patients treated by the Hospital as the result of an incident.

(2) Periodic Review

DOE will be responsible for reviewing this agreement annually as required by the DOE Order 5500.3A and initiating any changes deemed necessary. Either party to the agreement can initiate a change at any time.

(3) Working Committees

If regarded as necessary by either party to this agreement, DOE will be responsible for organizing and chairing a standing committee to resolve problems identified by either party. Discussions will be documented and recommended changes will be fully coordinated to ensure total concurrence from the management of both parties.

(4) Special Provisions

(a) It is understood by the parties to this Agreement that one or more drugs designated by the U. S. Food and Drug Administration as "investigational" may be necessary for the management of patient internal contamination by radioactive material. The Medical Director and full-time physicians on the staff of LANL's Medical Department are specifically identified on the applicable Investigational Drug Authorization filed with the U. S. Food and Drug Administration to administer these drugs. Therefore, the Hospital agrees to accord LANL's Medical Director and full time physicians the privilege of participating in the care of patients admitted to the hospital under this Agreement for the purpose of administering these investigational drugs, and other activities as the Hospital may permit.

(b) It is further understood that these drugs must be administered under conditions of informed consent. The Hospital will take whatever steps are necessary to preapprove the informed consent procedure in order to avoid administrative delay at the time of actual patient care.

b. Guidelines

Implementation of this Agreement shall be coordinated by the DOE Area Manager and Hospital Administrator, Patient Care Services, or their designees. They, or their designated representatives, shall meet as necessary to coordinate the

implementation of this Agreement; provided further, that they shall meet not less than annually to review this Agreement and revise or update it as necessary.

c. **Program Funding**

The details of the levels of support to be furnished one organization by the other with respect to funding will be developed in specific interagency agreements, subject to the availability of funds. This MOU shall not be used to obligate or commit funds or as a basis for the transfer of funds. DOE and the Hospital will provide each other mutual support in budget justification to the Office of Management and Budget and hearings before the Congress with respect to programs on which the organizations collaborate.

d. **Management Arrangements**

This MOU envisages direct communication between DOE and officials of other organizations involved in managing the work to be performed. Interagency agreements or project plans will set forth specific arrangements for program implementation. Such plans set forth necessary cooperative arrangements and procedures for handling decisions required by various Government officials. Specific funding and tasking will be implemented through interagency agreements.

4. **ADMINISTRATION**

a. **Public Information Coordination**

Subject to the Freedom of Information Act (5 U. S. C. 552), decisions on disclosure of information to the public regarding projects and programs referenced in this MOU shall be made by DOE following consultation with the other party's representatives.

b. **Security**

Nothing in this MOU authorizes access to or disclosure of classified information required to be protected in accordance with federal law or regulation in the interest of national security. The Hospital agrees to comply with, and to assure that its personnel participating in any training hereunder at LANL comply with all applicable security regulations and requirements of the DOE pertaining to their conduct while on DOE property.

c. **Amendment and Termination**

This MOU may be amended by written agreement between DOE and the Hospital. This MOU may be terminated by the mutual written agreement of DOE and the Hospital or by either party upon 90-day written notice to the other party.

d. **Effective Date**

This MOU shall become effective upon the latter date of signature of the parties. It shall remain in effect for a five-year term from the effective date.

LOS ALAMOS AREA OFFICE OF THE DOE

BY: _____
Area Manager

DATE: 4-29-94

LOS ALAMOS MEDICAL CENTER

BY: _____
Administrator

DATE: 4-26-94