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DATE: May 18, 1994
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Ms. Stephanie Kruse
New Mexico Environment Department
Hazardous and Radioactive Materials Bureau
525 Camino de los Marquez
Santa Fe, New Mexico 87502

Dear Ms. Kruse:

At our meeting in Santa Fe on May 12 to discuss the closure plan for two surface impoundments at the Los Alamos National Laboratory, I said I would send you copies of Appendix H, Appendix J, and Appendix K of this Laboratory's Installation Work Plan for Environmental Restoration. Those three appendices are enclosed. Appendix J is the text from the November, 1993, submittal to the Environmental Protection Agency, Region 6. That Agency sent a Notice of Deficiency in January that resulted in changes to Appendix H and Appendix K. The revised versions of those two appendices are enclosed. Please note that we have received no information from Region 6 concerning our March 1 response to the Notice of Deficiency. Therefore, we do not know if this material is to be considered final.

I am enclosing as well this Laboratory's response to the Notice of Deficiency. The discussions in this document amplify the Laboratory's positions concerning some aspects of risk assessment. These might be of interest to you.

Please let me know if there is additional information you would like me to send.

Sincerely,

Edward Norris

Edward Norris

EN/sg

Enclosures: a/s

Cy: (w/o enc.)
T. Baca, EM, MS J591
J. Shipley, EM, MS J591
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PA P. Aamodt, EM/ER, MS M992
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■ APPENDIX K

Human Health Risk Assessment Methodology

1.0 INTRODUCTION

The purpose of this appendix is to present the fundamental risk assessment methodology to be used to evaluate potential risks to human health associated with exposure to contaminants at, or released from, potential release sites (PRSs) at Los Alamos National Laboratory (the Laboratory). This methodology has been developed to establish the scope of the baseline risk assessment as an integral part of the Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) process and to establish a consistent risk assessment approach to be applied at all operable units (OUs).

Risk-based decisions are used to support an RFI decision that no further action (NFA) is needed or to provide a point of comparison relative to which the benefits of a proposed corrective action can be evaluated. Risk assessments address both long-term and near-term risks. Long-term risk assessments evaluate the fate and transport of contaminants far into the future. Near-term risk assessments focus on the current human health impacts of contaminants on both the public and workers.

The major elements of the risk assessment process addressed in this appendix are

- developing a set of chemical and radiological data for risk assessments. Contaminants of concern are identified by means of the screening process described in Appendix J. Once contaminants of concern have been identified, a set of chemical data for use in the risk assessment is developed.

- exposure assessment. The exposure assessment process identifies appropriate land use scenarios, receptors, contaminant transport pathways, exposure pathways, and intake parameters so that concentrations of contaminants in environmental media can be converted to chemical intake and radiological dose levels for human receptors.

- toxicity assessment. The toxicity assessment identifies significant toxic effects and endpoints so that appropriate toxicity values may be selected to quantify potential toxic effects.

- risk characterization. The final step of the process integrates the results of the exposure assessment and toxicity assessment so that the investigator can estimate excess cancer risks and noncarcinogenic toxicological impacts.

Each of the components of the risk assessment, as it will be applied at the Laboratory, is described in detail in the following sections.

2.0 DEVELOPING A SET OF CHEMICAL AND RADIOLOGICAL DATA AND INFORMATION FOR USE IN THE RISK ASSESSMENT PROCESS

Evaluation of environmental data at the Laboratory begins with the screening assessment process, which involves comparing measured concentrations of potential contaminants of concern with screening action levels (SALs) and/or with background concentrations when background concentrations are below SALs. SALs are media-specific concentration levels for potential contaminants that are derived using conservative risk-based criteria. SALs for nonradiological contaminants are based on the methodology presented in proposed Subpart S of 40 CFR 264 (EPA 1990, 0432) to calculate action levels. Radiological SALs are based on a 10-mrem/yr dose using a residential exposure scenario. Environmental sampling and analysis during the screening assessment process are designed to determine whether potential contaminants of concern are present at concentrations above SALs or background concentration distributions. For the purposes of performing risk assessment at the Laboratory, any contaminant present above a SAL or background distribution, when background is higher than SALs, is considered a contaminant of concern. A site with contaminants of concern requires further investigation. A detailed description of the screening assessment process and the derivation of SALs is presented in Appendix J.

Environmental data from screening assessments or more detailed environmental investigations conducted during the RFI process at the Laboratory are used as input to risk assessments.

A set of site-specific chemical and radiological data that has undergone extensive quality assurance evaluations for use in risk assessment is critical to the success of evaluating the potential impacts on human health. Approaches to data evaluation are documented in Appendix H of this Installation Work Plan (IWP). The Environmental Restoration (ER) Program will follow Environmental Protection Agency (EPA) guidance (1989, 0305) to focus the data set that will be carried through each step of the risk assessment.

3.0 EXPOSURE ASSESSMENT

3.1 Introduction

Exposure assessment requires the framework of a conceptual site model, which identifies contaminant sources, potential current and future receptors, and exposure pathways that link the sources and receptors. Conceptual site models are used to examine the completeness of potential human exposure pathways. Any exposure pathway considered in quantitative human health risk assessment must have each element present, i.e., a contaminant source and mechanism for release, a potential for human contact with the exposure medium, and a route of human exposure from that medium.

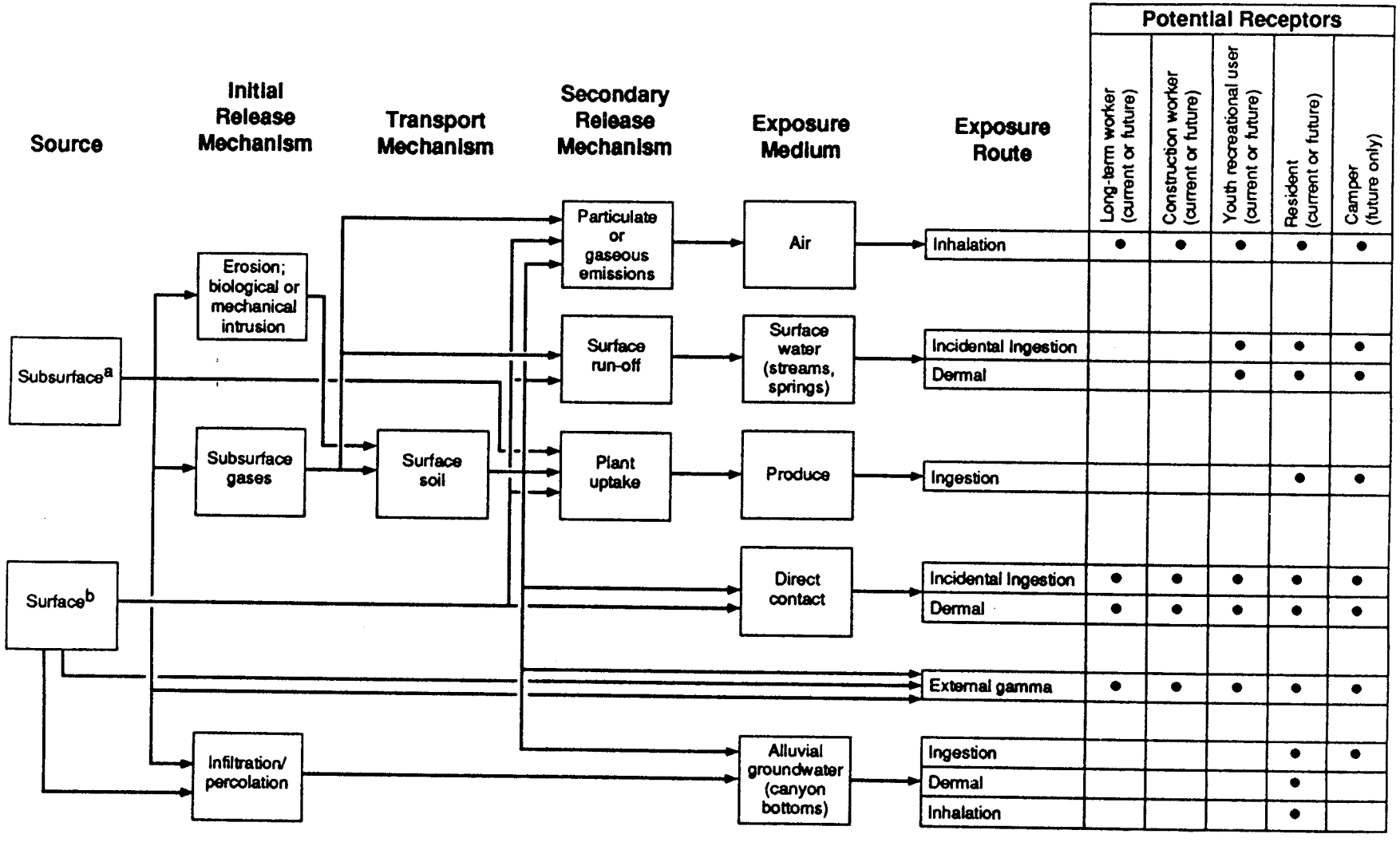
At the Laboratory, contaminants were originally deposited in either surface or subsurface soils, as shown in the conceptual site model (Figure K-1) and Table K-1. Through release mechanism pathways, contaminants were or could have been distributed in potentially contaminated media of concern, which include soil,

air, edible plants, and water (Section 3.2.2). Receptors are exposed through contact with a contaminated medium by means of exposure routes (i.e., ingestion, inhalation, dermal contact). Land use and receptor-specific characteristics must be considered when identifying significant exposure routes for quantitative dose estimates. Section 3.2.3 identifies the most likely receptors for evaluation in ER Program risk assessments. This conceptual framework for the receptors is used to identify appropriate receptor-specific exposure routes (Section 3.2.4) for evaluation using quantitative risk assessment; these routes are indicated by bullets in Figure K-1.

Baseline risk assessments are conducted during the RFI to evaluate the potential threat to human health that a site may pose in the absence of any remedial action. Baseline risk assessments are risk assessments used to evaluate corrective actions that are conducted during the corrective measures study (CMS) or voluntary corrective action. In assessing exposure of current receptors, the investigator considers currently existing restrictions to areas of contamination (e.g., fencing, cover materials). Under the EPA's risk assessment guidance for evaluating potential future receptors, the investigator must assume that current access restrictions, such as fencing, are no longer in place and that disturbance of subsurface contamination may occur (EPA 1989, 0305). The ER Program generally applies this EPA guidance in developing risk assessment methodology.

PRSs at the Laboratory consist of the solid waste management units (areas in which solid wastes have been routinely and systematically released, including chemically contaminated wastes) identified in Module VIII of the Laboratory's permit to operate under RCRA [the Hazardous and Solid Waste Amendments (HSWA) Module] and other areas of concern (sites that potentially contain hazardous substances, such as radionuclides, but no hazardous constituents defined by RCRA) designated by the Laboratory's ER Program. For risk assessment, PRSs have been grouped in two categories: those located inside the Laboratory's current boundaries (Laboratory PRSs) and those located outside of the Laboratory's present boundaries (extra-Laboratory PRSs). The scope of this appendix is limited to exposures occurring within a given PRS or OU for both Laboratory and extra-Laboratory PRSs. If Phase I and/or Phase II data from RFIs indicate contaminant migration past OU or Laboratory boundaries, additional methods for evaluating effects upon distant receptors will be developed.

Each of the elements of the conceptual site model for the Laboratory is discussed in detail in this section, and detailed information is provided on estimating chemical intake and radiological dose for receptors likely to incur the "reasonable maximum exposure (RME)" (EPA 1989, 0305) to site contaminants under both current and future exposure conditions. In general, these receptors are those persons who potentially spend the most time near an area of contamination; in some instances, the receptor is selected because of substantial physical contact with a contaminated medium (e.g., construction workers). Schematic representations of the conceptual site model for Laboratory and extra-Laboratory PRSs are presented in Figure K-1.



a. Examples of subsurface sources include landfills (buried wastes and structures), MDAs, underground storarge tanks, dry wells, and septic systems.

b. Examples of surface sources include firing site and drop tower experiments, surface disposal and burn areas, outfalls, cooling tower releases, buildings, spills, and overflows.

KEY: ● identifies exposure routes for evaluation using quantitative risk assessment

Figure K-3.1. Conceptual site model for LANL PRSs.

TABLE K-1

SUMMARY OF CONCEPTUAL MODEL ELEMENTS

PATHWAYS/MECHANISM	CONCEPT/HYPOTHESES
HISTORICAL SOURCES	• Operations/processes that contributed to the creation of the PRS (i.e., storage area, etc.).
INITIAL RELEASE MECHANISM	• Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, leaching, dumping, or disposing into the environment.
TRANSPORT MECHANISMS	
Atmospheric Dispersion	• Entrainment is limited to chemicals in surface soils.
Particulate Dispersion	• Entrainment and deposition are controlled by soil properties, surface roughness, vegetative cover, and terrain, as well as atmospheric conditions.
Volatilization	• Volatilization of volatile organic compounds occurs in surface soils, subsurface soils, and surface water.
Surface Water Runoff and Sediment Transport	• Surface water run-off is directed by natural topographic features or manmade diversions and flows toward the canyons. A topographic low can cause the water to pond on the mesa top; however, in most cases, the water flows into the canyon. • Chemical transport by surface run-off can occur in solution, sorbed to suspended sediments, or as the result of mass movement of heavier bed sediments. • Surface run-off may carry chemicals beyond the OU boundary. • Contaminated surface run-off may infiltrate the canyon-bottom alluvium.
Sediments	• Surface soil erosion and sediment transport are functions of run-off intensity and soil properties. • Chemicals dispersed on the soil surface can be collected by surface water run-off and concentrated in sedimentation areas in drainages. • Erosion of drainage channels can extend the area of contaminant dispersal in the drainage.
Alluvial Aquifers	• Surface run-off discharged to the canyons may infiltrate into sediments of channel alluvium.
Infiltration	• Infiltration into surface soils depends on the rate of precipitation or snowmelt, prior soil water status, depth of soil, and hydraulic properties of the soil. • Infiltration into the tuff depends on the unsaturated flow properties of the tuff. • Joints and fractures in the tuff may provide additional pathways for infiltration to enter the subsurface regime.
SECONDARY RELEASE MECHANISM	
Leaching	• Storm water/snowmelt can dissolve chemicals from soil or other solid media, making them available for leaching. • Water solubility of chemicals and their relative affinity for soil or other solid media affect the ability of leaching to cause a release. • Leaching and subsequent resorption can extend the area of contamination.
Soil Erosion	• The erosion of surface soils is dependent on soil properties, vegetative cover, slope and aspect, exposure to the force of the wind, and precipitation intensity and frequency. • Depositional areas, as well as erosional areas exist, and erosive loss of soil may not occur in all locations. • Storm water run-off can mobilize soils/sediments, making them available for contact. • Storm intensity/frequency, physical properties of soils, topography, and ground cover determine the effectiveness of erosion as a release mechanism. • Erosion may also enlarge the contaminated area.

TABLE K-1 (continued)

PATHWAYS/MECHANISM	CONCEPT/HYPOTHESES
SECONDARY RELEASE MECHANISM (continued)	
Mass Wasting	• The loss of rock from the canyon walls is a discontinuous, observable process. • The rate of the process is extremely slow.
Resuspension (wind suspension)	• Wind suspension of contaminated soil/sediment as dust makes chemicals available for contact via inhalation/ingestion. • Physical properties of soil (e.g., silt content, moisture content), wind speed, and size of exposed ground surface determine effectiveness of wind suspension as a release mechanism. • Wind suspension can enlarge the area of contamination and create additional exposure pathways, such as deposition on plants followed by plant consumption by humans/animals.
Excavation	• Manual or mechanical movement of contaminated soil during construction, remediation, or other activities makes contaminated soil available for dermal contact, ingestion, and inhalation as dust. • The method of excavation (i.e., type of equipment), physical properties of soil, weather conditions, and magnitude of excavation activity (i.e., depth and total area of excavation) influence the effectiveness of excavation as a release mechanism. • Excavation can increase or decrease the size of the contaminated area, depending on how the excavated material is handled.
EXPOSURE ROUTE	
Inhalation	• Vapors, aerosols, and particles (including dust) can be inhaled and absorbed by the lungs and mucous membranes. • Physical and chemical properties of airborne chemicals influence the degree of retention in the body after being inhaled.
Ingestion	• Ingestion of soil, water, food, and dust can lead to chemical intake via absorption in the gastrointestinal tract.
Direct Contact	• Some hazardous chemical constituents absorb through the skin when in contact with contaminated surfaces of soil, tuff, or rubble. • Physical and chemical properties of chemicals influence the degree of dermal absorption. • Factors such as skin moisture and temperature affect the degree of dermal absorption.
External Penetrating Radiation	• External, or whole body radiation, can occur through exposure to gamma-ray-emitting radionuclides that may be present in soil either directly through the soil or re-entrained dusts. • Exposure to penetrating radiation can also occur through inhalation or ingestion when radionuclide-contaminated soil or tuff surfaces erode and/or dusts become re-entrained.

3.2 Exposure Scenarios

3.2.1 Sources of Contamination

Potential sources of environmental contamination at the Laboratory are leaking tanks and other subsurface structures, spills, surface disposal, etc. Contaminants released during past operations could be transported from the medium in which a spill occurred to other media (e.g., surface soil contaminated by an operational release could provide a source of contamination for sediments in drainages). In some cases, the source itself may be the exposure point. Information is being gathered during the RFIs to identify possible sources of contamination and release mechanisms for each PRS at the Laboratory.

The original release sources at the Laboratory include but are not limited to

- subsurface sources: buried wastes [landfills, materials disposal areas (MDAs)], septic systems (tanks and drainlines), sanitary waste treatment facilities, sumps, underground storage tanks, and storm sewers.

- surface sources: firing-site experiments (including firing pads and chambers), blowdown from cooling towers, surface disposal units (e.g., burn areas), drop tower experiments, spills, storage areas, buildings, outfalls, debris, and fallout from stack emissions.

Many of the constituents found in the environment are naturally occurring (e.g., metals and polycyclic aromatic hydrocarbons); however, past Laboratory operations may have contributed to the release of several classes of compounds at levels that exceed background levels. The following paragraphs describe sources that may have contributed to environmental contamination.

Many types of volatile organic compounds (VOCs) have been used in Laboratory experiments and maintenance operations. Nonhalogenated VOCs were used as solvents and scintillation cocktails (e.g., acetone, toluene, and benzene) and may have been present in paints, paint thinners, and fuels. Halogenated VOCs were also used as solvents and degreasing agents (e.g., 1,1,1-trichloroethane and trichloroethene) and may have been present in research chemicals. These types of compounds may be found in buried waste, sumps, drainlines, underground storage tanks, septic systems, sanitary waste treatment facilities, spills, storage areas, buildings, and outfalls.

Semivolatile organic compounds (SVOCs) include a variety of chemical groups [e.g., polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), pesticides, herbicides, and others that may have been used in research applications]. Because PCBs have been used widely as coolants and lubricants in transformers, capacitors, and other electrical equipment, it is expected that transformers, MDAs, storage areas, and landfills contain PCBs. PAHs are typically generated as products of incomplete combustion or detonation of fuels and/or fuel oil. Thus, PAHs are most likely to be found in buried wastes, firing sites, burn areas, drop tower experiments, waste oils, spills, storage areas, buildings, outfalls, and debris. Sources of possible pesticide and herbicide contamination include maintenance and chemical storage areas and any surface soil at locations where pesticides and/or herbicides were used regularly to control pests and

vegetation. Other SVOCs may be found at source areas such as buried waste sites, sumps, drainlines, spills, storage areas, buildings, outfalls, and debris.

Metals and related compounds were used for a variety of purposes in past Laboratory operations, and their presence is likely to be confirmed at many source areas. Metals are typically associated with plating activities (chromium and nickel), blowdown from cooling towers (chromates and molybdenates), photoprocessing operations (silver and cyanide), machining operations, electroprocessing operations (nickel, lead, silver), and activities associated with machining, testing, and disposing of explosives (beryllium and lead).

Some PRSs may contain high explosives (HE) used in formulations (e.g., TNT, RDX and HMX), their environmental degradation products (e.g., DNT and TNB), impurities of commercial HE, inert components (e.g., cyanuric acid), residual HE, and binders (e.g., nitrocellulose). Several types of explosives and their degradation products may be present in the soils and/or sediments at sites where explosives were or are currently processed, assembled, machined, stored, tested, or disposed. PRSs that contain sites of past HE activities are likely to include buried waste, sumps, drainlines, firing sites, surface disposal units, drop tower experiments, storage areas, burn areas, buildings, outfalls, and debris.

Radionuclides have been used in a variety of Laboratory studies and operations, including medical research (iodine, tritium); animal studies (lanthanum, ^{90}Sr, cobalt, cesium); reaction (iodine, tritium); detonation of test assemblies (^{140}La, depleted uranium); radiographic facilities for examination of HE charges (radium, ^{90}Sr, cobalt); weapons research and testing (plutonium, uranium, americium, tritium); and other research (fission and activation products). Sources that contain radionuclides are widespread across the Laboratory; these sources include septic tanks, dry wells, drainlines and drain fields, outfalls, storage areas, surface disposal areas, MDAs, landfills, stack emissions, and firing sites.

3.2.2 Exposure Pathways

Exposure pathways describe the courses that contamination takes from its source to a receptor. Exposure pathway analysis at the Laboratory links sources, locations, and types of environmental releases with locations and activity patterns of receptors to determine the significant pathways of exposure (Figure K-1). Exposure generally involves three elements: (1) a source and mechanism for contaminant release, (2) a pathway consisting of a retention or transport medium and a location of potential human contact with the contaminated medium (often referred to as the exposure point), and (3) a receptor who may receive a dose of a contaminant via ingestion, inhalation, or dermal contact at the exposure point. A medium contaminated as a result of a past release can be a contaminant source for other media, e.g., soil contamination can be a source for groundwater or surface water contamination. In some cases, the source itself is the exposure point, without any release to other media.

3.2.2.1 Contaminant Release Scenarios

Possible release mechanisms and potentially impacted environmental media are described in Table K-1. Under current conditions, the release mechanisms considered most likely to lead to human exposures to contaminants from PRSs are (1) dispersion of airborne particulates or gases from contaminated soil into the air, (2) surface water run-off, which would redistribute soil contaminants into

drainage pathways, (3) release of external gamma radiation, (4) generation of radon gas from a few PRSs that contain high concentrations of radon-generating contaminants (i.e., radium and thorium), and (5) volatilization for a few PRSs that contain high concentrations of tritium or volatile organic compounds.

The potential for contaminants to migrate from surface and subsurface soil areas to the main aquifer is considered low because of the nature of the tuff underlying the Laboratory, the high rate of evapotranspiration relative to precipitation in northern New Mexico, and the great depth to the main aquifer (600 ft or more). However, the Laboratory is continuing to investigate the possibility of more rapid contaminant transport along fractures in the tuff and the extent of perched groundwater. Alluvial aquifers in some canyon bottoms contain significant quantities of contaminants, but these aquifers do not appear to provide enough water to support domestic or recreational use. When groundwater may be a reasonable source of human exposure, ER Program risk assessments evaluate potential exposure to perched and alluvial groundwater on a PRS-specific basis.

3.2.2.2 Contaminant Fate and Transport

A variety of site-specific and chemical-specific factors influence the fate and transport of environmental contaminants at the Laboratory. Once a contaminant has been released to the receiving medium, it may be

- transported (e.g., carried downstream in water or transported through air),
- physically transformed (e.g., by volatilization),
- chemically transformed (e.g., by hydrolysis or oxidation),
- biologically transformed (e.g., by biodegradation), and/or
- accumulated in one or more medium, including the receiving medium.

To determine the fate of contaminants at a particular PRS, information on the contaminants' physical and chemical properties is required. Representative physical and chemical properties of contaminants of concern at the Laboratory include K_{OC} (the organic-carbon-partitioning coefficient), K_{OW} (the octanol/water-partitioning coefficient), Henry's Law Constant, solubility, vapor pressure, bioconcentration factor, and medium-specific half-life. Site-specific characteristics that may influence fate and transport must also be considered. Examples of site-specific characteristics include soil properties, such as moisture content, organic content, grain size, and cation exchange capacity.

In performing risk assessments, the ER Program uses applicable chemical and site-specific information to evaluate transport within and between media and retention or accumulation within a single medium. Data from environmental sampling will be used to identify media that are contaminated now. Fate and transport modeling may be required to identify media that may be contaminated now (for media not sampled) or in the future.

3.2.3 Characterization of Potentially Exposed Populations

3.2.3.1 Demographic Data

Los Alamos County includes the two residential areas that border the Laboratory—the towns of Los Alamos and White Rock. The Los Alamos townsite, at the northern border of the Laboratory, had an estimated population of 12,000 in 1990; the town of White Rock immediately to the east of the main Laboratory site had an estimated population of 7,200 in 1990. The percent of the Los Alamos County population under age 18 is approximately 26%; about 9% of the population is 65 years of age or older (Environmental Protection Group 1990, 0497).

Large tracts of land to the south, southeast, and west of the Laboratory are managed by the National Park Service (Bandelier National Monument) and the Forest Service (Santa Fe National Forest). Bandelier National Monument is used exclusively for recreation (e.g., hiking and camping), whereas, on Santa Fe National Forest lands, grazing, logging, and other uses, in addition to recreational use, are allowed. The Rio Grande forms the southeastern boundary of the Laboratory; the land on the opposite bank belongs to the Santa Fe National Forest. The San Ildefonso Pueblo borders the Laboratory to the northeast.

3.2.3.2 Land Use

Ideally, estimation of risks to human health and the environment at the Laboratory will be based on reasonable and site-specific land use and exposure assumptions that reflect stakeholder input. However, until this input has been provided and incorporated, current and future land use at all OUs is assumed be residential.

An approach that will be proposed to stakeholders involves a number of scenarios for two categories of PRS: those located inside and those located outside Laboratory boundaries; therefore, these two categories are discussed separately. The land use scenarios discussed in this appendix are generalized scenarios that are likely to apply to many of the OUs under evaluation. However, OU-specific differences in current and potential future land uses should be considered in individual risk assessments. This OU-specific information should be used to identify appropriate receptors for evaluation.

3.2.3.2.1 Current Land Use Scenarios

3.2.3.2.1.1 Extra-Laboratory OUs

Three OUs—1071, 1078, and 1079—address areas located outside current boundaries of the Laboratory. Two of the extra-Laboratory PRSs are located in the town of Los Alamos; the third contains many sites located on canyon sides or in canyon bottom areas to the north, south, and east of the town. Some PRSs comprising these OUs are still managed and used by the Laboratory; others are considered to have been remediated by past decontamination and decommissioning (D&D) projects and have been released for unrestricted use. Changes in regulatory standards and guidance since past remediation activities have led to listing some of the released areas as solid waste management units in the HSWA Module. Current land use categories for extra-Laboratory PRSs can be classified as (1) commercial/industrial, (2) recreational, and (3) residential.

3.2.3.2.1.2 Laboratory OUs

The most prevalent current land use for OUs and PRSs located within the Laboratory's current boundaries is Laboratory operations, which encompasses potential exposure of employees. Risk assessments for these OUs will evaluate exposure of current employees to residual contaminants from past operations using data collected under the ER Program. Risks from current operations (i.e., occupational exposures) are monitored by the operator groups and are not included in ER Program risk assessments.

Large portions of Laboratory property are currently undeveloped. Many of these properties are located in canyons; a few are located on mesa tops. Much of the undeveloped land controlled by the Laboratory is used as a buffer zone to provide security for Laboratory facilities and as a reserve for future construction (Chapter 2). The public is allowed limited access to some Laboratory areas (e.g., parts of Ancho, Mortandad, and Pueblo canyons, and an archaeological site near the White Rock Y).

Some of the currently undeveloped areas of the Laboratory were used for operations or waste disposal in the past, and contaminants may have migrated to other areas (e.g., surface run-off may have carried contaminants into canyons). Current use of undeveloped areas is limited to occasional recreational use (e.g., hiking or biking) by Laboratory employees, the public (for the few areas listed above), and trespassers.

3.2.3.2.2 Future Land Use Scenarios

3.2.3.2.2.1 Extra-Laboratory OUs

Future land use for most extra-Laboratory PRSs (including canyon bottom areas) is presumed to be residential because this use is generally the most restrictive. Physical restrictions for some extra-Laboratory areas preclude residential use (e.g., steep canyon sides, narrow bottoms); an appropriate future land use assumption for those areas is likely to be recreational.

3.2.3.2.2.2 Laboratory OUs

Future land use assumptions for OUs located on Laboratory property include (1) continued Laboratory operations and (2) recreational use (hiking, biking, and camping). Future residential land use for most Laboratory OUs is implausible because they are likely to be managed by DOE over the long term. Proposed RCRA Subpart S supports the use of plausible assumptions on future patterns of use, assuming that institutional controls such as deed restrictions are used as necessary to guide those future uses (EPA 1990, 0432). Most Laboratory land would involve a transfer of ownership to the neighboring National Park Service or National Forest Service, whose functions include managing recreational lands. Generally, future recreational land use is the most appropriate assumption for those canyon bottom areas unlikely to be used for Laboratory operations. For mesa tops, continued Laboratory operations is generally the appropriate future land use assumption.

Notwithstanding the general assumption that future residential use of Laboratory OUs is implausible, it is acknowledged that limited areas released for recreational use might actually be used for residential purposes such as ranger housing. The

Laboratory may need to re-evaluate these limited areas at the time a change in land use is proposed, using assumptions for a residential exposure scenario.

3.2.3.3 Potential Receptors

The appropriate current and future receptors likely to come into contact with contaminated media are being assessed (Figure K-1). The characteristics of these generalized receptors are summarized below. Receptor-specific assumptions may need to be modified, or additional alternate receptors may be needed based on OU-specific data; however, it is expected that the generalized receptor scenarios discussed below will be applicable for most ER Program risk assessments.

3.2.3.3.1 Receptors under Current Land Use Scenarios

Currently, the receptors that may be evaluated in risk assessments are long-term workers, construction workers, youth (i.e., age 10-18) recreational users, and residents. Only current residents of extra-Laboratory PRSs will be evaluated. The worker scenarios are appropriate for any properties currently used for commercial/industrial activities (e.g., commercial areas in extra-Laboratory OUs) or for continued Laboratory operations (Laboratory OUs). Exposure parameters for long-term workers should generally reflect the RME conditions, which include periods of outdoor work (discussed further in Section 3.4.2.1). PRS-specific data are used to determine whether a construction worker scenario, which evaluates subsurface contamination, should be assessed.

The youth recreational scenario is used to evaluate current use of canyonside and bottom areas at extra-Laboratory sites and for trespassing on Laboratory-controlled PRSs. This receptor is assumed to hike or bike frequently in the area encompassing a given PRS.

It is assumed that long-term institutional controls are imposed on the MDAs at the Laboratory to prevent contact with subsurface contamination. These areas have been or are currently used for subsurface disposal of radioactive and nonradioactive waste, and it can be assumed that these areas would present a significant risk if excavation were to occur. For these MDAs, current exposures will be determined for workers, and long-term risks will consider workers and the potential for migration of contaminants to an offsite receptor.

3.2.3.3.2 Receptors under Future Land Use Scenarios

For most extra-Laboratory OUs, the future receptor evaluated will be a resident, regardless of current land use. In a limited number of extra-Laboratory areas (e.g., canyon sides) in which physical restrictions preclude residential use, a youth recreational user will be assessed.

For both mesa top and canyon bottom OUs whose past, current, or likely future use is Laboratory operations, the RME receptor is likely to be the long-term worker or the construction worker, both of which will be assessed as current receptors. However, the receptor most often assumed for canyon bottoms on Laboratory land will be a future camper (because most canyon bottom areas have not been used for Laboratory operations).

In general, it is not expected that canyonside areas will have subsurface

contamination (i.e., greater than 2 ft in depth). Because of erosion, the soil in these areas generally does not extend to depths of greater than 2 ft. Accordingly, no current or future exposure to subsurface contamination on canyon sides needs to be considered. Also, the most plausible land use identified for canyonside areas is recreational use, which does not involve exposure to subsurface contamination. Therefore, the receptor evaluated for both current and future land use of canyonside areas will be the recreational youth user (i.e., hiker or biker). Exceptions can be addressed in PRS-specific risk assessments, as necessary.

To facilitate evaluation of changed land use (particularly loss of institutional control) and to account for possible redistribution of subsurface contaminants to the surface, future receptors may be evaluated by assuming exposure to subsurface contamination that has been redistributed to the soil surface. Use of subsurface contamination levels estimates the RME for future receptors when subsurface contamination levels are higher than those at the surface. Appropriate use of surface or subsurface contaminant levels to assess future receptors will need to be determined on a PRS-specific basis.

3.2.3.3.3 Application of Current and Future Scenarios in Risk Assessments

In some instances, it may be sufficient to evaluate only one receptor for a given PRS; this receptor represents the maximally exposed individual under both current and future conditions. An example would be a PRS currently used residentially and at which no subsurface contamination exists. Conversely, depending on PRS-specific contaminants of concern, depths of contamination, and other factors, it may be necessary to evaluate up to three receptors for a single PRS. An example is an operating Laboratory PRS at which both surface and subsurface contamination are present and at which subsurface contamination levels are higher than surface levels. For this example, a "current" long-term worker is assessed for the current exposure scenario (using surface contamination data), a construction worker is used to assess possible current exposure to subsurface contamination if excavation should take place, and a "future" long-term worker, who is assumed to be exposed to former subsurface contaminants that have been redistributed to the surface, is assessed for the future land use scenario.

The risk associated with contamination of environmental media depends on the actual dose to receptors engaged in the activities that occur in the selected land use scenario. This dose is proportional both to the temporal frequency and duration of exposure and to the contaminant concentration over a spatial exposure unit within which these activities take place. For example, under the camping scenario, exposure may occur annually over several years for a period of 2 to 4 weeks each year (the exposure frequency and duration), during which time the receptor can be expected to roam over an area of one-half to several acres (the exposure unit). Exposure units for the land use scenarios used by the ER Program are defined below in Section 3.3.2.

3.2.4 Summary of Receptor-Specific Exposure Routes

Exposure routes evaluated for all potential receptors are inhalation of particulate and/or gaseous emissions from soils or structural surfaces, direct contact with soil or dust from structural surfaces (ingestion and dermal contact), and external

gamma irradiation from soils or structural surfaces (Figure K-1).

Potential contact with perennial surface water in canyon streams is most likely for the future camper and the youth recreational user. Contact with perennial surface waters may also be an exposure route for future residential scenarios in a limited number of extra-Laboratory canyon bottom PRSs. Dermal uptake from surface water and incidental ingestion of surface water while wading are appropriate exposure routes for quantitative assessment. Inhalation does not need to be assessed because volatile contaminants are present in surface waters for only short periods before being dissipated to the air. The appropriateness of the surface water pathway should be determined on a PRS-specific basis; surface water may not be present in quantities large enough to warrant evaluation of this pathway. For most PRSs, it is unlikely that worker contact with surface water will be a significant exposure route because infiltration occurs rapidly after storm events and areas of Laboratory operations are distant from perennial canyon streams.

The need for assessment of exposure to temporary standing water after storm events will be assessed on a PRS-specific basis. However, surface water pools created by storm events are generally present only for short periods (e.g., about 2 h) before infiltration occurs, and storm events capable of generating these pools occur approximately 3 to 11 times per year. Therefore, potential for contact with this standing water is limited.

If field investigations reveal the presence of measurable gaseous emissions directly to air (i.e., via subsurface vapor migration from MDAs), exposure to these emissions will be evaluated. Based on OU data available to date, the location of emissions is assumed to be distant from work and residential areas, which indicate that the receptor evaluated will be the youth recreational user or the future camper; inhalation will be the exposure route assessed.

The ingestion exposure route may be evaluated for current and future residents who ingest homegrown produce and possibly for future campers who ingest wild edible plants (e.g., berries and nuts). PRS-specific information is needed to determine whether quantitative assessment of this pathway is appropriate. For example, extra-Laboratory PRSs currently used for residences may have a concrete cover over the contaminated area, ruling out gardening. In this instance, evaluation of ingestion for the current resident would not be appropriate, although the pathway would be evaluated for a future resident to address the possibility that the concrete cover is removed. Similarly, ingestion of wild foods by future campers should be assessed only if edible species are identified in the vicinity of the PRS.

Although ingestion of game animals such as elk is a possible current or future exposure route, the large territory over which these animals graze in semiarid climates makes the probability of significant uptake of contaminants from a single PRS small. Similarly, although grazing livestock on Laboratory lands may be allowed in the future, these animals would not be expected to have significant uptake of contaminants from any single PRS. Because the overall uptake from multiple PRSs may result in significant bioaccumulation of contaminants in game animals, the risks from ingestion of contaminated meat may be evaluated on a Laboratory-wide basis. Therefore, evaluation of the game and/or livestock ingestion pathway is outside the scope of an OU-specific risk assessment. Similarly, although contaminants from the Laboratory may have reached the Rio

Grande River via canyon streams, the potential for contaminant intake as the result of ingesting fish will be evaluated (if needed) on a Laboratory-wide basis.

For Laboratory OUs with associated alluvial aquifers in canyon bottoms, it is hypothesized that a well is drilled in the future to support recreational use of the areas. It is assumed that water supply to these wells is adequate to provide drinking water for future campers but not to provide bathing facilities. Therefore, ingestion is the only significant exposure pathway associated with groundwater to be evaluated for future campers. For extra-Laboratory OUs, there is a possibility that canyon bottoms will be used residentially and that a domestic well will be drilled to access alluvial groundwater, although this source may be limited. If necessary, ingestion of and dermal contact with contaminants in alluvial groundwater may be assumed for future residents in extra-Laboratory canyon bottom OUs (only when contaminants of concern have been identified in alluvial groundwater). Volatile contaminants are not likely to be present in alluvial groundwater because the most likely mechanism of contamination, run-off from contaminated surface soil, results in volatilization. However, should any volatiles be identified, inhalation of these contaminants during household use (e.g., showering) should be evaluated.

3.3 Estimation of Exposure Concentrations

The media-specific concentration of a contaminant at the location of exposure (i.e., the exposure concentration) must be estimated in order to evaluate the amount of human exposure that might be associated with a contaminant source. This section provides guidelines for estimating exposure concentrations for all contaminants of concern in soil, air, produce, on structural surfaces, and in surface water and alluvial aquifers.

Exposure concentrations can be estimated directly by using media-specific environmental sampling and analysis data or by using a combination of sampling data and environmental fate and transport calculations and models. For most risk assessments performed under the ER Program, some combination of sampling data and fate and transport modeling will be required to estimate exposure concentrations.

3.3.1 Methods

3.3.1.1 Use of Sampling Data

Insofar as possible, sampling data will be used to directly estimate exposure concentrations for ER Program risk assessments. Direct use of sampling data is particularly applicable when exposure involves direct contact with the environmental medium of concern (e.g., direct contact with contaminated soils) and in cases where monitoring has occurred directly at an exposure point (e.g., a drinking water well). For these example exposure scenarios, sampling data provide the best estimate of current exposure concentrations.

In some instances, it may not be appropriate to use sampling data directly to estimate exposure concentrations, and some form of environmental fate and transport calculations or computer modeling applications will be required. Instances in which fate and transport calculations or modeling may be required include the following:

- Fate and transport calculations for contaminants will be required when exposure points are remote from contaminant sources and when release mechanisms exist to transport contaminants to an exposure point (e.g., transport of contaminants in groundwater to a receptor).

- Modeling will be required when temporal distribution of contaminants is needed and monitoring data are lacking. Typically, environmental sampling data give an indication of current conditions. Although there are situations in which it is reasonable to assume that contaminant concentrations will remain constant over time, in many cases, the time span over which data are taken during one-time sampling are not adequate to predict future exposure concentrations.

- When direct measurements of contaminant concentrations in air are unavailable, fate and transport modeling will be needed to determine air concentrations based on contaminated soil concentrations.

The level of effort required to estimate exposure concentrations depends on the type and quantity of data available, the level of detail required in the assessment, and the expected level of risk to human health and the environment. In general, estimating exposure concentrations involves analyzing direct sampling data and applying simple environmental fate and transport calculations. Section 3.3.2 describes simple methods for estimating exposure concentrations for the exposure routes of inhalation of particulates and gas, ingestion of contaminated plants, and external gamma radiation, on the basis of concentrations of contaminants in surface and subsurface soil.

More sophisticated modeling approaches than those presented there may be required, based on PRS-specific needs. For those efforts requiring a complicated modeling approach, a wide variety of EPA-approved contaminant fate and transport models is available for use in exposure assessments. Contaminant fate and transport models are applied in ER Program risk assessments on a PRS-specific basis. The procedure for complicated contaminant fate and transport modeling includes

- identifying and bounding the modeling problem and approach,

- selecting qualified experts to identify the appropriate models to be applied (this step may also include developing models to account for unique conditions at the Laboratory), and

- communicating with regulatory agencies to obtain approval of the modeling approach before conducting the modeling exercise.

The data quality objectives (DQO) process applied to the design of sampling plans during the phases of the RFI will result in the collection of environmental data appropriate for use in the risk assessment, whether direct or indirect modeling approaches are required.

3.3.1.2 Estimation of Reasonable Maximum Exposure (RME)

EPA (1989, 0305) suggests using an "upper 95% confidence limit on the arithmetic average concentration of contaminants at a site (or portion thereof)" as the appropriate statistic to represent the RME. In general, LANL will use the upper 95% confidence limit for the average concentration within an exposure unit as an initial point estimate of RME. Selection of statistical estimators for this average and for the corresponding 95% upper confidence limit depends on the statistical distribution of the observations. In Bayesian analyses, 95% upper confidence limits would be replaced by upper 95% probability bounds.

A recent Science Advisory Board review (EPA 1993, 1013) of the *Human Health Evaluation Manual* recommended that EPA move toward a distributional approach for calculating RMEs. This approach would require the development of distributions for the parameters that enter the calculation of individual exposures. These distributions, together with Monte Carlo simulation methods, would then be used to determine the distribution of exposure, and an appropriate quantile of the distribution (e.g., the 95th percentile) would be used as the RME. The ER Program at Los Alamos endorses this distributional approach to exposure and risk assessment, and distributions for environmental data and parameters used in calculating dose/intake should be developed. However, this represents a substantial investment of time and energy, and initially such distributions will be used primarily for quantitative uncertainty analysis.

3.3.1.3 Uncertainty in Exposure Concentration Estimates

Evaluating uncertainty is a very important component of the exposure assessment. EPA (1989, 0305) specifies that a qualitative discussion of uncertainty in the exposure analysis should include (1) a tabular presentation of the ranges of estimates of exposure concentrations and exposure parameters consistent with the data, the point values used in calculating the RME dose or intake, and a brief description of the rationale used in selecting the point value; and (2) a summary of major sources of uncertainty in the risk assessment that specifically addresses monitoring data, the models used to estimate exposure concentrations, and the point estimates selected for intake parameters.

In addition, particularly where a complex modeling approach to exposure estimation is required, quantitative assessments of the effect of uncertainty in all parameters, including both those estimated from site-specific data and those whose values are selected from other sources, is recommended. The Monte Carlo simulation method mentioned in the preceding section may indicate that the point estimates are in an extreme tail of the likely distribution of actual exposure concentrations. In this case a reevaluation of the selected point estimate may be required.

3.3.2 Exposure Concentrations for Various Exposure Pathways

3.3.2.1 Exposure Concentrations for Soil-Related Exposure Pathways

Soil data can be used to estimate exposure concentrations for the following pathways: incidental soil ingestion, dermal contact with soil, inhalation of particulates and gases, ingestion of contaminated plants, external gamma exposure, and inhalation of radon and its decay products. These pathways are

addressed in the following subsections. Using measured air or food concentrations, gamma exposure rates, and radon concentrations (when available) is preferable to the use of soil data for the following pathways: inhalation of particulates and gases, ingestion of contaminated produce, external gamma exposure, and inhalation of radon.

Under the Laboratory's ER Program, surface soil samples are generally considered to include any data obtained within the top 6 in. of soil, although some surface samples may be obtained from up to 2 ft of soil (EPA 1989, 0088). In assessing the risk from incidental soil ingestion, dermal contact, and particulate inhalation, it is preferable to use soil samples taken from shallow depths (2 in.) because receptors are most likely to be exposed to near-surface soils. However, in instances in which contaminant levels in the upper 2 ft of soil are homogeneous or in which levels in the 0.5- to 2-ft horizon exceed those in the 0- to 0.5-ft horizon, use of data from the lower horizon will provide equal or higher estimates of dose or intake. Use of data from the 0.5- to 2-ft horizon also takes into account possible limited soil intrusion by receptors. Therefore, use of data from the 0.5- to 2-ft horizon to derive surface exposure concentrations is acceptable and should be used as necessary on a PRS-specific basis.

For the purposes of ER Program risk assessments, subsurface soil is considered to extend to a depth of 12 ft (EPA 1989, 0088). This depth is assumed under RCRA guidance because 12 ft is considered the maximum depth to which a basement is excavated, and therefore direct exposure to contaminants in soils deeper than 12 ft does not need to be assessed. Contamination of soil or tuff found at depths of greater than 12 ft may be assessed by modeling potential for transport to groundwater. For many mesa tops in the vicinity of the Laboratory, consolidated tuff is reached at depths of less than 12 ft. It is also uncommon for house foundations to be placed in the tuff in the Los Alamos area . Therefore, the total depth used to derive direct subsurface exposure concentrations may be adjusted on a PRS-specific basis.

An exposure unit is defined as the surface area over which a given receptor is assumed to receive a daily average exposure. Ideally, when data are collected for risk assessment, sampling plans are designed so that the samples collected represent the area over which they will be averaged. The statistics used to describe the contaminant distribution (the RME) for the exposure unit of concern are used to calculate the dose to a receptor (e.g., current EPA guidance suggests using a 95% upper-confidence bound of the arithmetic average). For example, a resident could be assumed to be randomly exposed to an area of soil equal to the average size of a residential property [about 1
1989, 0305)].

Precedent for using the exposure unit concept is given in
guidance (EPA 1989, 0305). This EPA document state
which the [receptor] activity is expected to occur shoulc
averaging the monitoring data.... For example, averaging
the size of a residential backyard (e.g., 1/8 acre) may be
evaluating residential soil pathways."

Explanation for soil conc. averaging.

The land use scenario assumed for the PRS directly leads
area over which a receptor receives a daily exposure. Thu
assessments, each land use assumed (Section 3.2.2) has an associated exposure unit. Assumptions of appropriate exposure unit areas are made using

site-specific information on land use patterns and likely activities for receptors being evaluated (EPA 1989, 0305). For ER Program risk assessments, assumed exposure unit areas are needed for four receptors: current and future residents, long-term workers, construction workers, and current and future recreational users. Assumed exposure unit areas for these receptors are presented in Attachment I and are discussed below. In general, PRSs on extra-Laboratory OUs are treated as residential and have an exposure unit of 500 m^2.

Recreational land use scenarios have exposure units equal to 1/2 acre (2,000 m^2). A 1/2-acre area is a reasonable estimate of the area covered by a child playing, a youth recreating, an adult exercising, or a family camping in the lands surrounding Laboratory work sites. The exposure unit concept for recreational users assumes that receptors locate a "preferred area" in which to spend the predominant portion of their recreational time and that this area encompasses the PRS being evaluated. The half-acre exposure unit is not necessarily assumed to be square but can be fit to the site-specific landscape of the PRS (e.g., a long rectangle for an outfall). A variable exposure unit shape for the recreational scenario is an appropriate assumption because potentially contaminated areas are formed over easily accessible land, where receptors tend to be exposed.

As part of the continued-Laboratory-operations land use scenario, commercial/industrial exposure scenarios have variable exposure unit sizes, depending on the type of PRS. PRSs modeled with a continued-Laboratory-operations scenario are generally on mesa tops and either have subsurface contamination or surface contamination only. For PRSs with a subsurface component for which a construction worker scenario is being evaluated, the exposure unit area equals the surface area of the contamination (i.e., it is assumed that the construction worker spends the entire exposure duration in the contaminated area and that no dilution from exposure to uncontaminated areas occurs). Construction worker receptors are likely to be exposed to a small area of contamination for a short time only. For PRSs with surface contamination, the appropriate receptors for the commercial/industrial exposure scenario are the long-term workers at a site. Under the long-term worker scenario, the exposure unit chosen equals 500 m^2, which is a reasonable estimate for a typical site worker who works indoors, taking lunch and breaks outdoors or spending up to 4 h outdoors.

When data have been collected without the appropriate exposure unit as a basis for averaging, an adjustment for the correct exposure unit must be incorporated before dose from soil sources can be calculated. Adjustment is made only for areas of contamination that are smaller than the exposure units. For PRSs that are smaller than the exposure unit, a correction factor can be applied to the dose or intake estimates to adjust them downward, accounting for the likelihood that, on average, the receptor will only be exposed to the contaminated area for a fraction of the daily exposure time. Corrections for exposure unit size can be made with the "fraction from contaminated source" parameter (Section 3.4.2.8).

3.3.2.1.1 Exposure Concentrations for Incidental Soil Ingestion

To evaluate exposures to current receptors (e.g., long-term worker, youth recreational user, resident at extra-Laboratory PRS), contaminant concentrations in surface soils are used to calculate incidental soil ingestion intakes. An appropriate statistic is used as the RME for the incidental soil ingestion pathway (e.g., current EPA guidance suggests using the 95% upper confidence of the

arithmetic average; averages and the corresponding upper confidence bounds are evaluated for appropriate exposure units).

Assessment of potential exposure to subsurface soil contaminants is needed for evaluating the construction worker scenario and future exposure scenarios. For the construction worker, an appropriate statistic is used as the RME for the incidental soil ingestion pathway (e.g., again, current EPA guidance suggests using the 95% upper confidence of the arithmetic average, and averages are determined for the appropriate exposure units).

Subsurface soil exposure concentrations can be used to evaluate exposures of future receptors exposed over the long term (i.e., workers, recreational users, residents of extra-Laboratory properties). To estimate exposures for these future receptors, it is assumed that subsurface soil contaminants have been redistributed to the soil surface before these receptors can be exposed. PRS-specific data, such as soil depth, volume of contaminated soil, likely future land use, and likely size of structure to be built on the property, are needed to determine the surface area over which the contaminated soil will be distributed. Assuming an appropriate soil thickness (e.g., 6 in.), area and depth of excavation corresponding to the likely type of structure to be built, and the appropriate exposure unit for the future receptor of interest, "derived" surface soil exposure concentrations for the future receptor can be estimated. This method is similar to one described by Reynolds et al. (1990, 1009) for estimating potential surface contaminant concentrations on the basis of measured subsurface levels. To distinguish these derived surface concentrations from measured surface concentrations in this text, the derived surface concentrations are termed "subsurface exposure concentrations."

In instances where receptor-specific exposure concentrations from surface soil data exceed exposure concentrations calculated from subsurface soil data, the risk assessor may decide to use surface soil data to assess risks to future receptors in order to ensure that risks are not underestimated. This decision is based on the likelihood of future excavation and should consider site-specific data and probable future land uses.

3.3.2.1.2 Exposure Concentrations for Dermal Contact with Soils

With few exceptions, the dermal absorption exposure route does not apply for most radionuclide contaminants in soil because the skin provides an effective barrier to the absorption of most radionuclides. Even absorption of tritium from soil water is likely to be much lower than absorption from immersion in a body of water, given equal concentrations of tritium. In the Los Alamos area, where soil moisture is generally low, dermal uptake of tritium from soil is assumed to be negligible.

It is possible that the presence of radioactively tagged organic contaminants will result in a dermal exposure route for radionuclides. The significance, if any, of this exposure route for radionuclides should be evaluated on a PRS-specific basis.

For chemicals, the significance of dermal absorption from soils is highly dependent on the identity of contaminants of concern for specific PRSs. In general, organic contaminants are more easily absorbed through the skin than are inorganic contaminants. Chemical-specific data for the PRS-specific

contaminants of concern should be used to determine whether evaluation of this pathway is appropriate. When evaluation is necessary, exposure concentrations are the same as those for the soil ingestion pathway (i.e., surface exposure concentrations for current receptors and subsurface exposure concentrations for future receptors, both in units of milligrams per kilogram).

3.3.2.1.3 Exposure Concentrations for the Inhalation of Soil-Derived Particulates and Gases

3.3.2.1.3.1 Particulates

The inhalation-of-soil-derived-particulates exposure route includes the inhalation of contaminants adhering to dust particles that become airborne as the result of wind erosion and mechanical disturbances of contaminated soil. Exposure concentrations of airborne contaminants depend to some extent on the exposure scenario being assessed. For example, the concentrations of particulates inhaled by an indoor office worker are expected to be significantly lower than the concentration of particulates inhaled by an outdoor construction worker because particulate levels are higher in construction zones. The concentrations of airborne contaminants may be obtained by direct measurement or by modeling the emission and dispersion from the source (i.e., soil).

Generally, measured air concentrations of particulate-associated radionuclide and chemical contaminants will not be available for use in ER Program risk assessments. Emissions resulting from suspension of soils by wind erosion or vehicular disturbance can be estimated using site-specific input parameters and any of a number of models (e.g., models described in EPA's *Superfund Exposure Assessment Manual* (EPA 1988, 0747) or models from the Air Superfund National Technical Guidance Series (EPA 1989, 1011). When necessary, models can also be used to estimate dispersion from the source to downwind receptor locations. The need for air emission and dispersion modeling is determined on an OU- or PRS-specific basis.

In some instances, it is sufficient to estimate emissions from the contaminant source simply by obtaining a site-specific value for mass loading of particulates to air and assuming that radionuclide and chemical contaminant levels in these particulates are equal to those measured in soils. Average particulate level values can be used for most exposure scenarios and may be obtained from the meteorologic station nearest the site. An average value for the Los Alamos area has been estimated as 0.09 mg/m^3 (Environmental Protection Group 1990, 0497). However, for the construction worker scenario, the assumed particulate level is higher because of receptor activities that disturb the soil. If data for construction sites at the Laboratory are not available, a particulate level of 15 mg/m^3, which is the Occupational Safety and Health Administration's limit for nuisance dust (OSHA 1991, 0610), can be assumed for construction worker scenarios. It may also be necessary to assume a particulate level higher than the average level for some recreational users (e.g., bikers), depending on whether their activities are expected to generate dusts. Appropriate assumptions based on PRS-specific particulate levels are made in individual ER Program risk assessments.

Not all particulate matter is respirable by humans; therefore, an adjustment is needed to account for the respirable portion of the particulates. Paustenbach (1989, 1007) gives a range of 30% to 50% as the respirable fraction of

suspended particulates. Unless site-specific data on levels of respirable particulates are available, it is recommended that 50% of air particulate matter be assumed to be respirable. Air exposure concentrations for particulate-associated contaminants can be estimated as follows:

$$\text{Air EC} = \text{Soil EC} \times \text{PC} \times \text{CF} \times \text{RF} \ , \qquad (1)$$

where

Air EC = exposure concentration in exposure concentration in air (picocuries per cubic meter for radionuclides, milligrams per cubic meter for chemicals),

Soil EC = appropriate surface or subsurface soil exposure concentration (picocuries per gram for radionuclides, milligrams per kilogram for chemicals),

PC = particulate concentration (milligrams per cubic meter),

CF = conversion factor (10^{-3} g/mg for radionuclides, 10^{-6} kg/mg for chemicals), and

RF = respirable fraction (0.5).

3.3.2.1.3.2 Gases

Inhalation of volatile contaminants from soils is not a pathway of concern for most receptors because these contaminants volatilize quickly from surface soils; therefore, exposure is relatively short-term. EPA guidance (EPA 1991, 0302) does suggest evaluating this pathway for workers exposed to subsurface contaminants [e.g., construction worker scenarios for ER Program risk assessments (EPA 1991, 0302)]. The only volatile radiological contaminants of concern are radon and tritium. Radon is addressed separately (Section 3.3.2.1.6). The concentration for tritium in air will be evaluated on a PRS-specific basis. Air exposure concentrations for volatile chemicals can be estimated as follows:

$$\text{Air EC} = \text{Soil EC} \times (1/\text{VF}) \ , \qquad (2)$$

where

Air EC = exposure concentration of volatile contaminant in air (milligrams per cubic meter),

Soil EC = appropriate subsurface soil exposure concentration (milligrams per kilogram), and

VF = soil-to-air volatilization factor, chemical-specific (cubic meters per kilogram).

Available soil-to-air volatilization factors for potential chemicals of concern are given in Appendix J. The equation for deriving volatilization factors is given in EPA guidance (EPA 1991, 0302).

3.3.2.1.4 Exposure Concentrations for Ingestion of Contaminated Foods

The ingestion of edible plants grown in contaminated soils presents a potential exposure route for current and future residents at extra-Laboratory PRSs and recreational users. When concentrations of contaminants in edible vegetation are available, an appropriate statistic will be used as the RME for ingestion (e.g., current EPA guidance suggests using the 95% upper-confidence bound of the arithmetic average). Alternatively, concentrations in foods can be modeled from soil concentrations; food contamination resulting from root uptake is modeled separately from that resulting from foliar deposition.

3.3.2.1.4.1 Root Uptake

Root uptake will be the primary contributor to contaminant levels for nonleafy food species such as potatoes, carrots, and berries. Soil data can be used to predict contaminant concentrations resulting from root uptake in edible plants; however, considerable uncertainty is involved. Contaminant-specific data relating concentrations in edible produce to soil concentrations are generally unavailable, especially for chemical contaminants. Soil-to-plant transfer factors available in the literature are derived from data used for evaluating radiological exposure from weapons testing fallout and may not be appropriate for evaluating chemical toxicity. Additionally, the transfer of contaminants of concern from soil to edible plants depends on many factors, such as plant species, pH of the soil, and chemical form of the contaminant (Gough et al. 1979, 0998). For some substances, a certain soil level is toxic to some plant species and, beyond that level, growth does not occur.

Nonetheless, a general method for predicting contaminant concentrations in edible plants from soil concentrations is provided here for use in deriving baseline risk estimates. This method may result in overestimating concentrations in foods. If the resulting calculated risks are unrealistically high, a more thorough assessment may be required, based on PRS-specific contaminants of concern and data on soil types, growing conditions, and types of edible plants likely to grow in the Los Alamos area.

Although not entirely applicable for every species of edible plant, soil-to-plant transfer factors have been assigned to many radioactive and inorganic substances (Yu et al. 1993, 1014; Ng et al. 1968, 1016; 1982, 1006). Plant uptake of organic compounds may be estimated using the procedure described by Briggs et al. (1982, 0995). Alternatively, soil-to-plant transfer factors for organic substances have also been compiled (Strenge and Peterson 1989, 0837).

Exposure concentrations in edible plants may be calculated as follows:

$$\text{Produce EC} = \text{Soil EC} \times \text{TF} \times \text{RDP}\ , \qquad (3)$$

where

Produce EC = exposure concentration in edible portion of plant picocuries per gram for radionuclides, milligrams per kilogram for chemicals),

Soil EC = exposure concentration in soil (picocuries per gram for radionuclides, milligrams per kilogram for chemicals),

TF = soil-to-plant transfer factor, radionuclide- and chemical-specific (unitless), and

RDP = root depth parameter, PRS-specific (unitless).

The root depth parameter is used to assess the fraction of root length that is in contact with contaminated soil, which essentially provides a dilution factor for root uptake. For example, if contamination is found only in the top 15 cm of soil and the active root depth is 100 cm, the root depth parameter is 0.15 (i.e., the fraction of contaminant in soil transferred to the plant is estimated to be 15% of the amount that would be transferred to a plant with a root depth of 15 cm or less). Site-specific values of root depths for local edible plants should be used when available. If site-specific values for the species of concern are not available, generic values can be used (e.g., Zipparo et al. 1993, 1015). This root-depth dilution factor method is recommended for the produce ingestion pathway if only surface soil [the top 6 in. (15 cm)] is contaminated.

Another approach for estimating the exposure concentration in edible plants resulting from root uptake is to use the effective soil exposure concentration over the soil depth equivalent to the root length and to assume that the root depth parameter in Equation 3 is equal to 1. In cases where subsurface soil is contaminated, this weighted average method is recommended.

3.3.2.1.4.2 Foliar Deposition

Foliar deposition may be a significant contributor to contaminant levels for leafy edible species such as lettuce and spinach. A method has been developed that uses contaminant-independent "mass-loading" transfer factors from soil to air to edible portions of plants in estimating foliar deposition (Kennedy and Strenge 1993, 1002). These mass-loading transfer factors are recommended for a variety of plant types and are added to contaminant-specific root uptake transfer factors to obtain total soil-to-plant transfer factors. (Both factors must be based on dry plant weight). The factors are then multiplied by dry-plant-weight to wet-plant-weight conversion factors. Finally, multiplication by the soil concentration yields the contaminant concentration in edible portions of the plant. The equation for this calculation is

$$\text{Produce EC} = CF \times [(\text{Soil } EC_{eff} \times TF_{RT}) + (\text{Soil } EC_{surf} \times TF_{FD})] \times W \quad (4)$$

where

Produce EC = concentration in edible portions of plant (picocuries per kilogram or milligrams per kilogram),

CF = unit conversion factor (radionuclides only, 1,000 g/kg),

Soil EC_{eff} = effective soil exposure concentration over length of roots (picocuries per gram or milligrams per kilogram),

Soil EC_{surf} = surface soil exposure concentration (picocuries per gram or milligrams per kilogram),

TF_{RT} = soil-to-plant transfer factor from root uptake [picocuries (or milligrams) per kilogram dry plant per picocurie (or milligrams) per kilogram soil],

TF_{FD} = soil-to-plant transfer factor from foliar deposition [picocuries (or milligrams) per kilogram dry plant per picocurie (or milligram) per kilogram soil], and

W = dry-plant-weight to wet-plant-weight conversion factor (kilograms dry weight per kilogram wet weight).

The above methodology, although inherently simple, is based on fixed assumptions of airborne dust, crop yields, removal rates, etc. These assumptions should be evaluated for applicability to conditions at the Laboratory before using this model.

3.3.2.1.5 Exposure Concentrations for External Gamma Exposure

When possible, direct measurement of external gamma exposure rates should be used to estimate external gamma exposure concentrations. Exposure to gamma radiation in air is measured by the quantity of ion pairs (ionization) formed per unit mass of air by gamma rays emitted from contaminated air, soil, and structural materials. For onsite assessments, the contribution from gamma emitters in air is generally negligible compared with the other two sources. Exposure to external radiation may be estimated from the concentrations of emitters in the source, taking into account attenuation and source/receptor geometries. However, directly measuring exposure via the air pathway at the receptor location (in units of milliroentgens per hour) results in a faster, more accurate assessment of dose than measuring the concentrations in the source medium.

When direct measurement of gamma exposure rates is not practical (e.g., for use

in assessing future exposure from contaminated subsurface soil), soil concentrations of specific radionuclide contaminants of concern can be used to estimate gamma exposure rates (external gamma irradiation from structural surfaces is addressed in Section 3.3.2.3). Other minor exposure routes, such as external radiation from immersion in contaminated dust and water, do not contribute significantly to the external gamma exposure of any of the postulated receptors. Therefore, exposure concentrations in air and water are not needed to assess the risk to receptors from the external exposure route.

To assess external gamma irradiation from soils, soil exposure concentrations for the appropriate soil depths should be used. For current receptors, surface soil data (i.e., samples collected within 2 ft of the surface) should be used as the exposure concentrations. For future receptors, subsurface soil data will be needed to assess the risk both during activities involving soil excavation and after subsurface soil contaminants are redistributed to the surface.

If the receptor is postulated to be indoors a significant portion of the time (i.e., long-term worker or resident) and the source of contamination is soil, shielding by uncontaminated structural materials should be taken into account to more realistically assess receptor exposure. The recommended shielding factor is 0.7 (Yu et al. 1993, 1014). Also, the presence of any uncontaminated cover material should be accounted for in calculating the exposure rates. To conservatively assess the risks from the external exposure route, the receptor is assumed to be located at the center of the contaminated area.

3.3.2.1.6 Exposure Concentrations for the Inhalation of Radon

The presence of ^{226}Ra (and other members of the natural uranium chain) or ^{228}Th (and other members of the natural thorium decay chain) in soil or structural materials results in the generation of ^{222}Rn or ^{220}Rn gas, respectively. Exposure concentrations in air of either radon isotope may be estimated from the concentrations of radium or thorium in soil by using an appropriate model such as RESRAD (Attachment II to this appendix) or by measuring them directly. Modeling is recommended if radon precursors are detected and measurements of airborne radon are not available. Modeling is also required when estimating the dose in a future use scenario that involves indoor occupancy of buildings that do not currently exist (Section 3.4.3.6). In such cases, surface or subsurface soil concentrations for the appropriate radium or thorium isotope are used as exposure concentrations.

When radon measurements are available, they should be used in calculating exposure concentrations. Radon measurements are usually reported in units of picocurie per liter. To calculate the radon dose, however, these concentrations must be corrected for the ingrowth of radon decay products, which contribute most of the dose. The radon concentration unit that accounts for this contribution is defined as the working level (WL), which is equal to the concentration of short-lived decay products that release 1.3×10^5 MeV of potential alpha energy per liter of air. The concentrations of decay products in air are seldom in equilibrium with radon. To convert concentrations of radon from picocuries per liter to concentration of daughters in working levels, the degree of equilibrium between the former and the latter must first be estimated. Equilibrium factors depend on factors such as radionuclide half-lives, radon emanation and ventilation rates, fraction of decay products attached to particulates, plateout of decay products, and particulate deposition rates. The following equation is used

to convert the radon concentrations to decay product working levels (i.e., the exposure concentrations):

$$C_{WL} = C_{pCi/l} \times CF\ EF\ , \qquad (5)$$

where

C_{WL} = concentration of radon decay products (working level),

$C_{pCi/L}$ = radon concentration (picocuries per liter),

CF = conversion factor (working level per picocurie per liter), and

EF = equilibrium factor (unitless).

The conversion factors for ^{222}Rn and ^{220}Rn are 0.01 and 0.13 WL per picocurie per liter, respectively (ICRP 1981, 1000). In the absence of site-specific data, an equilibrium factor of 0.5 is recommended (National Research Council 1991, 1005).

3.3.2.2 Exposure Concentrations for Water Pathways

3.3.2.2.1 Ingestion of Groundwater or Surface Water

When contaminants of concern are identified in potable alluvial groundwater, it is appropriate to assess ingestion of groundwater in canyon bottoms. Water is considered potable if there is sufficient yield to support the assumed use (e.g., domestic or recreational use) and adequate quality (e.g., the water is low in total dissolved solids). The receptor to be evaluated for this pathway depends on the location of the PRS; a future resident is evaluated for extra-Laboratory PRSs, and a future camper is evaluated for Laboratory PRSs. No actual current use of alluvial groundwater is known.

When sufficient numbers of samples exist, an appropriate statistic is used to represent the RME in alluvial groundwater. For example, current EPA guidance suggests using the 95% upper-confidence bound of the arithmetic average. However, it is expected that data for alluvial groundwater will be limited to one or two rounds of sampling from only a few monitoring wells for most OUs. Given such limited data, it may be necessary to use the maximum level of each contaminant of concern in any monitoring well as the exposure concentration. The units are picocuries per liter for radionuclides and milligrams per liter for chemicals.

Perennial surface water bodies are generally limited to streams in a few canyon bottoms. Assessment of potential exposure to contaminants in these surface waters includes an assumption of limited ingestion during recreational use (e.g., wading) by the youth recreational user, future camper, or future resident. The exposure concentrations are an appropriate statistic to represent the RME in alluvial groundwater. The units are picocuries per liter for radionuclides and milligrams per liter for chemicals.

3.3.2.2.2 Dermal Absorption from Groundwater or Surface Water

Dermal absorption of most radionuclides from water is negligible compared with other exposure pathways and is not assessed. However, absorption of tritium from water may be significant (Pinson and Langham 1957, 1008). The tritium exposure concentration used to evaluate dermal absorption from the water pathway is simply the concentration of tritium in water in units of picocuries per liter.

After chemical contaminants of concern have been identified for a PRS, their potential for dermal absorption from water should first be evaluated qualitatively. If a significant potential for dermal absorption exists, either an appropriate statistic is used to represent the RME in water, or the maximum contaminant levels detected are used as exposure concentrations, depending on the numbers of samples available. The units are milligrams per liter.

3.3.2.2.3 Inhalation from Household Use of Groundwater

In general, this pathway is unlikely to be applicable for ER Program assessments. The most likely mechanism for contamination of alluvial groundwater in canyon bottoms is via run-off from Laboratory operations on mesa tops. This mechanism would lead to volatilization rather than to leaching of volatile contaminants to groundwater. However, because there may be some sources of volatile contaminants in canyon bottoms, this pathway cannot be completely ruled out.

If volatile contaminants are detected in alluvial groundwater, inhalation exposure to volatiles will only be a potentially significant pathway for extra-Laboratory areas in which future residential use is possible (future campers in canyon bottoms would not use the groundwater for bathing or showering). For future residents, showering is likely to be the most significant exposure source during household use. Because of the limited application of this pathway, equations for the derivation of air exposure concentrations and dose/intake while showering are not presented. The need for evaluating this pathway should be determined on a PRS-specific basis. If needed, methods for evaluating exposure while showering are available [e.g., Byard (1989, 0996)].

3.3.2.3 Exposure to Contaminated Building Surfaces

3.3.2.3.1 Radiological Contaminants

Building surfaces that have been contaminated as a result of past Laboratory operations may result in worker exposures to these contaminants. It is assumed that these buildings will remain in use for industrial/commercial purposes in the future or be demolished during D&D. Long-term-worker scenarios need to be considered for buildings that remain in operation. Demolishing and renovating contaminated buildings may result in higher short-term exposures to construction personnel; however, these health impacts are likely to be lower than exposures from long-term building use. Worker exposure to radiological contaminants in buildings may occur from one or more of the following pathways (Kennedy and Strenge 1993, 1002):

- dermal exposure to and inhalation of gamma radiation emitted from building surfaces,

- ingestion of dust from contaminated building surfaces, and
- inhalation of air contaminated by the entrainment of radionuclides from building surfaces.

For the external exposure route, actual measurement of exposure rates at locations where individuals are likely to work provide the most precise estimate of worker doses. Alternatively, surface or volumetric concentrations of total radioactivity (loose plus fixed) in disintegrations per minute per 100 cm^2 or picocuries per gram may be used in conjunction with shielding models or external dose rate factors to estimate exposure rates at receptor locations.

For ingestion of radionuclides, the exposure concentration is the measured concentration of loose surface contamination in disintegrations per minute per 100 cm^2.

The exposure concentration for the inhalation pathway resulting from the building occupancy scenario may be obtained by direct measurement of airborne contaminants (picocuries per cubic meter for radionuclides). When no measurements are available, the exposure concentration may be obtained by modeling the resuspension of contaminants from building surfaces (Kennedy and Strenge 1993, 1002).

3.3.2.3.2 Chemical Contaminants

Exposure to chemical contaminants on indoor surfaces may occur via ingestion, dermal contact, and inhalation. Ingestion and dermal contact are possible only when surfaces are accessible for direct contact. Potential for inhalation depends on the extent of dust resuspension. For ER Program risk assessments, volatile contaminants are presumed to have dissipated.

A recent review of the literature found no correlation between chemical contaminant concentrations in surface wipe samples (for which methods are specified under the Occupational Safety and Health Act) and air concentrations of those chemicals (Caplan 1993, 0997). Caplan attributed the lack of correlation to the dependence of resuspension on several factors, including properties of dusts (e.g., adhesiveness, particle size distribution, and density); properties of surfaces (e.g., macro- and microstructure, adhesive properties, porosity); and variable activities in buildings (e.g., foot traffic, vehicle traffic, vibrations, air exchange). Because an accurate resuspension factor for chemicals from surfaces to air is not available, monitoring data will likely be needed for estimating air exposure concentrations caused by surface contamination. Wipe samples will be used to identify contaminants that might be present in air.

Estimates of potential ingestion and/or dermal contact exposure via contaminated indoor surfaces can be made using wipe sample data and assumptions on extent of contact. The receptor of concern for this exposure pathway in ER Program risk assessments is a long-term worker. The need for assessing this pathway should be evaluated on a PRS-specific basis. Examples of risk calculations for contaminated building surfaces in the literature are scarce, although such an analysis has been conducted for dermal contact with PCBs on contaminated surfaces (Rosenbaum et al. 1990, 1010). For the ingestion pathway, methods used for assessing radiological contamination in buildings (Kennedy and Strenge 1993, 1002) could be adapted to address chemical contamination.

3.4 Estimation of Radiological Dose and Chemical Intake

3.4.1 Methods

3.4.1.1 General Exposure Parameters

Estimates of exposure are based on the contaminant concentrations at exposure locations (Section 3.3) and scenario-specific assumptions and exposure parameters. Scenario-specific assumptions include factors such as frequency and duration of exposure to a contaminated medium by a potential receptor. Exposure parameters are associated with the route of exposure (e.g., ingestion and inhalation). The assumptions and intake factors for the exposure scenarios applicable for ER Program risk assessments are presented in Section 3.4.2. The approach and equations for determining contaminant doses and intakes at the potential exposure locations are given in Sections 3.4.3-3.4.5.

The EPA's risk assessment guidance recommends the quantification of intakes for each route of exposure from an exposure medium (EPA 1989, 0305). Exposure estimates are based on the RME expected to occur under current and future land use conditions (Sections 3.2.2. and 3.2.3). The RME is defined as the highest exposure that can reasonably be expected to occur at a site. Scenario assumptions and intake parameters used to estimate the RME are based, to the extent possible, on values provided in the *Exposure Factors Handbook* (EPA 1989, 0304), in *Human Health Evaluation Manual* (EPA 1989, 0305), and in a supplement to that manual (EPA 1989, 1011). Section 3.3 provides further discussion of appropriate methods for estimating the RME.

3.4.1.2 Estimates of Radiological Dose

Internal exposure to radioactive contaminants is expressed in terms of the 50-yr committed effective dose equivalent (CEDE). To calculate the CEDE, the contaminant concentration is multiplied by dose conversion factors (DCFs) and by the environmental transport factors appropriate for each medium and receptor scenario. Dose conversion factors, which are specific to the radionuclide and exposure pathway, are used to determine the CEDE per unit intake of the radionuclide. Derivation of DCFs incorporates the following consideration for each radionuclide:

- the radiosensitivity of each internal organ,
- the type of radiation emitted by the radionuclide (alpha, beta, and gamma), and
- the solubility class or gastrointestinal absorption fraction of the radionuclide following inhalation or ingestion, respectively.

The concept of committed dose applies only to internal dose pathways. For the external dose pathway, there is no long-term residence of radionuclides in the body. In this case, the appropriate measure of radiological exposure is the effective dose equivalent (EDE). Dose conversion factors for external exposure from contaminated soil are based on continuous occupancy and a contaminated area of infinite extent and depth. The calculation of EDE at the receptor point must therefore be corrected for appropriate occupancy factors and shielding and

geometry for each exposure scenario (Sections 3.4.2-3.4.5).

The sum of the CEDE (internal dose pathways) and the EDE (external dose pathway) is termed the total effective dose equivalent. For purposes of simplification, both CEDE and EDE are referred to as dose (expressed as millirem) in the following sections.

Separate DCFs are available for the various exposure routes (i.e., external gamma, inhalation, ingestion) for the radionuclides potentially present at the Laboratory. When several inhalation or ingestion DCFs are available for each radionuclide, the DCF resulting in the highest dose estimate will be applied. DCFs are available from a DOE (1988, 0266) report for internal dose and from Yu et al. (1993, 1014) for external dose. The dose contributions from short-lived decay products (having half-lives of less than 6 mo) are incorporated in the DCF for the parent radionuclide. For example, the dose contributions from ^{90}Y and ^{137}Ba are included in the DCFs for ^{90}Sr and ^{137}Cs, respectively.

Radiation doses can be calculated with RESRAD, a computer program used to estimate doses to onsite receptors at radioactively contaminated sites (Yu et al. 1993, 1014). The code incorporates the DCFs discussed above and allows the user to enter values for site- and scenario-specific parameters (contaminant concentrations, area and thickness of the contamination at the PRS, exposure pathways, occupancy factors, intake rates, etc.). Use of the RESRAD code to calculate radiological doses is discussed in Attachment II.

3.4.1.3 Estimates of Chemical Intake

Exposure to chemical contaminants is expressed in terms of intake, which is the amount of contaminant taken into the body per unit body weight per unit time (generally expressed as milligrams per kilogram per day).

3.4.2 Scenario-Specific Assumptions and Exposure Parameters

The assumptions used to estimate radiological doses and chemical intakes for the receptors described in Section 3.2.3 are discussed in Sections 3.4.2.1 through 3.4.2.8 and are summarized in Attachment I.

Some exposure parameters depend on the age of the receptor (e.g., ingestion and inhalation rates, body weight, skin surface areas). For long-term receptors for whom some portion of exposure occurs during childhood (e.g., residents and future campers), variable exposure parameters may be appropriate for the portions of exposure that occur during childhood and those portions that occur during adulthood. However, use of variable exposure parameters generally does not alter calculated intake significantly because, for example, decreased body weight corresponds with decreased ingestion and inhalation rates. The only pathway for which incorporation of both child and adult intake parameters alters calculated intake substantially is the soil ingestion pathway because children have higher ingestion rates than adults (and lower body weights). Under EPA guidance, variable exposure parameters should be assumed for the soil ingestion pathway but are not necessary for inhalation and dermal contact pathways (EPA 1991, 0746; EPA 1992, 1012).

3.4.2.1 Exposure Time, Frequency, and Duration

Exposure time, frequency, and duration together define the total amount of time a receptor may be in contact with a given distribution of contaminants in the exposure unit. The exposure time is the number of hours per day that a receptor is present at a specific exposure point, the exposure frequency is the number of days per year that exposure occurs, and the exposure duration is the total number of years over which exposure occurs. For each scenario, the exposure time is further divided into time spent indoors and time spent outdoors.

Long-term workers at the Laboratory are assumed to be onsite 8 h/day for 250 days/yr over 25 yr. EPA risk assessment guidance recommends these exposure time, frequency, and duration values for workers (EPA 1991, 0746). In general for ER Program risk assessments, assumptions of increased worker time spent outdoors result in higher intake and dose estimates than assumptions of no or little time spent outdoors. These results occur because intake from particulate inhalation and dose from external gamma irradiation are greater for outdoor exposures, and the assumed soil ingestion rate is also higher for outdoor workers. Therefore, an assumption of a substantial fraction of the day spent outdoors (e.g., 4 h) generally represents the RME for a long-term worker. An exception to this assumption occurs when radon is the contaminant of concern; radon build-up inside buildings might lead to a higher calculated risk for workers who spend most of their time indoors. Specific exposure assumptions for long-term workers in ER Program risk assessments should be made on a PRS-specific basis, depending on the contaminants of concern and the likelihood of outdoor work.

Youth recreational users of canyon sides and bottoms (e.g., hikers and bikers) are assumed to spend 2 h/day outdoors in canyon areas for 170 days/yr (e.g., about 5 days/wk for 8 mo/yr, which are reasonable estimates, considering the climate in the Los Alamos area). The exposure duration is estimated as 9 yr, which is the median time spent at one residence (EPA 1989, 0088) and is also consistent with the age range assumed for this receptor (10-18 years). Although the youth recreational user is more likely to be a concern in the future, the current use scenario is included to address potential trespassers.

The current and future residents of PRS areas in the townsite are assumed to have an exposure frequency of 350 days/yr and an exposure duration of 30 yr, as recommended in EPA guidance (EPA 1991, 0746). The exposure time assumes 20 h/day, allowing for 4 h/day spent away from the property. Two hours per day are assumed to be spent outdoors on the residential property.

Construction workers are assumed to be onsite 8 h/day, 90 days/yr. An exposure duration of 1 yr is used, assuming the time spent at any single PRS is limited. Construction workers' activities are assumed to occur outdoors only. In general, construction is currently not allowed in PRS areas. However, because schedules for required construction work cannot be predicted, the construction worker scenario is considered possible for both the present and the future. Cumulative exposures from several PRSs for construction workers will be evaluated when this scenario is possible.

For PRS areas where future recreational use is assumed (i.e., canyon bottoms), camper receptors are assumed to be onsite 24 h/day, 28 days/yr over 20 yr. The future camper is assumed to spend the entire 24 h outdoors.

For the dermal-absorption-from-soil-pathway, all the scenarios except the residential scenario assume the number of soil contact events is equal to the exposure frequency (days per year). For residents, it is assumed that dermal contact occurs seasonally (e.g., during gardening), approximately 5 days/wk for 8 mo/yr over 30 yr. For the youth recreational user, future camper, and future resident scenarios, dermal exposure to compounds in surface water (e.g., during wading) is assumed to occur during daily 1-h exposure events. The future camper is assumed to wade in surface water daily while present at the PRS (i.e., 28 days/yr), whereas the youth recreational user and the future resident are assumed to wade 40 days/yr (it is assumed that these receptors are unlikely to wade daily). For the future resident in canyon bottoms, dermal exposure to compounds in groundwater (e.g., during bathing) is assumed to occur for 15 min/day, 350 days/yr over 30 yr.

3.4.2.2 Body Weight

The standard assumption for adult body weight is 70 kg (EPA 1989, 0305). Therefore, a body weight of 70 kg is used for long-term worker, construction worker, resident, and future camper scenarios and for that portion of the current or future resident and future camper scenarios for which an adult is assessed (applicable to soil ingestion pathway only). A body weight of 50 kg for youths of ages 10 to 18 (EPA 1989, 0305) is considered representative for the youth recreational user. A body weight of 15 kg for children of ages 1 to 6 (EPA 1991, 0746) is assumed for both the child portion of the future camper scenario and for the child portion of the current and future resident scenarios for evaluation of the soil ingestion pathway.

3.4.2.3 Inhalation Rates

EPA recommends the use of an inhalation rate of 0.83 m^3/h (20 m^3/day) for the assessment of resident adult scenarios (EPA 1989, 1011). This inhalation rate (which is based on the average inhalation rate over an entire day, including periods of rest, and light, moderate, and heavy activity) should be used for indoor exposures for the current and future resident scenarios. It is also appropriate for the long-term worker scenario for indoor activities, which are assumed to involve light office, laboratory, or maintenance work. [EPA (1989, 0304) defines activity levels as follows: resting includes watching television, reading, and sleeping; light activity includes most domestic work, hobbies, and conducting minor home repairs; moderate activity includes heavy indoor cleanup, conducting major home repairs, and climbing stairs; and heavy activity includes vigorous physical exercise and climbing stairs carrying a load.]

The inhalation rate for other scenarios is adjusted to account for greater exertion while working outdoors or engaging in recreational activities. The outdoor inhalation rate assumed for worker and resident scenarios is 1.7 m^3/h, assuming that half of the exposure time is spent at moderate activity and half at light activity. For the youth recreational user, an inhalation rate of 3.2 m^3/h is used; this rate is based on a moderate activity level for a 10-yr-old child (EPA 1989, 0304). The inhalation rate of 1.3 m^3/h for a future camper is based on adult exposures of 8 h/day resting, 12 h/day light activity, 2 h/day moderate activity, and 2 h/day heavy activity.

3.4.2.4 Ingestion Rates for Soil and Dust

Soil ingestion rates are based on EPA guidance (EPA 1991, 0746) to account for incidental ingestion of soil and dust. For most scenarios, the recommended soil ingestion rate of 100 mg/day for adults and youths more than 6 yr of age is appropriate. The assumed soil and dust ingestion rate for youth recreational users is 100 mg /day (EPA 1991, 0746).

The soil ingestion rate recommended for workers spending most of their work day indoors is 50 mg/day (EPA 1991, 0746); this rate should be used for long-term workers who are assumed to perform little or none of their work outdoors. For workers assumed to spend their entire exposure duration (i.e., 8 h/day) indoors, a factor of 0.4 (Alzona et al. 1979, 0994) is applied to the ingestion rate to account for the fact that not all indoor dust is composed of contaminated soil (i.e., smoking and other indoor activities). Long-term workers who spend some portion of their workday outdoors (e.g., 1 h or more) are assumed to have a higher ingestion rate of 100 mg /day [which is also consistent with EPA guidance to assume 100 mg/day soil ingestion for adults; (EPA 1991, 0746)].

Based on a study by Hawley (1985, 0999), EPA recommends 480 mg/day as a default soil ingestion rate for short-term, outdoor activities in a commercial/industrial setting. Therefore, for the construction worker scenario, an ingestion rate of 480 mg/day is assumed to account for extended daily exposure to contaminated material and ingestion of inhaled material that is not retained in the lungs.

EPA guidance recommends considering both early childhood (i.e., ages 1 to 6, when intake is greater) and adult exposures when evaluating soil ingestion for a residential scenario. For ER Program risk assessments, this approach is used for evaluating both current and future resident and future camper scenarios. Therefore, for the soil ingestion pathway, exposure for these receptors is evaluated assuming 6 yr of exposure as a young child, with an ingestion rate of 200 mg/day, and either 24 yr of exposure (resident scenario) or 14 yr exposure (future camper scenario) at the lower ingestion rate of 100 mg/day.

3.4.2.5 Ingestion Rate for Water

Future residents in canyon bottoms and future campers are the only receptors for which the pathway of groundwater ingestion is evaluated. For this scenario, the standard default value of 2 L/d, recommended by EPA (1991, 0746) for adult residents, is assumed to be the water ingestion rate. It is also assumed that incidental ingestion of surface water might occur during wading for the youth recreational user, future camper, and future resident scenarios. The surface water ingestion rate of 0.05 L/d is based on EPA's (1989, 0088) recommended incidental ingestion level of 50 mL/h for a 1-h exposure time.

3.4.2.6 Produce Ingestion Rate and Fraction of Ingested Produce Grown on Contaminated Area

Current and future residents and future campers are the receptors for which the ingestion of contaminated produce and wild plants is evaluated. EPA (1989, 0304; 1991, 0746) presents figures for "typical" consumption of fruit and vegetables as 140 g/d and 200 g/d, respectively. The reasonable worst-case proportion of ingested produce that is considered to be homegrown (i.e., grown

on the contaminated area) ranges from 30% to 40% for fruits and vegetables. Therefore, for the resident scenario, the produce ingestion rate is assumed to be 340 g/d, of which the fraction of ingested produce grown on the contaminated area is estimated to be 40%. The future camper is assumed to ingest wild plants at a rate of 140 g/d, of which 100% is assumed to grow on the contaminated site. Data specific to the Los Alamos area should be used to determine the fractions of produce assumed to be leafy and nonleafy (Section 3.3.2.1.4).

3.4.2.7 Skin Surface Area (Soil and Water Pathways)

Assumptions for total body surface area and the surface area of component body parts are both scenario- and age-dependent (EPA 1992, 1012). For ER Program risk assessments, dermal exposure is evaluated only for adult receptors. This simplification is warranted because dermal exposure is proportional to surface area; thus, intakes calculated for adult and child receptors are similar.

For the showering/bathing scenarios for future residents using canyon bottom groundwater, the mean total adult body surface area is approximately 20,000 cm^2, which is in EPA's recommended default range. For soil contact and wading in surface water scenarios, dermal exposure is expected to occur on roughly 25% of the total surface area (i.e., hands, lower legs, forearms, neck, and head). Twenty-five percent of the mean total body surface area is 5,000 cm^2 for adults. The soil contact surface area for the youth recreational user is increased to 5,000 cm^2 (i.e., adult value) based on the potential dust-generating nature of the recreational activity. For long-term workers who perform some of their work outdoors and future construction workers, protective clothing probably limits the exposure to hands, forearms, neck and head; therefore, the mean surface area for these upper extremities of adults is 3,200 cm^2.

3.4.2.8 Fraction from Contaminated Source

Sampling plans are generally designed so that samples collected for use in a risk assessment represent an exposure unit area. The statistic used to describe the contaminant distribution, the RME, within an exposure unit area is used to calculate receptor dose. An adjustment is recommended in cases for which the area of the PRS is smaller than the appropriate exposure unit area and for which data have not been obtained outside the PRS. This adjustment can be made by prorating the values obtained in the PRS according to the fraction of the exposure unit area corresponding to the PRS. This fraction is termed the "fraction from contaminated source" (FI) and is set to 1 if the PRS is not smaller than the exposure unit.

In effect, the FI parameter adjusts the concentration parameters used in the equations presented in the following sections. This adjustment is equivalent to an assumption that the area outside the PRS but inside the exposure unit is free of contamination. However, considering that the potential impact of nonzero contamination in this area is likely to be small, averaging with an assumption that this area is free of contamination is unlikely to cause gross decision-making errors. Other assumptions can be made about the area outside the PRS; however, if other assumptions are made, the adjustment becomes more complex.

3.4.3 Equations for Exposure to Soil

This section describes the methodology for estimating chemical intakes and

radiological doses for exposures based on concentrations in soil. Equations for estimating human intakes are presented for the following exposure routes: incidental soil ingestion, dermal contact with soil, inhalation of particulates, ingestion of contaminated produce, external gamma exposure, and inhalation of radon. With the exception of the external gamma exposure and radon inhalation pathways, the equations presented are based on equations given in EPA's *Human Health Evaluation Manual* (EPA 1989, 0305); analogous equations are used for the external gamma exposure and radon inhalation pathways.

3.4.3.1 Incidental Soil Ingestion

For both radiological dose and chemical intake estimates, scenario-specific assumptions on exposure time, frequency, and duration, and the assumed ingestion rates for the various receptors are given in Attachment I. The intake for a long-term worker whose work is exclusively indoors is multiplied by a factor of 0.4 to account for the fact that all exposure occurs indoors, where not all ingested dust originates from contaminated soil (Section 3.4.2.4).

3.4.3.1.1 Radiological Dose

The basic equation used to calculate radiation doses from ingesting contaminated soil is

$$D_{is} = R_{is} \times IR_s \times CF \times EF \times FI \times DCF_i(Ing) \times ED \ , \qquad (6)$$

where

D_{is} = dose from ingestion of radionuclide, i, in soil (millirem),

R_{is} = soil exposure concentration of radionuclide, i, in soil (picocuries per gram) (Section 3.3.2.1.1),

IR_s = soil ingestion rate (milligrams per day),

CF = conversion factor (10^{-3} g/mg),

EF = exposure frequency (days per year),

FI = fraction from contaminated source, calculated using scenario-specific exposure units (unitless) (Section 3.4.2.8),

$DCF_i(Ing)$ = dose conversion factor for ingestion of radionuclide, i (millirems per picocurie), and

ED = exposure duration (years).

To account for increased soil intake rates during childhood years, the ingestion rate can be calculated as the time-weighted average over the exposure duration:

$$IR_s = \frac{(IR_{sc} \times ED_c) + (IR_{sa} \times ED_a)}{ED_c + ED_a}, \qquad (7)$$

where

IR_{sc} = child soil ingestion rate (milligrams per day),

IR_{sa} = adult soil ingestion rate (milligrams per day),

ED_c = child exposure duration (6 yr), and

ED_a = adult exposure duration [24 yr or 14 yr (scenario-specific)].

The soil ingestion dose may be calculated with the RESRAD code using the methodology in Attachment II.

3.4.3.1.2 Chemical Intake

The basic equation used to calculate chemical intake via ingestion is

$$\text{Intake (mg/kg-d)} = \frac{C_i \times IR_s \times CF \times FI \times EF \times ED}{BW \times AF \times AD}, \qquad (8)$$

where

C_i = soil exposure concentration of chemical, i (milligrams per kilogram) (Section 3.3.2.1.1),

IR_s = soil ingestion rate (milligrams per day),

CF = conversion factor (10^{-6} kg/mg),

FI = fraction from contaminated source, calculated using scenario-specific exposure units (unitless) (Section 3.4.2.8),

EF = exposure frequency (days per year),

E = exposure duration (years),

BW = body weight (kilograms),

AF = averaging frequency (365 days/yr), and

AD = averaging duration [years (equal to ED for carcinogens and 70 yr for carcinogens)].

A modified equation is used to model 6 yr of childhood exposure and 24 yr of adult exposure for the resident scenario and 6 yr of childhood exposure and 14 yr of adult exposure for the future camper scenario. The modified equation is

$$\text{Intake (mg/kg-d)} = \frac{C_i \times IR_{sc} \times CF \times FI \times EF \times ED_c}{BW_c \times AF \times AD} + \frac{Ci \times IR_{sa} \times CF \times FI \times EF \times ED_a}{BW_a \times AF \times AD} \quad (9)$$

where

C_i = soil exposure concentration of chemical, i (milligram per kilogram) (Section 3.3.2.1.1),

IR_{sc} = child soil ingestion rate (milligrams per day),

IR_{sa} = adult soil ingestion rate (milligrams per day),

CF = conversion factor (10^{-6} kg/mg),

FI = fraction from contaminated source, calculated using scenario-specific exposure units (unitless) (Section 3.4.2.8),

EF = exposure frequency (days per year),

ED_c = child exposure duration (6 yr),

ED_a = adult exposure duration [24 yr or 14 yr (scenario-specific)],

BW_c = child body weight (15 kg),

BW_a = adult body weight (70 kg),

AF = averaging frequency (365 days/yr), and

AD = averaging duration [years (equal to ED for noncarcinogens and 70 yr for carcinogens)].

Because chemical intakes for carcinogenic risk calculations are averaged over a lifetime of 70 yr, the intakes calculated for use in carcinogenic risk estimates differ somewhat from those calculated for noncarcinogenic endpoint estimations.

3.4.3.2 Dermal Contact with Soil

Dose estimates and chemical intakes for the dermal exposure pathway are calculated using the exposure concentrations in soil (Section 3.3.2.1.1). Scenario-specific assumptions on the dermal exposure factors (exposure time, frequency, duration, skin area, and soil adherence) are given in Attachment I.

3.4.3.2.1 Radiological Dose

The dermal absorption of radionuclides depends on the chemical compound in which the radioactive element is incorporated. Most radionuclides found in the environment have relatively low dermal absorption fractions, and the contribution to dose from dermal absorption is typically much smaller than the dose from soil ingestion. In addition, dose conversion factors have not been developed for the

dermal absorption pathway for most radionuclides (tritium is an exception). If the dermal absorption pathway results in a significant radiation dose because of the high dermal absorption potential of the chemical compound, the dose must be calculated on a case-by-case basis and requires the derivation of dose conversion factors for dermal absorption.

3.4.3.2.2 Chemical Intake

The following equation is used to estimate the dermal absorption of chemicals from soil:

Intake (mg/kg-day)

$$= \frac{C_i \times CF \times FI \times ADF \times ABS \times EF_d \times ED \times SA_s}{BW \times AF \times AD}, \quad (10)$$

where

C_i = soil exposure concentration of chemical, i (milligrams per kilogram) (Section 3.3.2.1.1),

CF = conversion factor (10^{-6} kg/mg),

FI = fraction from contaminated source, calculated using scenario-specific exposure units (unitless) (Section 3.4.2.8),

ADF = adherence factor of soil to skin (milligrams per square centimeter per event),

ABS = absorption fraction (unitless, chemical-specific),

EF_d = exposure frequency for soil dermal contact (events per year),

ED = exposure duration (years),

SA_s = skin surface area available for soil contact (square centimeter),

BW = body weight (kilograms),

AF = averaging frequency (365 days/yr), and

AD = averaging duration [years (equal to ED for noncarcinogens and 70 yr for carcinogens)].

Estimation of the dermal absorbed dose for compounds in soil requires identification of appropriate chemical-specific absorption fractions. Although the use of soil permeability coefficients may be preferable, EPA currently recommends the use of absorption fractions until this issue is investigated further. In estimating absorption fractions, preference is given to experimentally derived values; otherwise, predictive models must be used. Some theoretical

approaches to determining an appropriate absorption fraction are discussed in EPA guidance for assessing dermal exposure (EPA 1992, 1012); that document also lists absorption fractions for several compounds.

An EPA review (1992, 1012) of experimental data on soil adherence indicates a conservative range of values from 0.2 mg/cm^2 to 1.5 mg/cm^2 per event. Although the uncertainties in the studies make it difficult to recommend a default value, EPA suggests that 1 mg/cm^2 is a reasonable upper value. Therefore, 1 mg/cm^2 should be used as the soil-to-skin adherence factor for all applicable scenarios (Attachment I).

3.4.3.3 Inhalation of Particulates

Scenario-specific assumptions on exposure time, frequency, and duration and assumed inhalation rates for use in calculating dose and intake from the inhalation pathway are given in Atachment I.

3.4.3.3.1 Radiological Dose

The following equation is used to calculate radiation doses from the inhalation of contaminated dust when all exposure is outdoors:

$$D_{ia} = R_{ia} \times IR_a \times ET \times EF \times FI \times DCF_i(Inh) \times ED \ , \qquad (11)$$

where

D_{ia} = dose from inhalation of radionuclide, i, in air (millirem),

R_{ia} = concentration of radionuclide, i, in air (picocuries per cubic meter), based on soil exposure concentration (Section 3.3.2.1.3),

IR_a = inhalation rate (cubic meters per hour),

ET = exposure time (hours per day),

EF = exposure frequency (days per year),

FI = fraction from contaminated source, calculated using scenario-specific exposure units (unitless) (Section 3.4.2.8),

$DCF_i(Inh)$ = dose conversion factor for inhalation of radionuclide, i (millirems per picocurie), and

ED = exposure duration (years).

For receptors assumed to spend some portion (or all) of the exposure time indoors (i.e., long-term workers and current and future residents), the concentration of particulates indoors is assumed to be reduced by 60% (Alzona et al. 1979, 0994). To account for this assumption, the product of inhalation rate and exposure time in the above equation may be substituted by the following expression:

$$IR_a \times ET = (IR_o \times ET_o) + (0.4 \times IR_i \times ET_i) \quad , \qquad (12)$$

where

IR_o = outdoor inhalation rate (cubic meters per hour),

IR_i = indoor inhalation rate (cubic meters per hour),

ET_o = exposure time outdoors (hours per day), and

ET_i = exposure time indoors (hours per day).

The dust inhalation dose may be calculated with the RESRAD code using the methodology in Attachment II.

3.4.3.3.2 Chemical Intake

The following equation is used for calculating chemical intake via inhalation when all exposure is outdoors:

$$\text{Intake (mg/kg-day)} = \frac{C_i \times IR_a \times FI \times ET \times EF \times ED}{BW \times AF \times AD} \quad , \qquad (13)$$

where

C_i = concentration of chemical, i, in air (milligrams per cubic meter), based on soil exposure concentration (Section 3.3.2.1.3),

IR_a = inhalation rate (cubic meters per hour),

FI = fraction from contaminated source, calculated using scenario-specific exposure units (unitless) (Section 3.4.2.8),

ET = exposure time (hours per day),

EF = exposure frequency (days per year),

ED = exposure duration (years),

BW = body weight (kilograms),

AF = averaging frequency (365 days/yr), and

AD = averaging duration [years (equal to ED for noncarcinogens and 70 yr for carcinogens)].

For receptors assumed to spend some portion (or all) of the exposure time indoors (i.e., long-term workers and current and future residents), the concentration of particulates indoors is assumed to be reduced by 60%. The above equation is modified to account for this assumption, as follows:

$$\text{Intake (mg/kg-day)} = \frac{C_i \times IR_o \times FI \times ET_o \times EF \times ED}{BW \times AF \times AD} + \frac{C_i \times IR_i \times FI \times ET_i \times 0.4 \times EF \times ED}{BW \times AF \times AD}, \quad (14)$$

where

C_i = concentration of chemical, i, in air (milligrams per cubic meter), based on soil exposure concentration (Section 3.3.2.1.3),

IR_o = outdoor inhalation rate (cubic meters per hour),

IR_i = indoor inhalation rate (cubic meters per hour),

FI = fraction from contaminated source, calculated using scenario-specific exposure units (unitless) (Section 3.4.2.8),

ET_o = exposure time outdoors (hours per day),

ET_i = exposure time indoors (hours per day),

EF = exposure frequency (days/year),

ED = exposure duration (years),

BW = body weight (kilograms),

AF = averaging frequency (365 days/yr), and

AD = averaging duration [years (equal to ED for noncarcinogens and 70 yr for carcinogens)].

3.4.3.4 Ingestion of Contaminated Produce

3.4.3.4.1 Radiological Dose

The following equation is used to calculate the radiation doses from the ingestion of contaminated produce:

$$D_{ip} = R_{ip} \times IR_p \times F_{HG} \times EF \times DCF_i(Ing) \times ED, \quad (15)$$

where

D_{ip} = dose from ingestion of radionuclide, i, in produce (millirems),

R_{ip} = concentration of radionuclide, i, in produce (picocuries per kilogram), based on soil exposure concentration (Section 3.3.2.1.4),

IR_p = produce ingestion rate (kilograms per day),

F_{HG} = fraction of ingested produce that is grown on or collected from the contaminated area (unitless) (Section 3.4.2.6),

EF = exposure frequency (days per year),

$DCF_i(Ing)$ = dose conversion factor for ingestion of radionuclide, i (millirems per picocurie), and

ED = exposure duration (years).

The produce ingestion dose may be calculated with the RESRAD code using the methodology in Attachment II.

3.4.3.4.2 Chemical Intake

The following equation is used for calculating chemical intake via ingestion of contaminated produce:

$$\text{Intake (mg/kg-day)} = \frac{C_i \times IR_p \times F_{HG} \times EF \times ED}{BW \times AF \times AD}, \qquad (16)$$

where

C_i = concentration of chemical, i, in produce (milligrams per kilogram), based soil exposure concentration (Section 3.3.2.1.4),

IR_p = produce ingestion rate (kilograms per day),

FI_{HG} = fraction ingested produce that is grown on or collected from the contaminated area (unitless)(Section 3.4.2.6),

EF = exposure frequency (days per year),

ED = exposure duration (years),

BW = body weight (kilograms),

AF = averaging frequency (365 days/yr), and

AD = averaging duration [years (equal to ED for noncarcinogens and 70 yr for carcinogens)].

This equation is used for the current and future resident and future camper scenarios.

3.4.3.5 External Gamma Exposure

If direct measurements of the external radiation exposure levels from contaminated soil are available, the dose to current receptors may be estimated

as follows:

$$D_x = EL \times CF \times [(ET_i \times SF) + ET_o] \times EF \times ED \ , \qquad (17)$$

where

D_x = dose from external gamma radiation (millirems),

EL = outdoor exposure level at 1 m above ground averaged over the exposure unit (milliroentgens per hour),

CF = conversion factor (a function of the average gamma-ray energy) (millirems per hour per milliroentgens per hour),

ET_i = exposure time indoors (hours per day),

ET_o = exposure time outdoors (hours per day),

SF = shielding factor for indoor occupancy (0.7),

EF = exposure frequency (days/year), and

ED = exposure duration (years).

The RESRAD computer code (Attachment II) may be used to calculate the external gamma dose if direct measurements are not available.

3.4.3.6 Inhalation of Radon

The working-level month (WLM) is the unit of exposure used to calculate doses from direct measurement of radon (Section 3.3.2.1.6). It is defined as the exposure to 1 WL for 170 h (2,000 working hours per year). The WLM was used historically to report exposures to uranium miners. An exposure to 1 WLM of ^{222}Rn and ^{220}Rn decay products is equal to a committed effective dose equivalent of 1,000 mrem and 350 mrem, respectively (ICRP 1981, 1000). The ratio of inhalation rates for various scenarios (e.g., long-term worker or resident vs uranium miner) must be applied to correct for the implicit assumptions upon which the WLM is based.

The equation used to calculate dose from directly measured radon is

$$WLM = \frac{C_{Rn} \times IR \times ET \times EF \times ED}{CF} \ , \qquad (18)$$

where

WLM = working-level month,

C_{Rn} = indoor or outdoor air concentration of ^{222}Rn and ^{220}Rn decay products (WL),

IR = inhalation rate (cubic meters per hour),

ET = exposure time (hours per day),

EF = exposure frequency (days per year),

ED = exposure duration (years), and

CF = conversion factor, 204 m^3/mo [CF is the product of the inhalation rate assumed for uranium miners (1.2 m^3/h) and the number of working hours in 1 mo (170 h/mo)]

To estimate the dose from radon and radon decay products based on soil contaminant levels, the RESRAD code can be used (Attachment 1).

3.4.4 Equations for Exposure to Groundwater and Surface Water

This section describes the methodology for estimating chemical intakes and radiological doses for exposures based on concentrations in water. The following exposure routes are addressed: ingestion of groundwater or surface water, dermal absorption from groundwater or surface water, and inhalation from household use of groundwater. The equations presented are based on equations given in EPA's *Human Health Evaluation Manual* (EPA 1989, 0305).

3.4.4.1 Groundwater and Surface Water Ingestion

Radionuclide doses and chemical intakes from ingestion of alluvial groundwater and surface water are calculated based on exposure concentrations in groundwater and surface water (Section 3.3.2.2.1). The youth recreational user, future camper, and the future resident in a canyon bottom are considered the relevant scenarios for this exposure pathway (however, the youth recreational user would not ingest groundwater). Scenario-specific assumptions on exposure time, frequency, and duration, and the assumed ingestion rate are given in Attachment I.

3.4.4.1.1 Radiological Dose

The dose associated with intake of radioactive contaminants resulting from ingestion of groundwater or surface water can be calculated as follows:

$$D_{iw} = R_{iw} \times (IR_{gw} \text{ or } IR_{sw}) \times (EF \text{ or } EF_{sw}) \times ED \times DCF_i(Ing) \quad , \qquad (19)$$

where

D_{iw} = dose from ingestion of radionuclide, i, in water (millirem),

R_{iw} = exposure concentration of radionuclides in groundwater or surface water (picocuries per liter) (Section 3.3.2.2.1),

IR_{gw} = groundwater ingestion rate (liters per day),

IR_{sw} = surface water ingestion rate (liters per day),

EF = exposure frequency (for groundwater ingestion) (days per year),

EF_{sw} = exposure frequency (for surface water ingestion) (days per year),

ED = exposure duration (years), and

$DCF_i(Ing)$ = dose conversion factor for ingestion of radionuclide, i (millirems per picocurie).

3.4.4.1.2 Chemical Intake

The following equation is used for calculating chemical intake via ingestion of groundwater or surface water:

$$\text{Intake (mg/kg-day)} = \frac{C_i \times (IR_{gw} \text{ or } IR_{sw}) \times (EF \text{ or } EF_{sw}) \times ED}{BW \times AF \times AD}, \quad (20)$$

where

C_i = exposure concentration of chemical, i, in groundwater or surface water (milligram per liter) (Section 3.3.2.2.1),

IR_{gw} = groundwater ingestion rate (liters per day),

IR_{sw} = surface water ingestion rate (liters per day),

EF = exposure frequency (for groundwater ingestion) (days per year),

EF_{sw} = exposure frequency (for surface water ingestion) (days per year),

ED = exposure duration (years),

BW = body weight (kilograms),

AF = averaging frequency (365 d/yr), and

AD = averaging duration [years (equal to ED for noncarcinogens and 70 yr for carcinogens)].

Because chemical intakes for carcinogenic risk calculations are averaged over a lifetime of 70 years, the intakes calculated for use in carcinogenic risk estimates differ somewhat from those calculated for noncarcinogenic endpoint estimations.

3.4.4.2 Dermal Absorption from Groundwater and Surface Water

Dose estimates and chemical intakes for the dermal exposure pathway are calculated using the exposure concentrations in groundwater or surface water

(Section 3.3.2.1.2). Scenario-specific assumptions on the dermal exposure factors (exposure time, frequency, duration, and skin surface area) are given in Attachment II.

3.4.4.2.1 Radiological Dose

Only dermal absorption of tritium is evaluated (Section 3.3.2.1.2). Dermal absorption of tritium has been investigated for both air and water immersion. According to Pinson and Langham (957, 1008), the absorption rate of water vapor by skin is approximately 0.014 L/h (24°C, 100% humidity). Dermal absorption when skin is immersed in water that is the same temperature as the skin is estimated to be 2.5 times faster (0.035 L/h). These estimates are based on a total skin surface area of 1.9 m^2 and should be reduced in cases where only partial contact with the skin occurs (e.g., wading). The tritium uptake rate is simply the concentration of tritium per liter of water times the water absorption rate, as shown in the following equation:

$$D_{H\text{-}3} = C_{H\text{-}3} \times U \times (SA_{gw} \text{ or } SA_{sw}) \times (ET \text{ or } ET_{sw}) \times (EF \text{ or } EF_{sw}) \times ED \times DCF_{H\text{-}3}\ , \qquad (21)$$

where

$D_{H\text{-}3}$ = dose from dermal absorption of tritium (millirems),

$C_{H\text{-}3}$ = exposure concentration of tritium in water (picocuries per kilogram),

U = dermal absorption rate from submersion in water (1.8×10^{-6} L/h-cm^2),

SA_{gw} = skin surface area available for groundwater contact (square centimeters),

SA_{sw} = skin surface area available for surface water contact (square centimeters),

ET = exposure time (for groundwater contact) (hours per day),

ET_{sw} = exposure time (for surface water contact) (hours per day),

EF = exposure frequency (for groundwater contact) (days per year),

EF_{sw} = exposure frequency (for surface water contact) (days per year),

ED = exposure duration (years), and

$DCF_{H\text{-}3}$ = dose conversion factor for tritium uptake (6.3×10^{-8} mrem/pCi).

3.4.4.2.2 Chemical Intake

The following equation is used to estimate the dermal absorption of inorganic chemicals from groundwater or surface water:

$$\text{Intake (mg/kg-day)} = \frac{C_i \times CF \times K_p \times (ET_{gw} \text{ or } ET_{sw}) \times EV \times (EF \times ET_{sw})\ ED \times (SA_{gw} \text{ or } SA_{sw})}{BW \times AF \times AD}, \quad (22)$$

where

C_i = exposure concentration of chemical, i, in water (milligrams per liter),

CF = conversion factor (10^{-3} L/cm^3),

K_p = permeability coefficient, chemical-specific (centimeters per hour),

ET_{gw} = dermal contact time for exposure to groundwater (hours per event),

ET_{sw} = dermal contact time for exposure to surface water (hours per event),

EV = event frequency [events per day (equal to 1 event/day for youth recreational user, future resident, and future camper scenarios)],

EF = exposure frequency (days per year),

EF_{sw} = exposure frequency (for surface water contact) (days per year),

ED = exposure duration (years),

SA_{gw} = skin surface area available for contact with groundwater (square centimeters),

SA_{sw} = skin surface area available for contact with surface water, (square centimeters),

BW = body weight (kilograms),

AF = averaging frequency (365 d/yr), and

AD = averaging duration [years (equal to ED for noncarcinogens and 70 yr for carcinogens)].

The above equation applies to the youth recreational user, future camper, and future canyon bottom resident scenarios and assumes an absorbed dose that occurs during water contact events (i.e., wading and bathing). This equation is recommended for evaluating inorganic contaminants using the traditional steady-

state approach for estimating the dermally absorbed dose from water. Chemical-specific permeability coefficients for selected inorganics are summarized by EPA (1992, 1012); for other inorganics, the default assumption of 10^{-3} cm/h is used.

For organics, EPA is cautiously recommending a newer, non-steady-state approach EPA (1992, 1012). The agency feels that the model more accurately reflects normal human exposure conditions and that it accounts for the dose that may occur after the actual exposure event resulting from absorption of contaminants in skin lipids. However, it appears that the model may be overly conservative, and it is difficult to validate because data are lacking. Alternatively, the steady-state equation 23 may be used for organics by using permeability coefficients obtained from EPA (1992, 1012) in which experimentally measured or calculated values (i.e., based on octanol/water partition coefficients) are summarized for over 150 common organic compounds.

3.4.4.3 Inhalation from Household Use of Groundwater

Section 3.3.2.2 provides a discussion of this pathway.

3.4.5 Assessment of Exposure to Contaminated Building Surfaces

Radiation doses to current and future long-term workers resulting from contaminated building surfaces may be estimated using National Research Council methodology for dose assessments from residual radioactive contamination from decommissioning (Kennedy and Strenge 1993, 1002). That document provides detailed equations for estimating the dose to workers from external gamma radiation from contaminated surfaces, from inhalation of suspended surface contamination, and from inadvertent ingestion of surface contamination.

Section 3.3.2.3 provides a discussion of the evaluation of building surfaces contaminated with chemical substances.

4.0 TOXICITY ASSESSMENT

The toxicity assessment involves gathering information on potential health effects and/or toxicological properties of the chemicals of concern for subsequent comparison with estimated intake levels. Both noncarcinogenic and carcinogenic effects are considered in the toxicity assessment.

4.1 Types of Toxicological Information Considered in the Toxicity Assessment

In collecting toxicity information (much of this information will have been collected in the screening assessment phase but may need to be updated), the hierarchy established by Superfund guidance for the appropriate sources of toxicity values will be followed. The first choice for information is the Integrated Risk Information System (IRIS) (EPA 1993, 1062), which is a data base maintained by the EPA that contains the most up-to-date toxicity information and regulatory values for a number of chemicals. If the chemical of potential concern is not in IRIS, the Health Effects Assessment Summary Tables (HEAST) (EPA 1992, 0833) will be consulted. These tables are not as current as IRIS; however, unlike IRIS, they

contain interim as well as verified health-based values. If values are not available in IRIS or HEAST, toxicity values will be derived from alternate sources such as regulatory levels (e.g., maximum concentration levels in drinking water or comparative potency factors for PAHs). The basis and confidence for all toxicity values will be provided.

The outcome of this analysis will be a table of toxicity values for the chemicals of potential concern. Available toxicity information will be reviewed and summarized for each chemical of potential concern. This information will focus on health effects (both noncarcinogenic and carcinogenic) from chronic and/or subchronic exposure because these time spans are typically the exposure durations of concern when estimating human health risk. However, acute toxicity will also be considered. A chronic toxicity table will follow the table of toxicity values in the text to summarize critical effects and target organs associated with each chemical.

4.2 Toxicity Assessment for Noncarcinogenic Effects

The goal of this step is to identify reference doses (RfDs) for the various compounds. The RfDs, established by the EPA, are estimates of the daily exposure to the human population below which exposure is not likely to incur appreciable risk of noncarcinogenic deleterious effects during a lifetime. Reference concentrations are analogous to RfDs and are typically used to evaluate toxicity resulting from exposure via inhalation. These values are converted to a daily inhalation dose, an inhalation RfD. The RfD and/or reference concentration are used to evaluate the potential for noncarcinogenic health effects from a particular chemical.

4.3 Toxicity Assessment for Carcinogenic Effects

4.3.1 Nonradiological Contaminants

The cancer slope factor is an upper-bound estimate of cancer risk associated with exposure to a particular chemical and is used to estimate the lifetime excess cancer risk associated with the estimated chemical intake for that chemical. The EPA's weight-of-evidence classification will be provided to indicate the confidence in the evidence used to classify a chemical as a carcinogen. The EPA classifies chemicals in Groups A, B1, B2, C, D, and E. Group A chemicals are those chemicals considered to be human carcinogens because sufficient evidence has been obtained to demonstrate carcinogenicity in humans. Group B chemicals are probable human carcinogens. A classification of B1 indicates limited evidence of carcinogenicity in humans, and B2 indicates demonstrated evidence of carcinogenicity in animals with inadequate or lack of evidence in humans. Group C suggests only the possibility of human carcinogenicity because evidence of carcinogenicity in animals is limited and data on humans are inadequate or lacking. Group D compounds are not classifiable as to human carcinogenicity because of inadequate or no evidence, and Group E chemicals show evidence of noncarcinogenicity. The cancer slope factors are used to estimate the excess cancer risk associated with exposure to potential carcinogens.

4.3.2 Radiological Contaminants

The toxic effects of radiological contaminants are distinctly different from those of nonradiological contaminants. Therefore, a separate section will be included in

the analysis to discuss the chronic toxicity of radionuclides. It is recognized that exposure to radionuclides can have several health effects, such as teratogenesis and mutagenisis; however, carcinogenicity will be the focus of toxicity assessment and risk characterization because it is the principal adverse biological effect following chronic exposure and is well documented.

4.4 Identifying Appropriate Toxicity Values for Risk Assessment

RfDs and cancer slope factors are EPA's preferred toxicity values; therefore, when available, they will be used for the quantitative portion of the toxicity assessment. Alternate sources will be used (also when available) for those compounds that do not have published toxicity values, and toxicity values will be derived from these data, if possible. Additional information may include controlled epidemiologic investigations, clinical studies, and experimental animal studies. A toxicologist will review this information and, if it is determined that the information is adequate to establish a valid toxicity value, the toxicologist will derive a toxicity value.

4.5 Uncertainties Related to Toxicity Information

For those compounds that have established RfDs, the confidence in the RfD and the data base of toxicological information will be provided. The weight of evidence for the carcinogenic potential of compounds will also be discussed. Uncertainty is increased when alternate means are used to derive toxicity values. The uncertainty generated from the various methods used to estimate toxicity values will be examined. When no toxicity information is available, the limitations and impact inherent to excluding contaminants of concern can be great. The cumulative consequences of uncertainty from the different sources of toxicity information (or lack thereof) will be described and quantified to the extent possible.

5.0 RISK CHARACTERIZATION

5.1 Quantifying Risks

Risk characterization involves integrating the exposure and toxicity assessments in quantitative and qualitative expressions of potential health risk. The data from the initial tasks are reviewed, and the carcinogenic and noncarcinogenic risks are quantified for individual and multiple chemicals.

To characterize potential noncarcinogenic effects, chemical intakes and toxicity values are compared. The hazard quotient is the ratio of a chemical exposure level over a specified amount of time to an RfD for that chemical. The hazard quotient is not a statistical probability that a noncarcinogenic effect will occur but is rather a comparison of the exposure level and the appropriate toxicity value. The hazard quotients for several chemicals are summed for a particular pathway to yield a hazard index for that pathway. All hazard indices in an exposure scenario will be totaled. Hazard indices are not mathematical probabilities of the incidence or severity of an adverse health effect but a numerical index of a recommended safety threshold. A hazard index or hazard quotient greater than 1 indicates a potential health risk. If a hazard index exceeds 1, the hazard index is segregated by target organ on a chemical-by-chemical basis. A hazard index of less than 1 suggests that site-related contaminants are not likely to present a health risk

under the given exposure scenario.

Carcinogenic risk is characterized by estimating the probability that an individual will develop cancer over a lifetime as a result of exposure to a potential carcinogen. The probability of developing cancer is estimated by multiplying the cancer slope factor by the calculated intake. The carcinogenic risk estimate is generally an upper-bound estimate of risk, which means that the "true risk" probably does not exceed the risk estimates generated for the assessment and is likely to be less than the predicted risk. Again, risk is summed by chemical and pathway to determine the scenario cancer risk.

Exposure to radiological contaminants of concern are calculated by using the RESRAD computer code, which generates annual doses for potential receptors. The dose estimates are compared with the DOE's dose limit of 25 mrem/yr, which is based on exposure to an individual from a single site. This dose estimate is not combined with nonradiological risk. The contribution to adverse carcinogenic health effects from exposure to radionuclides will be discussed in the risk assessment in conjunction with carcinogenic risk from nonradiological constituents.

5.2 Combining Risk Across Exposure Pathways

The resulting carcinogenic and noncarcinogenic risks are added across exposure pathways in an exposure scenario. Additionally, combined impacts from multiple exposure scenarios are assessed if exposure to more than one scenario is possible (e.g., a child exposed in both recreational and residential scenarios).

5.3 Assessing and Presenting Uncertainty

The risk assessment will also discuss the uncertainties inherently associated with all components of the risk assessment process. The uncertainty analysis will highlight the areas in which assumptions were incorporated because sufficient data were not available to accurately characterize the risks associated with a particular exposure. The implication of these uncertainties on the overall risk results will be discussed fully. Whenever possible, uncertainty analysis will include a quantitative evaluation. The general approach, when it is necessary to make assumptions about the frequency or magnitude of exposures, will be to use conservative assumptions so that risk is never underestimated.

5.4 Summarizing and Presenting the Results of Baseline Risk Characterization

Once the carcinogenic and noncarcinogenic risks have been assessed for a site, a determination will be made of which contaminants, media, and pathways present the greatest risks for each scenario. The conclusions will be summarized in the text, and the risk values will be in tabular form.

ATTACHMENT I

RISK ASSESSMENT FOR LOS ALAMOS NATIONAL LABORATORY: SUGGESTED VALUES FOR SCENARIO PARAMETERS

Parameter	Unit	Long-Term Worker[a]	Construction Worker[b]	Youth Recreational User[c]	Resident[d]	Future Camper[e]
General Exposure Parameters						
Total Exposure Time (ET)	h/d	8	8	2	20	24
Exposure Time Outdoors (ET_o)	h/d	0-8	8	2	2	24
Exposure Frequency (EF)	d/yr	250	90	170	350	28
Exposure Duration[f] (ED)	yr	25	1	9	30	20
Area of Exposure Unit[g] (A_{EU})	m^2	500	Area of Contamin-ation	2000	500	2000
Body Weight[h] (BW)	kg	70	70	50	70 Adult 15 Child	70 Adult 15 Child
Indoor Shielding Factor for External Gamma (SF)	%	70	NA[i]	NA	70	NA
Pathway-Specific Exposure Parameters						
Inhalation Pathway						
Inhalation Rate[j] (IR_a)	m^3/h	0.83 Indoors 1.7 Outdoors	1.7	3.2	0.83 Indoors 1.7 Outdoors	1.3
Particulate Concentration in Air[k] (PC)	mg/m^3	0.09	15	PRS-specific	0.09	0.09
Amount of Outdoor Dust Present Indoors[l]	%	40	NA	NA	40	NA
Ingestion Pathways						
Soil Ingestion Rate[m] (IR_s)	mg/d	50 or 100	480	100	100 Adult 200 Child	100 Adult 200 Child
Groundwater Ingestion Rate[n] (IR_{gw})	L/d	1	1	NA	2	2
Surface water Ingestion Rate[n] (IR_{sw})	L/d	1	1	0.05	0.05	0.05
Exposure Frequency for Surface Water Ingestion[o] (EF_{sw})	d/yr	NA	NA	40	40	28
Produce or Berry Ingestion Rate[p] (IR_p)	g/d	NA	NA	NA	340	140
Fraction Ingested Produce Grown on Contaminated Area[p] (F_{HG})	%	NA	NA	NA	30	100
Soil Dermal Contact Pathway						
Exposure Frequency for Soil Dermal Contact[q] (EF_d)	events/yr	NA	90	170	170	28
Skin Surface Area Available for Soil Contact[r] (SA_s)	cm^2/event	NA	3200 (arms & hands)	5000	5000	5000
Soil-to-Skin Adherence Factor[r] (ADF)	mg/cm^2	NA	1	1	1	1
Groundwater Dermal Contact Pathway						
Dermal Contact Exposure Time for Groundwater (ET_{gw})	h/event	NA	NA	NA	0.25	NA
Skin Surface Area Available for Groundwater Contact[r] (SA_{gw})	cm^2/event	NA	NA	NA	20,000	NA

Parameter	Unit	Long-Term Worker[a]	Construction Worker[b]	Youth Recreational User[c]	Resident[d]	Future Camper[e]
Surface Water Dermal Contact Pathway						
Dermal Contact Exposure Time for Surface Water (ET_{sw})	h/ event	NA	NA	1	1	1
Exposure Frequency for Surface Water Dermal Contact[o] (EF_{sw})	d/yr	NA	NA	40	40	28
Skin Surface Area Available for Surface Water Contact[r] (SA_{sw})	cm^2/ event	NA	NA	5000	5000	5000

a. Current and future long-term workers; usually will assume 4 h/d working outdoors (represents reasonable maximum exposure). Primarily for mesa top areas but may be used for canyon bottoms, as appropriate.

b. Construction worker; for evaluation of exposure to areas of surface and subsurface contamination as appropriate. Evaluation limited to contaminants in soils at depths of 12 ft or less.

c. Youth recreational user of canyon sides and bottoms. Receptor is a youth age 10 to 18 using canyon sides and bottoms for hiking or biking. This is the only land use scenario applicable for areas of contamination on canyon sides. Although unlikely as a current use scenario because of institutional controls on Laboratory property, it is possible that limited trespassing occurs.

d. Current or future resident is a resident of extra-Laboratory areas (may include some canyon bottom areas in the future). This scenario does not apply to Laboratory property, for which future land use will be controlled by DOE.

e. Future camper on Laboratory mesa top or canyon bottom areas, assuming the site is released for recreational use (e.g., released to National Park Service).

f. Exposure duration for occupational and residential scenarios (i.e., 25 and 30 yr) recommended by the EPA (1991, 0746). For youth recreational user, 9 yr is the age-range duration and is also the median time at one residence (EPA 1989, 0305). Construction worker exposure duration is chosen based on assumption that projects will be of limited scope. Future recreational users are assumed to use site as long-term vacation area.

g. Area of residential exposure unit based on EPA guidance (EPA 1989, 0305). Other areas based on assumptions on likely scenario-specific activity patterns.

h. Body weights: 70 kg for adult scenarios (EPA 1991, 0746); 50 kg for youth scenarios, 12 to <15 yr old (EPA 1989, 0304); 15 kg for child 1-6 yr old (EPA 1991, 0746).

i. Not applicable.

j. Inhalation Rates: standard default value of 0.83 m^3/h used for indoor residential and indoor long-term worker exposures (EPA 1991, 0746). Inhalation rates accounting for resting, light, moderate, and heavy activity (EPA 1989, 1011) are calculated for other scenarios as follows:

- Long-term or Construction Worker, Resident—outdoor inhalation rate of 1.7 m^3/h equal to 0.5 exposure time at light activity + 0.5 exposure time at moderate activity, adult male inhalation rate.
- Youth Recreational User—inhalation rate of 3.2 m^3/h equal to entire exposure time at moderate activity, inhalation rate for 10-yr olds.
- Future Camper—inhalation rate of 1.3 m^3/h equal to 8 h/d resting, 12 h/d light activity, 2 h/d moderate activity, and 2 h/d heavy activity, adult male inhalation rate.

- Definitions—resting: reading, sleeping, watching television; light activity: domestic work, personal care, minor indoor repairs and home improvements; moderate activity: heavy indoor cleanup, major indoor repairs, climbing stairs; heavy activity: vigorous physical exercise, climbing stairs carrying a load (EPA 1989, 1011).

k. Reference for 0.09 mg/m^3 particulate concentration in air is Environmental Protection Group (1990, 0497). Value of 15 mg/m^3 considered maximum for construction worker scenarios (OSHA 1991, 0610).

l. Based on value given in Alzona et al. (1979, 0994). Only applies for inhalation pathways and for soil ingestion pathway where entire exposure occurs indoors.

m. Standard default soil ingestion rates recommended by EPA (1991, 0746). For the resident and future camper scenarios, the soil ingestion pathway assumes an ingestion rate of 200 mg/d and a body weight of 15 kg for 6 yr exposure as a child and an ingestion rate of 100 mg/d and a body weight of 70 kg for 24 yr and 14 yr, respectively, for exposure as an adult. Long-term worker rates of 50 or 100 mg/d are rates recommended for commercial/industrial scenarios by EPA (1991, 0746). Rate of 480 mg/d for the future construction worker based on EPA guidance (1991, 0746) to account for substantial soil contact and potential ingestion of inhaled material that is not retained in the lungs.

n. For groundwater, standard default water ingestion rate recommended in EPA (1991, 0746). For surface water ingestion, 0.05 L/d based on EPA recommended ingestion level of 50 mL/h for the 1-h exposure time (EPA 1989, 0305).

o. Exposure frequency for surface water ingestion and dermal exposure equal to total exposure frequency (28 d/yr) for the future camper; equal to 40 d/yr for the youth recreational user and future residents (based on best professional judgment of likely wading frequency.

p. Produce ingestion rate and fraction produce grown on or collected from the contaminated area: 340 g/d, 30% for residential scenario includes ingestion of vegetables and fruits; 140 g/d, 100% for future recreational user for fruits only (EPA 1991, 0746).

q. Number of soil dermal contact events equal to exposure frequency, except for residential scenario. For residents, it is assumed that dermal contact occurs seasonally (e.g., during gardening), about 5 d/wk for 8 mo/yr.

r. Skin surface area available for contact and soil-to-skin adherence factor assumptions, as recommended in EPA (1992, 0833).

ATTACHMENT II

METHODS FOR USING RESRAD IN ER PROGRAM RISK ASSESSMENTS

1.0 BACKGROUND

DOE Order 5400.5 (DOE 1990, 0080) requires that the methodology incorporated in the RESRAD computer code (Gilbert 1987, 0312; Yu et al. 1993, 1014) be used to establish soil cleanup guidelines for radionuclide contamination at DOE sites. With some minor modifications of input data and output results, which are outlined in this attachment, the RESRAD code can also be used in implementing the proposed risk assessment methodology for soil contaminated with radionuclides. The use of a computer code, such as RESRAD, carries the additional advantage of minimizing data input and calculational errors.

RESRAD is a pathway analysis code that calculates radiation doses to an onsite individual from chronic exposure to soil contaminated with radionuclides. The RESRAD code allows the user to define up to nine pathways and three exposure routes: external gamma dose from radionuclides in soil; inhalation dose from contaminated dust and radon gas; and ingestion dose from intake of contaminated plants, meat, milk, aquatic foods, water, and soil. A variety of scenarios, including residential, industrial, and recreational, can be modeled by adding or suppressing pathways and entering appropriate values for occupancy and consumption rates.

The following exposure pathways will be considered:

- external exposure from gamma-emitting radionuclides in soil,
- inhalation of airborne particulates originating from contaminated soil,
- inhalation of radon progeny caused by radon emanations from soil contaminated with radon precursors,
- ingestion of contaminated soil, and
- ingestion of produce grown on contaminated soil.

In the discussion that follows, it is assumed that the reader is familiar with the operation of the RESRAD code (i.e., is experienced in entering data, running the code, and obtaining results) or has access to the user's guide.

To provide conservative results that are compatible with the calculations performed for chemicals, leaching of radionuclides from the contaminated zone is neglected for all pathways, which also has the effect of suppressing the water-dependent pathways. To set the leach rate to 0, the distribution coefficients for the radionuclides in the contaminated zone should all be set to a very large number (e.g., 106). This way, only the radioactive decay is taken into consideration. Also, the erosion rate of the contaminated zone should be set to 0.

The RESRAD code calculates doses on an annual basis. The maximum dose from most radionuclides occurs at time 0. However, for some radionuclides, the ingrowth of decay products may result in higher dose rates at a later time. To obtain a conservative total dose estimate, the maximum annual dose calculated for each radionuclide should be multiplied by the exposure duration (in years). However, for radionuclides such as ^{60}Co whose half-lives are short relative to the exposure duration, the user may choose to have the code calculate doses at regular intervals throughout the period of exposure. For example, if the exposure duration is 30 yr, the user could have the code calculate doses at 3-yr intervals (t=0, 3, 6, ..., 27 yr). The resulting annual doses are then summed and multiplied by 3 to obtain the total dose received during the exposure period.

With the exception of the external exposure pathway and the plant ingestion pathway, the concentrations entered in the code should cover the entire exposure unit area. The appropriate depth of the contamination should be entered as input to the code (e.g., 0.15 m for surface soil contamination). When exposure to future receptors from subsurface contamination is evaluated, a zone of surface contamination is created by assuming that the contaminated subsurface soil is excavated and distributed over the exposure unit area. The average depth of the contaminated layer to be entered in the code is calculated by dividing the volume of the excavated soil by the exposure unit area. If this thickness exceeds 0.15 m, then 0.15 m should be entered.

For external exposure and plant ingestion pathways, the contaminant concentrations entered in the code should be derived from measurements taken over the area of contamination rather than the exposure unit area.

The RESRAD code calculates area factors that are used to take into account uncontaminated areas when the contaminated zone is small relative to the size of the exposure unit. However, RESRAD does not allow the user to change the size of the exposure unit parameter. For all pathways except external exposure, it is recommended that the area of the contaminated zone be set to the RESRAD default of 10,000 m^2, which results in an area factor of 1 calculated by the code. Because the concentrations entered in the code are averaged over the exposure unit area, no further adjustment may be needed for certain pathways.

2.0 EXPOSURE TO EXTERNAL RADIATION

The RESRAD computer code allows the user to estimate the exposure from gamma-emitting radionuclides in soil. A conservative assumption made in the RESRAD code is that the receptor is located roughly at the center of a homogeneously contaminated area. Because the dose contributions from external gamma exposure are not a linear function of area size, the exposure unit area concept is not valid for this pathway. The RESRAD code adjusts the dose automatically as a function of area size. Therefore, the user should enter the concentrations of contaminants that are present in the area of contamination rather than dilute the concentrations over the receptor-specific exposure unit.

The following parameters are important in calculating the external dose:

- area, thickness, and bulk density of soil in the contaminated zone;

- thickness and soil density of the cover (for subsurface contamination);
- fraction of time during the year that the receptor spends outdoors, indoors, and away from the contaminated area; and
- shielding from external gamma radiation afforded by buildings during indoor occupancy.

Adjusting the dose to reflect the shape of the contaminated zone is recommended only when the contaminated area is less than 1,200 m^2 and when the shape deviates considerably from that of a circular area. Appendix A of the RESRAD manual provides instructions on how to calculate the shape factor for a noncircular contaminated area.

In the case of subsurface contamination, two cases may be run. To assess current exposures, the exposure scenario is modeled by entering the thickness and density of the material covering the subsurface contamination. For future exposures, the contaminated soil is assumed to be redistributed over an area encompassing the exposure unit. In this case, no cover is assumed to be present, and the average thickness of the contaminated zone covering the exposure unit area will be equal to the excavated volume divided by the exposure unit area or 15 cm, whichever is smaller.

The fraction of time spent indoors or outdoors entered in the RESRAD code is calculated based on annual averages. These fractions can be calculated as follows:

$$f_i = \frac{ET_i \times EF}{8{,}766}, \text{ and}$$

$$f_o = \frac{ET_o \times EF}{8{,}766},$$

where

f_i = fraction of year spent indoors (dimensionless),

f_o = fraction of year spent outdoors (dimensionless)

ET_i = exposure time indoors (hours per day),

ET_o = exposure time outdoors (hours per day),

EF = exposure frequency (days per year), and

8,766 = number of hours in a year (hours per year).

The RESRAD default value for the shielding factor during indoor occupancy is 0.7 (i.e., indoor exposure levels are 30% lower than outdoor levels).

3.0 INHALATION OF CONTAMINATED DUST

The RESRAD code uses a mass-loading model to estimate the concentration of contaminants in air resulting from resuspension of contaminated soil. The mass-loading model assumes that the contaminant concentration in airborne dust is the same as the concentration in soil adjusted for the presence of a ground cover (e.g., grass, pavement), depth of the contaminated soil, and area size.

The following parameters are important in calculating the dust inhalation dose:

- inhalation rate;
- mass loading of respirable particulates;
- fraction of time during the year that the receptor spends outdoors, indoors, and away from the contaminated area;
- reduction in outdoor dust levels afforded by buildings during indoor occupancy;
- thickness of soil in the contaminated zone; and
- thickness of the cover (for subsurface contamination).

Inhalation rates entered in RESRAD must be converted to units of cubic meters per year. If separate inhalation rates are given for outdoor and indoor activities, a time-weighted average inhalation rate should be entered. (Time spent away from the contaminated area should not be included in the time-weighted average.) In obtaining this average, any reductions in the dust levels during indoor occupancy must also be considered. The following equation should be used to derive the time-weighted indoor/outdoor inhalation rate:

$$IR = EF \times \frac{(0.4 \times ET_i \times IR) + (ET_o \times IR_o)}{(0.4 \times ET_i) + ET_o},$$

where

IR = weighted average annual inhalation rate (cubic meters per year),

EF = exposure frequency (days per year),

0.4 = reduction factor for indoor dust that is of outdoor origin (dimensionless),

ET_i = exposure time indoors (hours per day),

IR_i = indoor inhalation rate (cubic meters per hour),

ET_o = exposure time outdoors (hours per day), and

IR_o = outdoor inhalation rate (cubic meters per hour).

Time fractions spent indoors and outdoors are calculated in the same way as that for the external exposure pathway.

A cover and depth factor calculated by RESRAD accounts for mixing of contaminated soil that may occur with underlying or overlying uncontaminated soil. If no cover is present and the contaminated layer is thicker than the mixing depth (set to 1 cm for the inhalation pathway, assuming no gardening), the cover and depth factor calculated by the code is 1 (i.e., no dilution). This will be the case for most surface contamination scenarios. If subsurface contamination is present and is assumed to be redistributed over the exposure unit area, RESRAD calculates a cover and depth factor less than 1 if the thickness of contaminated soil, averaged over the entire exposure unit area, is less than 1 cm.

In RESRAD, the area of the contaminated site and a dilution length are used to calculate an area factor that accounts for dilution from uncontaminated sources. This area factor is calculated as

$$FA = \frac{\sqrt{A}}{\sqrt{A} + DL},$$

where

FA = area factor for inhalation pathway,

A = area of contaminated zone (square meters), and

DL = dilution length (meters).

Conservative results that neglect dilution with uncontaminated dust from outside the exposure unit can be obtained by forcing the area factor to equal 1, which is accomplished by setting the value of DL to 0.

4.0 INHALATION OF RADON

The RESRAD code allows the user to estimate the dose to an onsite receptor resulting from inhalation of ^{222}Rn and ^{220}Rn (and their short-lived progeny) emanating from soil contaminated with radionuclides in the natural uranium and thorium decay series. Except for the mass-loading factor and the dust reduction factor for indoor occupancy, the same parameters that are important in the dust inhalation pathway are also important in the radon inhalation pathway. In addition, the following parameters are also important:

- density and porosity of cover and contaminated soil;
- density, thickness, and porosity of building foundation;
- diffusion coefficient or volumetric water content in cover, contaminated soil, and foundation;
- building height and air exchange rate;
- average annual wind speed; and

- radon emanation fraction.

In the absence of site-specific data for the above parameters, the RESRAD defaults may be used because they are representative of national average values.

For combinations of indoor and outdoor occupancy, the time-weighted average inhalation rate is calculated in the same way as for the dust inhalation pathway, except that the dust reduction factor for indoor occupancy is set to 1 rather than to 0.4 (i.e., no reduction).

The maximum radon dose may not occur at time 0 unless only the immediate precursors are present in the soil. Instead, the radon dose may increase over time as the result of ingrowth of radionuclides in the uranium or thorium decay series.

5.0 INGESTION OF CONTAMINATED SOIL

Doses from soil ingestion can be calculated using the RESRAD code. In the RESRAD model, the cover and depth factor derived for the inhalation models also applies to the soil ingestion model. However, RESRAD uses an area factor that is set to 1 if the contaminated area is greater than or equal to 1,000 m^2; otherwise it is the area divided by 1,000 m^2. Because the concentrations used in the RESRAD input will have already been adjusted for the appropriate exposure unit, an area of 1,000 m^2 or greater should be entered. Other important parameters include the soil ingestion rate and the fraction of time during the year that the receptor spends outdoors, indoors, and away from the contaminated area.

Because RESRAD allows the input of a single soil ingestion rate, an age-weighted average value is required to account for increased intakes during childhood years:

$$IR = 10^{-3} \times EF \times \frac{(IR_c \times ED_c) = (IR_a \times ED_a)}{ED_c + ED_a},$$

where

IR = age-weighted average soil ingestion rate (grams per year),

10^{-3} = conversion factor (grams per year),

EF = exposure frequency (days per year),

IR_c = child soil intake rate (milligrams per year),

IR_a = adult soil intake rate (milligrams per year),

ED_c = child exposure duration (years), and

ED_a = adult exposure duration (years).

Because the intake rate calculated above already factors in the exposure frequency, no correction is required for time spent inside, outdoors, or offsite. To prevent RESRAD from further correcting the soil intake rate, the parameter for time fraction outdoors onsite should be set to 1 (the time fraction indoors should be set to 0).

For workers that spend all their time indoors, the intake rate in milligrams per day should be multiplied by the exposure frequency in days per year and converted to grams per year. The RESRAD code automatically reduces the result by a factor of 0.4 (using the shielding factor for inhalation) to account for the fraction of soil ingested that originates outdoors. In this case, the fraction of time spent indoors should be set to 1 (the time fraction spent outdoors should be set to 0).

For a combination of outdoor and indoor activities, the time fractions are calculated as

$$f_i = \frac{ET_i}{ET_i \times ET_o} \text{, and}$$

$$f_o = 1 - f_i \text{ ,}$$

where the above parameters have been previously defined.

6.0 INGESTION OF CONTAMINATED PRODUCE

The RESRAD code can be used to estimate the radiation dose from ingestion of produce grown on contaminated soil. The model used in RESRAD accounts for the transfer of radionuclides in plants resulting from root uptake and foliar deposition. The contribution from contaminated irrigation water is set to 0, explicitly by setting the irrigation rate to 0 or implicitly by setting the radionuclide distribution coefficients in soil to a very large number (thus suppressing groundwater transport).

Because a relatively small area is required to grow produce for personal consumption, the exposure unit concept does not apply to the plant ingestion pathway. Concentrations entered in the code should be derived from the actual area of contamination. To prevent the RESRAD code from applying an area correction factor for small areas, the area of contamination should be entered as 1,000 m^2 or larger.

Other parameters in RESRAD important in calculating doses from ingestion of produce are

- produce consumption rates (leafy vegetables and other vegetables, fruit, and grain);
- soil-to-plant contaminant transfer factors (for root uptake);
- depth of plant roots;
- soil mixing layer; and
- mass loading of dust in air (for foliar deposition).

The ingestion rates entered in the code should be the annual average consumption of produce assumed to be grown or picked onsite and should not include any imported produce. Although it does not make a difference in the calculations which category of produce is selected (leafy vegetables or other vegetables, fruits, and grains), it is recommended that the consumption rate of leafy vegetables be set to 0.

The RESRAD code uses a mass-loading parameter for foliar deposition of resuspended contaminants that is not consistent with the approach presented in Section 3.3.2.1.4. This parameter should be set to 0 in the code input. To account for the differential transfer of contaminants through root uptake or foliar deposition, the transfer factor libraries should be modified using the following procedure.

In Section 3.3.2.1.4, a methodology is developed to account for the presence of surface and/or subsurface zones of contamination, each with potentially different concentrations of contaminants. Contaminants transferred to plants through foliar deposition originate from the surface layer of soil, whereas the contaminants transferred to plants through root uptake may originate from surface as well as from subsurface layers, depending on root depth.

Two separate runs are required to calculate the transfer of contaminants from soil to roots and from soil to leaves. In each run, the concentrations entered in the code are as follows:

- for root uptake, the concentrations may be entered either as the weighted average concentrations over the length of the roots (setting the thickness of the contaminated zone equal to the root depth) or as the surface concentrations if no subsurface contamination is present (setting the thickness of the contaminated zone to 15 cm), and

- for foliar deposition, the concentrations in the topmost 15 cm of soil should be entered.

For root uptake, the RESRAD default parameters for root uptake transfer factors may be used, or they may be changed to site-specific values if such data are available. For foliar deposition, values for a mass-loading transfer factor may be obtained for different types of vegetation from NUREG/CR-5512; these are not contaminant-specific but differ according to plant type. Before using them in RESRAD, these mass-loading transfer factors must be converted from a dry-plant- weight basis to a wet-weight basis using conversion factors provided in NUREG/CR-5512.

The dose contributions from the root uptake and foliar deposition runs are summed to obtain the total dose from ingestion of produce. However, RESRAD automatically assumes that only half of the produce ingested is grown onsite. Therefore, this total dose must be multiplied by a factor of 2.

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■ APPENDIX J

Screening Assessment Methodology

1.0 INTRODUCTION

Screening assessments are performed at Los Alamos National Laboratory (the Laboratory) to identify the presence of contaminants of concern at potential release sites (PRSs). Contaminants of concern are constituents whose concentration levels in one or more environmental medium are above a level of concern defined by medium-specific screening action levels (SALs). The screening assessment begins with the identification of potential constituents and environmental media of concern based on knowledge of the history and processes that occurred at a PRS. Existing or new environmental data collected during the Resource Conservation and Recovery Act (RCRA) field investigation (RFI) are then compared with SALs for the constituents identified.

The principal test carried out during screening assessments is the comparison of sampling data with SALs. If SALs are not exceeded, the PRS may be recommended for no further action (NFA). If SALs are exceeded, further evaluation, either statistical or by sampling, is required at the PRS. However, some additional screening may be necessary if two or more constituents are present to determine the potential for combined effects. When SALs are lower than background concentrations, constituent concentrations are compared with background distributions as an additional step in screening assessment. Table J-1* presents a summary of SALs for nonradiological potential chemicals of concern. The SALs for radionuclides are presented in Table J-2.

SALs will be used only for screening assessments and are not to be used as cleanup criteria in a corrective measures study or corrective measures implementation. If the results of the screening assessment show that chemical-specific levels are exceeded, more site-specific data and analysis may be needed.

2.0 SCREENING ACTION LEVELS FOR NONRADIOLOGICAL CONSTITUENTS

The Environmental Restoration (ER) Program at the Laboratory takes its primary direction from EPA guidance (EPA 1989, 0088). Subsequent guidance, Corrective Action for Solid Waste Management Units (Subpart S) (EPA 1990, 0432), a proposed regulation under RCRA, presents a methodology for calculating action levels to determine the need for further evaluation of contamination in various environmental media (i.e., groundwater, surface water, air, and soil). The action levels are calculated using chemical-specific toxicity values and default exposure parameters. In order to comply with the Hazardous and Solid Waste Amendments (HSWA) Module for the Laboratory, SALs have been developed that follow the Subpart S methodology for exposure parameter defaults but that incorporate more recent toxicity values available from the Environmental Protection Agency's (EPA's) Integrated Risk Information System (IRIS) data base (EPA 1993, 1062) and Health Effects Assessment Summary Tables (HEAST) (EPA 1992, 0833), which are updated periodically.

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*In this appendix, the tables are located after the text.

2.1 Assumptions

A summary of the nonradiological SAL values is presented in Table J-1. These values are based on the methodology presented under proposed Subpart S (EPA 1990, 0432) and on toxicity values [i.e., reference doses (RfDs) and carcinogenic slope factors] from the IRIS data base (EPA 1993, 1062) or the HEAST (EPA 1992, 0833). Table J-3 contains the toxicological information used for establishing nonradiological SALs. The constituents included in Tables J-1 and J-3 are those on the EPA's Target Analyte List (EPA 1991, 0814), Target Compound List (EPA 1991, 1074), and potential high-explosive compounds used at the Laboratory. Other constituents may need to be added as the results of site characterization become available. Tables J-1 and J-3 will be updated annually to reflect any modified toxicity values.

SAL derivations are based on the following assumptions and equations contained in proposed Subpart S:

1. To take the most conservative approach in deriving soil SALs that consider systemic (i.e., noncarcinogenic) effects, the model assumes that a 16-kg child ingests soil at a rate of 200 mg/day. For carcinogenic constituents in soil, the long-term exposure of an adult is modeled. For this calculation, it is assumed that a 70-kg adult ingests soil at a rate of 100 mg/day over a 70-yr exposure duration.

2. A modification of the Subpart S methodology has been introduced to account for exposure to organic compounds volatilizing from soil. The modification is applied to account for potential inhalation exposure, as presented in more recent EPA guidance for calculating preliminary remediation goals (EPA 1991, 0302). The Laboratory's Environmental Restoration (ER) Program has selected this approach because SALs for volatile substances calculated using this modified approach are lower (i.e., more conservative) than those calculated using the unmodified Subpart S method. For the purpose of calculating SALs, volatile constituents are defined as those with a molecular weight less than 200 and a Henry's Law Constant greater than 1×10^{-5} atm/m^3-mole (EPA 1991, 0302).

   The equation for calculating SALs for volatile constituents has been expanded to account for potential inhalation exposure (equations are given in Section 2.2, below). The soil-to-air volatilization factor was calculated based on an equation given by EPA (1991, 0302) and chemical-specific parameters (Strenge and Peterson 1989, 0837; EPA 1988, 0747). The default particulate emission factor was used in SAL calculations for volatile constituents to maintain consistency with the equation given in EPA guidance (EPA 1991, 0302), although this factor is so low that it does not affect the calculated SALs. To calculate SALs for volatile constituents that have systemic effects, the investigators use a model in which a 16-kg child ingests soil at a rate of 200 mg/day and inhales 20 m^3/day of air. The SAL calculation for carcinogenic volatile constituents models exposure of a 70-kg adult over a 70-yr exposure duration, with a soil ingestion rate of 100 mg/day and an

inhalation rate of 20 m^3/day.

3. In deriving SALs for constituents in water, it is assumed that a 70-kg adult ingests water at a rate of 2 L/day over a 70-yr exposure duration. These SALs apply to constituents in both groundwater and surface water.

4. In deriving SALs for constituents in air, it is assumed that a 70-kg adult inhales air at the rate of 20 m^3/day, 70-yr exposure duration.

5. Proposed Subpart S specifies the use of maximum contaminant levels (MCLs) promulgated under the Safe Drinking Water Act as action levels for groundwater constituents. Subpart S also indicates that state water quality standards established pursuant to the Clean Water Act, Section 303c, will be used as action levels for surface water constituents when these standards have been established for the surface water body in question. When numeric water quality standards have not been established by the state, Subpart S specifies that MCLs will be used as action levels if the state designates the surface water as a drinking water source.

In keeping with Subpart S, when the MCL value or state groundwater standard is not available, the value calculated using the specified exposure assumptions for water (No. 3 above) will be used as the SAL. Although not specifically stated, it is consistent with Subpart S to use the same SAL criteria for both groundwater and surface water constituents. For surface water constituents, these criteria may be more stringent than required because New Mexico has not designated surface waters to be evaluated as drinking water sources.

2.2 Equations

2.2.1 General Equations for Calculating SALs

2.2.1.1 Systemic Toxicants

$$SAL = \frac{THI \times RfD \times BW \times CF}{I \times A}, \qquad (1)$$

where

SAL	=	mg/kg for soil, µg/L for water, µg/m^3 for air ;
THI	=	target hazard index: 1;
RfD	=	chronic reference dose (mg/kg-day): oral RfD used for soil and water SALs, inhalation RfD used for air SALs;
BW	=	body weight: 16 kg for child (for soil SALs), 70 kg for adult (for water and air SALs);
CF	=	conversion factor: 10^6 mg/kg for soil SALs, 10^3 µg/mg for water and air SALs;
I	=	intake rate: 200 mg/day for soil SALs, 2 L/day for water SALs, 20 m^3/day for air SALs;
A	=	absorption factor: 1.

2.2.1.2 Carcinogenic Constituents

$$SAL = \frac{R \times BW \times LT \times CF}{SF \times I \times A \times ED}, \quad (2)$$

where

SAL	=	mg/kg for soil, µg/L for water µg/m^3 for air;
R	=	target risk: 10^{-6} for Class A and B carcinogens, 10^{-5} for Class C carcinogens;
BW	=	body weight: 70 kg;
LT	=	assumed lifetime: 70 yr;
CF	=	conversion factor: 10^6 mg/kg for soil SALs, 10^3 µg/mg for water and air SALs;
SF	=	slope factor (mg/kg-day)$^{-1}$: oral SF used for soil and water SALs; inhalation SF used for air SAL;
I	=	intake rate: 100 mg/day for soil SALs, 2 L/day for water SALs, 20 m^3/day for air SALs;
A	=	absorption factor: 1;
ED	=	exposure duration: 70 yr.

2.2.2 Equations for Calculating Soil SALs for Volatile Constituents

2.2.2.1 Systemic Toxicants

$$SAL = \frac{THI \times BW}{\{[1/RfD_o \times CF \times ING] + [1/RfD_i \times INH \times (1/VF + 1/PEF)]\}}, \quad (3)$$

where,

SAL	=	mg/kg for soil, µg/L for water, µg/m^3 for air;
THI	=	target hazard Index: 1;
BW	=	body weight: 16 kg;
RfD_o	=	chronic oral reference dose: mg/kg-day;
CF	=	conversion factor: 10^{-6} kg/mg;
ING	=	soil ingestion rate: 200 mg/day;
RfD_i	=	chronic inhalation reference dose: mg/kg-day;
INH	=	inhalation rate: 20 m^3/day;
VF	=	soil-to-air volatilization factor (chemical-specific): m^3/kg, calculated using equation given by EPA (1991, 0302) and chemical-specific parameters (Strenge and Peterson 1989, 0837; EPA 1988, 0747);
PEF	=	particulate emission factor: 4.63 x 10^9 m^3/kg (EPA 1991, 0302).

2.2.2.2 Carcinogenic Constituents

$$SAL = \frac{R \times BW \times LT}{ED \times \{[SF_o \times CF \times ING] + [SF_i \times INH \times (1/VF + 1/PEF)]\}} \quad , (4)$$

where,

SAL	=	mg/kg for soil, µg/L for water, µg/m^3 for air;
R	=	target risk: 10^{-6} for Class A and B carcinogens, 10^{-5} for Class C carcinogens;
BW	=	body weight: 70 kg;
LT	=	assumed lifetime: 70 yr;
ED	=	exposure duration: 70 yr;
SF_o	=	oral slope factor (mg/kg-day)$^{-1}$;
CF	=	conversion factor: 10^{-6} kg/mg;
ING	=	soil ingestion rate: 100 mg/day;
SF_i	=	inhalation slope factor (mg/kg-day)$^{-1}$;
INH	=	inhalation rate: 20 m^3/day;

VF and PEF as defined above.

2.3 Derivation of SALs When Chronic Toxicological Data Are Lacking

When SALs are needed for evaluating and comparing specific noncarcinogenic contaminants and adequate chronic toxicological information for the compound of interest does not exist, an interim conservative estimated value is derived by extrapolating from acute toxicological data.

2.4 Derivation of SALs for Other Media and Substances

Values analogous to SALs may be needed for evaluating substances that involve unique exposure considerations (e.g., substances found on structural surfaces and debris, shrapnel, high explosives, asbestos). The methods that will be used to evaluate these substances are discussed in the following paragraphs.

2.4.1 Structural Surfaces and Debris

Proposed Subpart S does not provide guidance on the derivation of SALs for potentially contaminated structural surfaces or debris (e.g., concrete, wood). These values may be needed for evaluating currently unused buildings. The structural surfaces of unused buildings may contain removable nonradiological constituents because these surfaces have not been subjected to weathering. SALs for these structural surfaces may be derived using wipe test data and appropriate assump-

tions on dust resuspension rates, inhalation and ingestion rates, and exposure period. These SALs for structural surfaces will be derived on an as-needed basis when characterization data become available.

Plausible exposure routes for structural materials (i.e., demolition debris), either buried or at the land surface, are through human contact with the surrounding media (soil, water, air) because some constituents may already have been released into the surrounding media as the result of weathering. Therefore, nonradiological contamination from exposed and buried structural debris can be evaluated by comparing SALs with constituent levels in surrounding media.

2.4.2 High Explosives and Asbestos

Shrapnel and unexploded high explosives present in some operable units need special consideration. The primary health hazard associated with these materials is injury by explosion. The toxicity of chemicals that might be released from these materials will be evaluated for individual constituents using appropriate SALs for soil, water, air, and structural surfaces. SALs for some high explosives and constituents of high explosives known to have been used at the Laboratory and for which toxicity data exist are presented in Tables J-1 and J-3. The SALs for high explosives were developed using Subpart S methodology. The work plans for individual operable units address characterization of sites with respect to shrapnel and high explosives, as needed.

Another special substance that needs criteria for screening decisions is asbestos. The SAL approach developed for evaluating most other constituents is not appropriate for asbestos; the Laboratory is seeking criteria consistent with federal and state guidance so that asbestos-contaminated soils can be evaluated.

3.0 SCREENING ACTION LEVELS FOR RADIOACTIVE CONSTITUENTS

As described above, SALs for many RCRA-regulated nonradioactive constituents have been recommended in, or derived using, proposed Subpart S regulations. However, radioactive compounds are not regulated under RCRA, and Subpart S regulations do not address radioactive constituents. To ensure that radioactive and nonradioactive compounds are addressed similarly and to simplify integrating RCRA, DOE, and CERCLA requirements for radioactive compounds, SALs for radioactive compounds have been derived in a manner similar to that used for deriving action levels in proposed Subpart S.

Section 3.1 presents the rationale for developing SALs for radioactive constituents in soil. Sections 3.2 and 3.3 discuss the methodology and assumptions used to derive SALs for radioactive constituents in soil and water, respectively.

3.1 Rationale for Deriving SALs for Radioactive Constituents in Soils

In developing SALs for radioactive constituents, it is necessary to consider all relevant and applicable standards for protecting human health. For radionuclides in the environment, guidance assumes that the protection standards that gover human health generally protect other biotic species (NCRP 1991, 0986; International Atomic Energy Agency 1992, 0983). The limits of radiation exposure to humans are governed by listing an upper bound of a radiation dose established in the radiation

protection standards that corresponds to an acceptable health risk. The upper-bounded radiation dose limit may not be exceeded but may be reduced by using health physics principles and DOE's as low as reasonably achievable (ALARA) guidance (DOE 1990, 0779).

Because current radiation protection standards [e.g., national emission standards for hazardous air pollutants (EPA 1992, 1061) and MCLs (EPA 1993, 1071)] are based on radiation dose limits rather than on corresponding cancer slope factors or risk levels, as are nonradioactive compounds enumerated in Subpart S, SALs for radioactive compounds are based on radiation dose levels considered to be "acceptable" to individuals in the general public. The national and international radiation communities and DOE (NCRP 1988, 0778; DOE 1990, 0080) have set a limit of 100 mrem/yr as a maximum acceptable radiation dose to individuals in the general public from all contaminant pathways, radionuclides, and exposure sources. Radiation dose to the public is further limited to 25 mrem/yr from individual facilities or sources (e.g., DOE 1988, 0266; EPA 1977, 1064). The radiation dose limits to the general public apply to cumulative exposure from multiple radioactive constituents through multiple pathways, whereas action levels for nonradioactive compounds in Subpart S have been derived for a single contaminant via a single exposure pathway.

The Laboratory has proposed SALs for radionuclides in soils at an annual dose limit of 10 mrem/yr (above background levels) from a single radioactive constituent via all pathways for radionuclides for which media-specific concentration limits are not specified in other regulations (e.g., MCLs). The proposed conservative dose limit of 10 mrem/yr was chosen as a SAL based on the following criteria (discussed in full in Chapter 4, Section 4.2.2.2):

- fraction of 100 mrem/yr and 25 mrem/yr regulatory standards,
- specified in DOE Order 5400.5 (DOE 1990, 0080) as a reporting level,
- generally within detection limits for current field instruments, and
- discernible from background radiation levels in the US (Table J-4).

Even if radionuclide levels exceed a SAL, consideration of ALARA may lead to further investigation or cleanup.

3.2 SALs for Radioactive Constituents in Soil

Preliminary SALs have been derived for several radionuclides that may be encountered in contaminated soils at the Laboratory (Table J-2). The following methodology and assumptions were used in deriving these SALs:

- The RESRAD computer code (Gilbert et al. 1989, 0754), Version 4.6, was used to derive the SALs. This code is DOE's choice of methodology required by DOE Order 5400.5 to be used in the derivation of cleanup criteria for radionuclides in soils at DOE sites.

- A residential scenario, which included exposure to the following sources through the following pathways, was used to derive a SAL for each radionuclide: (1) external exposure from gamma emitters in soil, (2) inhalation of contaminated dust and radon gas, (3) ingestion of contaminated soil and plants grown on the site, and (4) consumption of municipal water (which probably is not contaminated because of the great depth to the main aquifer in Los Alamos).

- The input data used in the RESRAD calculations typify the range of soil properties encountered on Laboratory mesa tops (Dorries 1992, 1066; 1992, 1067; 1992, 1068; 1993, 1069). The volume of contaminated soil is assumed to extend down 3 m from the surface and cover an area of 500 m^2. When site-specific data were not available, default values in the model were used. These default values were derived from averaged soil data obtained from both the Laboratory and the general literature (Gilbert et al. 1989, 0754).

3.3 SALs for Radioactive Constituents in Water

SALs for radionuclides in water are based on regulations given in 40 CFR 141.16 (EPA 1992, 1072) and the proposed national primary drinking water regulations for radionuclides (EPA 1991, 0887), which govern MCLs in community drinking water supplies. For alpha-emitting radionuclides, the proposed standards state that

- the maximum contaminant level for ^{226}Ra and ^{228}Ra is 20 pCi/L and

- the maximum contaminant level for gross alpha activity (excluding ^{226}Ra, radon, and uranium) is 15 pCi/L.

For beta- and gamma-emitting radionuclides, the proposed standards state that

- the maximum contaminant level for ^{228}Ra is 20 pCi/L and

- average annual concentrations of beta particle and gamma radioactivity (excluding ^{228}Ra) in drinking water shall not produce an effective dose equivalent greater than 4 mrem/yr. The proposed regulations also apply the 4-mrem/yr effective dose equivalent limit to tritium and ^{90}Sr. However 40 CFR 141.16 lists specific MCLs for these beta emitters. The MCLs are 20,000 pCi/L for tritium and 8 pCi/L for ^{90}Sr.

The EPA's Federal Guidance Report No. 11 (EPA 1988, 0982) tabulates dose conversion factors for intakes of radionuclides. Federal Guidance Report No. 11 is currently used to derive the SALs for radionuclides in water at the Laboratory. The effective dose equivalent factors contained in this document are consistent with the dose conversion factors published by DOE (DOE 1988, 0266) and EPA (EPA 1988, 0982). The following calculations are used to derive concentration limits of radionuclides that may be present in water at the Laboratory. Limits for other radionuclides may be derived using the methodology discussed below.

For beta- and gamma-emitting radionuclides, the yearly dose limit of 4 mrem/yr is converted to a SAL by dividing the annual dose limit by the water intake rate and effective dose equivalent factor, as shown below:

$$\mathrm{SAL} = \frac{DL \times CF}{IR \times DCF_{b-g}} , \qquad (5)$$

where

SAL	=	screening action level for beta-gamma emitters in picocuries per liter,
DL	=	annual dose limit of 4 mrem/yr,
CF	=	conversion factor, 10^6 pCi/µCi,
IR	=	water intake rate of 2 L/day or 730 L/yr,
DCF_{b-g}	=	ingestion effective dose equivalent factor for beta-gamma emitters, millirems per microcurie (dose conversion factors for ingestion are listed in Table 2.2 of Federal Guidance Report 11 in units of *Sv/Bq*. To convert to millirem per microcurie, these values were divided by 3.7 x 10^9).

Alpha-emitting radionuclides have a 15-pCi/L limit that excludes ^{226}Ra, uranium, and radon. Limits for uranium isotopes and other alpha emitters can be derived based on the 4-mrem/yr method used for beta-gamma emitters. Derived water SALs for radionuclide constituents are presented in Table J-2.

The method for applying the water SALs parallels the one proposed by the EPA to apply MCLs to drinking water (EPA 1991, 0887). For alpha emitters, ^{226}Ra, and uranium, the SALs would be applied by

- counting samples for gross alpha. If the gross alpha measurement is less than 15 pCi/L, the SALs for gross alpha, ^{226}Ra, and uranium are not exceeded.

- If the gross alpha measurement is greater than or equal to 15 pCi/L, the activity of ^{226}Ra and/or uranium in the sample is compared with the SALS. The "adjusted" gross alpha (less ^{226}Ra and/or uranium) is then computed. If this value is less than 15 pCi/L, the adjusted SAL for gross alpha is not exceeded.

- If multiple alpha-emitting radionuclides are present, they will be addressed as described in Section 4.

For beta-gamma emitters, the SALs will be applied by

- analyzing the samples for individual beta-gamma emitters and comparing the results with the SALs.
- addressing multiple beta-gamma-emitting radionuclides, if present, as described in Section 4.

4.0 ADDRESSING MULTIPLE CONSTITUENTS

Proposed Subpart S does not address how to evaluate several constituents with concentrations close to but below SALs in a single environmental medium. If multiple constituents do not exceed but are near their SALS, it is possible that in combination they could prove deleterious to human health. It is difficult to determine the interaction a mixture of chemicals will have on an organism. For example, a mixture of chemicals may produce an additive response that is simply the sum of their individual responses. However, more complicated interactions can include synergism, potentiation, and antagonism. Without research on a given combination of chemicals, predicting a possible toxic response from a mixture is highly uncertain.

As the first step in determining multiple effects, a simple additive equation based on concentration data normalized by SALs will be used. This approach assumes that there are no chemical interactions. Constituents are first grouped according to the environmental medium (soil, water, air) and toxicological effects (systemic toxicants, carcinogens, radionuclides). Then, SALs for all constituents are normalized to 1 so that concentration data can be treated as proportions of the respective SALs. If the sum of proportions for the different potential contaminants of concern is greater than 1, the effect of the multiple constituents is considered adverse and further action may be taken (i.e., baseline risk assessment); otherwise, NFA is proposed. The equation for calculating the appropriate normalized sum is

$$M = \max_{samples} \left\{ \sum_{PCOCs} C_i / SAL_i \right\} , \qquad (6)$$

where

M	=	maximum sum of proportions,
C_i	=	concentration of the ith chemical for a given sample, and
SAL_i	=	chemical-specific SAL for the ith chemical.

The maximum is taken over all samples such that the normalized sum of concentrations represents concentration data from within a single sample. The decision rule is restated in terms of a comparison of the maximum normalized sum of concentrations (M) with one.

The choice of potential contaminants of concern to include in the calculation also needs to be addressed. If all potential contaminants of concern are included, exceedance is very likely. However, the ER Program proposes not to include those potential contaminants of concern for which observed concentrations are within background levels when making this calculation.

TABLE J-1

SUMMARY OF SCREENING ACTION LEVELS FOR POTENTIAL CHEMICALS OF CONCERN IN SOIL, WATER, AND AIR FOR ENVIRONMENTAL CHARACTERIZATION OF LOS ALAMOS NATIONAL LABORATORY[a]

Chemicals[b]	Soil Screening Action Level mg/kg	Water Screening Action Level µg/l	Air Screening Action Level µg/m^3	CRQL[c] mg/kg and µg/l
Inorganics				
Aluminum[d], 7429-90-5				40, 200
Antimony, 7440-36-0	32	6[h]		12, 60[e]
Arsenic, 7440-38-2	0.40	50[i]	0.00023	2, 10[e]
Barium, 7440-39-3	5,600	2,000[h]	0.49	40, 200
Beryllium, 7440-41-7	0.16	4[h]	0.00042	1, 5[e]
Cadmium, 7440-43-9	80	5[h]	0.00056	1, 5
Calcium[d], 7440-70-2				1000, 5000
Chromium III, 16065-83-1	80,000	50		2, 10
Chromium VI, 7440-47-3	400	50	0.000083	2, 10
Chromium (Total)		100[h]		10, 50
Cobalt[d], 7440-48-4				10, 50
Copper, 7440-50-8	3,000	1,300		5, 25
Cyanide, 57-12-5	1,600	200[i]		2, 10
Iron[d], 1543-83-10				20, 100
Lead, 7439-92-1	500[f]	50[j]		0.6, 3
Magnesium[d], 7786-30-3				1000, 5000
Manganese, 7439-96-5	8,000	3,500	0.39	3, 15
Mercury, 7439-97-6	24	2[h]	0.30	0.04, 0.2
Nickel, 7440-02-0	1,600	100[h]	0.0042	8, 40
Nitrate	130,000	10,000[h]		
Nitrite, 14797-65-0	8,000	1,000[h]		
Potassium[d], 7447-40-7				1000, 5000
Selenium, 7782-49-2	400	50[h]		1, 5
Silver, 7440-22-4	400	170		2, 10
Sodium[d], 7647-14-5				1000, 5000
Thallium, 7440-28-0	6.4	2[h]		2, 10[e]
Vanadium, 7440-62-2	560	240		10, 50
Zinc, 7440-66-6	24,000	10,000		4, 20

TABLE J-1

SUMMARY OF SCREENING ACTION LEVELS FOR POTENTIAL CHEMICALS OF CONCERN IN SOIL, WATER, AND AIR FOR ENVIRONMENTAL CHARACTERIZATION OF LOS ALAMOS NATIONAL LABORATORY[a]

Chemicals[b]	Soil Screening Action Level mg/kg	Water Screening Action Level µg/l	Air Screening Action Level µg/m3	CRQL[c] mg/kg and µg/l
High Explosives				
2-amino-2,6-DNT (aminodinitrotoluene)[d]				
4-amino-2,6-DNT (aminodinitrotoluene)[d], 19406-51-0				
Ammonium nitrate[d], 6484-52-2				
Barium nitrate (soluble barium)	5,600	2,000[h]		40, 200
CEF (tri(b-chloroethyl)-phosphate)[d], 115-96-8				
1,3-DNB (dinitrobenzene), 99-65-0	8	3.5		
2,4-DNT (dinitrotoluene), 121-14-2	1	0.05		0.33, 10[e]
2,6-DNT (dinitrotoluene), 606-20-2	1	0.05		0.33, 10[e]
DPA (diphenylyamine), 122-39-4	2,000	880		
HMX (cyclotetramethylenetetranitramine), 2691-41-0	4,000	1,800		
Nitrocellulose (non-toxic)[d], 9004-70-0				
Nitromethane[d], 75-52-5				
NP (bis(2,2-dinitropropyl) acetal/formal)[d], 5917-61-3				
PETN (pentaerythritolletranitrate), 78-11-5	1,600	700		
RDX (trimethylenetrinitramine), 121-82-4	64	3.2		
TATB (triaminotrinitrobenzene)[d], 3058-38-6				
Tetryl (N-methyl-N,2,4,6-tetranitrobenzeneamine), 479-45-8	800	350		
1,3,5-TNB (trinitrobenzene), 99-35-4	4	1.8		
2,4,6-TNT (trinitrotoluene), 118-96-7	40	12		

TABLE J-1

SUMMARY OF SCREENING ACTION LEVELS FOR POTENTIAL CHEMICALS OF CONCERN IN SOIL, WATER, AND AIR FOR ENVIRONMENTAL CHARACTERIZATION OF LOS ALAMOS NATIONAL LABORATORY[a]

Chemicals[b]	Soil Screening Action Level mg/kg	Water Screening Action Level µg/l	Air Screening Action Level µg/m^3	CRQL[c] mg/kg and µg/l
Organics				
Volatile Organic Compounds				
Acetone, 67-64-1	8,000	3,500		0.01, 10
Benzene, 71-43-2	0.67	5[h]	0.12	0.01, 10[e]
Benzoic Acid, 65-85-0	320,000	140,000		100, —
Bromodichloromethane, 75-27-4	11	0.56		0.01, 10[e]
Bromoform, 75-25-2	89	4.4	0.90	0.01, 10[e]
Bromomethane, 74-83-9	0.43	49	4.9	0.01, 10
2-Butanone (Methyl ethyl ketone), 78-93-3	4,000	1,700	1,000	0.01, 10
Carbon disulfide, 75-15-0	7.4	3,500	10	0.01, 10
Carbon tetrachloride, 56-23-5	0.21	5[h]	0.066	0.01, 10[e]
Chlorobenzene, 108-90-7	67	100[h]	20	0.01, 10
Chloroethane, 75-00-3	3,300		10,000	0.01, 10
Chloroform, 67-66-3	0.21	100[h]	0.043	0.01, 10[e]
Chloromethane, 74-87-3	6.4	27	5.6	0.01, 10
Dibromochloromethane, 124-48-1	83	4.2		0.01, 10[e]
1,1-Dichloroethane, 75-34-3	410	3500	500	0.01, 10
1,1-Dichloroethene, 75-35-4	0.59	7[h]	0.29	0.01, 10[e]
1,2-Dichloroethane, 107-06-2	0.20	5[h]	0.038	0.01, 10[e]
cis-1,2-Dichloroethene, 156-59-2	800	70[h]		0.01, 10
trans-1,2-Dichloroethene, 156-60-5	1600	100[h]		0.01, 10
1,2-Dichloropropane, 78-87-5	6.5	5[h]	4.0	0.01, 10
cis-1,3-Dichloropropene, 10061-01-5	0.17	0.19	0.027	0.01, 10[e]
trans-1,3-Dichloropropene, 10061-02-6	0.17	0.19	0.027	0.01, 10[e]
Ethyl benzene, 100-41-4	3,100	700[h]	1000	0.01, 10
n-Hexane, 110-54-3	4,800	2,100		
2-Hexanone[d], 591-78-6				0.01, 10
Methanol, 67-56-1	40,000	18,000		

TABLE J-1

SUMMARY OF SCREENING ACTION LEVELS FOR POTENTIAL CHEMICALS OF CONCERN IN SOIL, WATER, AND AIR FOR ENVIRONMENTAL CHARACTERIZATION OF LOS ALAMOS NATIONAL LABORATORY[a]

Chemicals[b]	Soil Screening Action Level mg/kg	Water Screening Action Level µg/l	Air Screening Action Level µg/m3	CRQL[c] mg/kg and µg/l
4-Methyl-2-pentanone (MIK), 108-10-1	510	1,700	80	0.01, 10
Methylene Chloride, 75-09-2	5.6	5[h]	2.2	0.01, 10[e]
Styrene, 100-42-5	16,000	100[h]		0.01, 10[e]
1,1,2,2-Tetrachloroethane, 79-34-5	3.9	1.8	0.18	0.01, 10[e]
Tetrachloroethene, 127-18-4	5.9	5[h]	1.8	0.01, 10[e]
Toluene, 108-88-3	890	1000[h]	380	0.01, 10
1,1,1-Trichloroethane, 71-55-6	1,000	200[h]	1,000	0.01, 10
1,1,2-Trichloroethane, 79-00-5	6.3	5[h]	0.63	0.01, 10[e]
Trichloroethene, 79-01-6	3.2	5[h]	0.58	0.01, 10[e]
Vinyl Chloride, 75-01-4	0.013	2[h]	0.012	0.01, 10[e]
Xylene (Total), 1330-20-7	160,000	10,000[h]		0.01, 10
Semi-Volatile Organic Compounds				
Acenaphthene, 83-32-9	4,800	2,100		0.33, 10
Acenaphthylene[d], 208-96-8				0.33, 10
Anthracene, 120-12-7	24,000	10,000		0.33, 10
Benzo[a]anthracene, 56-55-3	0.64	0.1[i]		0.33, 10
Benzo[b]fluoranthene,205-99-2	0.7	0.2[i]		0.33, 10
Benzo[k]fluoranthene,207-08-9	1.5	0.2[i]		0.33, 10
Benzo[ghi]perylene[d], 191-24-2	44			0.33, 10
Benzo[a]pyrene, 50-32-8	0.10	0.2[h]	0.00057	0.33, 10[e]
alpha-BHC, 319-84-6	0.1	0.0056		
beta-BHC, 319-85-7	4	0.19		
Bis-(2-chloroethoxy)methane[d], 111-91-1				0.33, 10
Bis-(2-chloroethyl)ether, 111-44-4	0.13	0.032	0.0032	0.33, 10[e]
Bis-(2-ethylhexyl)phthalate, 117-81-7	50	4[i]		0.33, 10[e]
4-Bromophenyl-phenylether[d], 101-55-3				0.33, 10
Butyl benzyl phthalate, 85-68-7	16,000	100[i]		0.33, 10

TABLE J-1

SUMMARY OF SCREENING ACTION LEVELS FOR POTENTIAL CHEMICALS OF CONCERN IN SOIL, WATER, AND AIR FOR ENVIRONMENTAL CHARACTERIZATION OF LOS ALAMOS NATIONAL LABORATORY[a]

Chemicals[b]	Soil Screening Action Level mg/kg	Water Screening Action Level µg/l	Air Screening Action Level µg/m³	CRQL[c] mg/kg and µg/l
Carbazole, 86-74-8	35	1.8		0.33, 10
Chlordane, 57-74-9	0.54	0.2[h]		0.017, 0.05
4-Chloroaniline, 106-47-8	320	140		0.33, 10
4-Chloro-3-methylphenol[g] (p-chloro-m-cresol), 59-50-7	16,000	7,000		0.33, 10
2-Chloronaphthalene, 91-58-7	6,400	2,800		0.33, 10
2-Chlorophenol, 95-57-8	400	170		0.33, 10
4-Chlorophenyl phenyl ether[d], 7005-72-3				0.33, 10
Chrysene, 218-01-9	22	0.2[i]		0.33, 10
DDD, 72-54-8	2.9	0.15		0.03, 0.1
DDT, 50-29-3	2.1	0.1		0.03, 0.1
Dibenzo[a,h]anthracene, 53-70-3	0.086	0.3[i]		0.33, 10
Dibenzofuran[d], 132-64-9				0.33, 10
Di-n-butylphthalate, 84-74-2	8,000	3,500		0.33, 10
1,2-Dichlorobenzene, 95-50-1	1,600	600[h]	200	0.33, 10
1,3-Dichlorobenzene, 541-73-1	7,200	600[h]		0.33, 10
1,4-Dichlorobenzene, 106-46-7	290	75[h]	700	0.33, 10
3,3'-Dichlorobenzidine, 91-94-1	1.6	0.078		0.33, 10[e]
2,4-Dichlorophenol, 120-83-2	240	100		0.33, 10
Diethylphthalate, 84-66-2	64,000	5,000[i]		0.33, 10
Dimethylformamide, 68-12-2	8,000	3,500		
2,4-Dimethylphenol, 105-67-9	1,600	700		0.33, 10
Dimethyl phthalate, 131-11-3	80,000	35,000		0.33, 10
4,6-Dinitro-2-methylphenol[d] (4,6-dinitro-o-cresol), 534-52-1				0.8, 25
2,4-Dinitrophenol, 51-28-5	160	70		0.8, 25
Di-n-octyl phthalate, 117-84-0	1,600	700		0.33, 10
Endosulfan, 115-29-7	4	1.8		
Ethyl acetate, 141-78-6	72,000	32,000		
Ethylene glycol, 107-21-1	160,000	70,000		

TABLE J-1

SUMMARY OF SCREENING ACTION LEVELS FOR POTENTIAL CHEMICALS OF CONCERN IN SOIL, WATER, AND AIR FOR ENVIRONMENTAL CHARACTERIZATION OF LOS ALAMOS NATIONAL LABORATORY[a]

Chemicals[b]	Soil Screening Action Level mg/kg	Water Screening Action Level µg/l	Air Screening Action Level µg/m^3	CRQL[c] mg/kg and µg/l
Fluoranthene, 206-44-0	3,200	1,400		0.33, 10
Fluorene, 86-73-7	3,200	1,400		0.33, 10
Hexachlorobenzene, 118-74-1	0.44	1[h]	0.0022	0.33, 10[e]
Hexachlorobutadiene, 87-68-3	90	4.5	0.45	0.33, 10[e]
Hexachlorocyclopentadiene, 77-47-4	560	50[h]	0.07	0.33, 10
Hexachloroethane, 67-72-1	80	25	2.5	0.33, 10
Indeno[1,2,3-cd]pyrene, 193-39-5	0.41	0.4[i]		0.33, 10
Isophorone, 78-59-1	7,400	370		0.33, 10
2-Methylnaphthalene[d], 91-57-6				0.33, 10
2-Methylphenol (o-cresol), 95-48-7	4,000	1,700		0.33, 10
4-Methylphenol (p-cresol), 106-44-5	4,000	1,700		0.33, 10
Naphthalene, 91-20-3	3,200	1400		0.33, 10
2-Nitroaniline, (o-nitroaniline) 88-74-4	4.8	2.1	0.20	0.8, 25[e]
3-Nitroaniline(m-nitroaniline)[d], 99-09-2				0.8, 25
4-Nitroaniline(p-nitroaniline)[d], 100-01-6				0.8, 25
Nitrobenzene, 98-95-3	5.3	18	2.0	0.33, 10
2-Nitrophenol[d], 88-75-5				0.33, 10
4-Nitrophenol[d], 100-02-7				0.8, 25
N-Nitrosodiphenylamine, 86-30-6	140	7.1		0.33. 10[e]
N-Nitrosodi-N-propylamine, 621-64-7	0.10	0.0050		0.33, 10[e]
2,2-Oxybis(1-chloropropane) (bis[2-chloroisopropyl]ether), 108-60-1	100	0.50	1.0	0.33, 10
PCB (Aroclors), 1336-36-3	0.09	0.50[h]		0.033, 1
Pentachlorophenol, 87-86-5	5.8	1[h]		0.8, 25[e]
Phenanthrene[d], 85-01-8				0.33, 10
Phenol, 108-95-2	48,000	21,000		0.33, 10
Pyrene, 129-00-0	2,400	1,000		0.33, 10
1,2,4-Trichlorobenzene, 120-82-1	160	70[h]	9.0	0.33, 10
2,4,5-Trichlorophenol, 95-95-4	8,000	3,500		0.8, 25
2,4,6-Trichlorophenol, 88-06-2	64	3.2	0.32	0.33, 10[e]

a. SALs based on methodologies given by EPA 1990 (0432) and EPA (1991, 0302). SALs are rounded to two significant figures. Water SALs are used for both groundwater and surface water.

b. Target Analyte List (TAL), Target Compound List (TCL), High-Explosive List, with associated Chemical Abstract Services numbers, as given by EPA (1991, 0814; 1991; 0779; 1991, 1074)

c. Contract Laboratory Program (CLP) and Contract-Required Quantitation Limits (CRQLs) for soil (mg/kg) and water (µg/l), respectively. CRQLs are provided as an indicator of the analytical method detection limit, and are not to be viewed in an absolute sense as a standard of performance for a given sample representing a given matrix and a given analyte. CRQLs are not available for air.

d. Toxicity data (e.g., RfDs and/or slope factors) were not available; therefore, SALs were not calculated.

e. The SAL is less than the CRQL; therefore, special analytical services may be required.

f. Soil SAL based on EPA guidance on establishing lead cleanup levels (EPA 1989, 0987).

g. Based on subchronic RfD divided by 10; chronic RfD not available.

h. Safe drinking water regulations (EPA 1993, 1071) MCL water SALs were not calculated for compounds with MCLs in accordance with proposed EPA guidance (EPA 1990, 0432)

i. MCL is not final. Number presented is a draft or proposed MCL from EPA (1993, 1071)

j. No MCL or toxicity information appropriate for SAL derivation is available for lead. The SAL presented is based on Federal ambient water quality criteria for the protection of human health based on water and fish consumption (EPA 1993, 0830).

TABLE J-2

SUMMARY OF SCREENING ACTION LEVELS FOR RADIONUCLIDES IN SOIL AND WATER FOR ENVIRONMENTAL CHARACTERIZATION OF LOS ALAMOS NATIONAL LABORATORY

Radionuclides	Soil Screening Action Level (pCi/g dry soil)[a]	Water Screening Action Level pCi/l[b]
Americium-241	22.0	15[e]
Carbon-14	4.7×10^5	2,600[f]
Cesium-134	1.90	75[f]
Cesium-137	4.0	110[f]
Cobalt-57	40.0	4,600[f]
Cobalt-60	0.90	200[f]
Gross Alpha Particle Activity	NA	15[g]
Iodine-129	41.0	20[f]
Manganese-54	3.40	2,000[f]
Plutonium-238	27.0	15[e]
Plutonium-239	24.0	15[e]
Radium-226	0.73[c]	20[g]
Radium-228	1.6[c]	20[g]
Ruthenium-106	15.0	200[f]
Sodium-22	1.30	480[f]
Strontium-90	8.90	8[h]
Thorium-230	10.0[c]	15[e]
Thorium-232	0.88[c]	15[e]
Tritium	1.5×10^7[d]	2×10^4[h]
Uranium-233	86.0	19[f,i]
Uranium-234	86.0	19[f,i]
Uranium-235	18.0	21[f,i]
Uranium-238	59.0	6.7[i]
Depleted Uranium	59.0[j]	NA[i]
Natural Uranium	66.0[j]	NA[i]

a. Based on 10 mrem/yr (above background) dose limit. Input data are representative of mesa top environment at the Laboratory.

b. Water SALs are used for both groundwater and surface water.

c. Generic limits for ^{226}Ra, ^{228}Ra, ^{230}Th, and ^{232}Th are set in DOE Order 5400.5 (DOE 1990, 0080) at 5 pCi/g averaged over the first 15 cm of soil and 15 pCi/g averaged over each additional 15-cm interval. The more conservative derived SALs are to be used for screening purposes only.

d. The SAL for tritium in soil is 1.5×10^7 pCi/g dry soil. If soil tritium concentrations are reported in pCi/mL soil moisture, the values must be converted to a dry soil basis by multiplying by $M/[\rho w(1-M)]$, where M is the moisture fraction of the sample (g water/g total sample) and ρw is the soil moisture density ≈1g/mL). E.g., a soil with 10% moisture fraction containing 106 pCi of tritium per milliliter of soil moisture contains $10^6 \times 0.1 / (1 \times 0.9) = 1.1 \times 10^5$ pCi/g dry soil.

e. The total of all alpha emitters, less ^{226}Ra, ^{222}Rn, and uranium, will not exceed 15 pCi/L in accordance with EPA's proposed rule (EPA 1991, 0887, pp. 33050-33127).

f. Calculated based on 4-mrem/yr dose limit using Federal Guidance Report No. 11 (EPA 1988, 0982). The total of all beta and photon emitters, less ^{228}Ra, will not exceed 4 mrem/yr in accordance with EPA's proposed rule (EPA 1991, 0887).

g. MCL listed in EPA's proposed rule (EPA 1991, 0887).

h. MCL from Table A, Average Annual Concentrations Assumed to Produce a Total Body or Organ Dose of 4 mrem/yr, in 40 CFR 141 (EPA 1991, 0887).

i. The MCL for total uranium concentration is 20 µg/L or 30 pCi/L in accordance with EPA's proposed rule (EPA 1991, 0887). In the proposed rule, the EPA states that the activity ratio of ^{234}U to ^{238}U in rock (1:1) is not appropriate for drinking water. EPA has found ratios ranging from 0.7:1 to 32:1, with a geometric mean of 2.7:1. Using the geometric mean, an "overall mass to activity ratio" (specific activity) of 1.3 pCi/µg was calculated for uranium as it appears in drinking water. The specific activity of natural uranium in rock is 0.68 pCi/µg. Therefore, no value is listed for "natural" or "depleted" uranium in the water SAL column because it appears that the isotopic mix can change in water. The MCL for total uranium (20 µg/L) was set based on toxicity to the kidney. However, for ^{233}U, ^{234}U, and ^{235}U, the SALs were set based on cancer mortality risk because radiation dose, not kidney toxicity, was the limiting factor.

j. Calculated assuming the following isotopic abundances:

	Natural Uranium (%)	Depleted Uranium (%)
^{234}U	0.0057	0.0005
^{235}U	0.7204	0.2500
^{234}U	99.2739	99.7500

TABLE J-3

TOXICOLOGICAL INFORMATION FOR ESTABLISHING SCREENING ACTION LEVELS FOR POTENTIAL CHEMICALS OF CONCERN IN SOIL, WATER, AND AIR FOR ENVIRONMENTAL CHARACTERIZATION OF LOS ALAMOS NATIONAL LABORATORY[a]

Chemicals[b]	Chronic Oral RfD mg/kg-day	Oral Carcinogenic Slope Factor $(mg/kg\text{-}d)^{-1}$ and Group[c]	Chronic Inhalation RfD mg/kg-d	Inhalation Carcinogenic Slope Factor $(mg/kg\text{-}d)^{-1}$ and Group[c]	VF[d] m^3/kg	Soil Screening Action Level Systemic Toxicant mg/kg	Soil Screening Action Level Carcinogen mg/kg	Water Screening Action Level Systemic Toxicant µg/l	Water Screening Action Level Carcinogen µg/l[e]	Air Screening Action Level Systemic Toxicant $\mu g/m^3$	Air Screening Action Level Carcinogen $\mu g/m^3$	CRQL[f] mg/kg and µg/l
Inorganics												
Aluminum[g], 7429-90-5												40, 200
Antimony, 7440-36-0	0.0004					32						12, 60[h]
Arsenic, 7440-38-2	0.0003	1.75, A		15, A		24	0.40				0.00023	2, 10[h]
Barium, 7440-39-3	0.07	ND, D	0.00014[i]	ND, D		5,600				0.49		40, 200
Beryllium, 7440-41-7	0.005	4.3, B2		8.4, B2		400	0.16				0.00042	1, 5[h]
Cadmium, 7440-43-9	0.001[j]			6.3, B1		80					0.00056	1, 5
Calcium[g], 7440-70-2												1000, 5000
Chromium III, 16065-83-1	1.0					80,000						2, 10
Chromium VI, 7440-47-3	0.005			42, A		400					0.000083	2, 10
Cobalt[g], 7440-48-4												10, 50
Copper, 7440-50-8	0.037[i]					3,000		1,300				5, 25
Cyanide, 57-12-5	0.02	ND, D		ND, D	8.2e+03	1,600						2, 10
Iron[g], 1543-83-10												20, 100
Lead[g], 7439-92-1		ND, B2		ND, B2								0.6, 3
Magnesium[g], 7786-30-3												1000, 5000

TABLE J-3

TOXICOLOGICAL INFORMATION FOR ESTABLISHING SCREENING ACTION LEVELS FOR POTENTIAL CHEMICALS OF CONCERN IN SOIL, WATER, AND AIR FOR ENVIRONMENTAL CHARACTERIZATION OF LOS ALAMOS NATIONAL LABORATORY[a]

Chemicals[b]	Chronic Oral RfD mg/kg-day	Oral Carcinogenic Slope Factor $(mg/kg\text{-}d)^{-1}$ and Group[c]	Chronic Inhalation RfD mg/kg-d	Inhalation Carcinogenic Slope Factor $(mg/kg\text{-}d)^{-1}$ and Group[c]	VF[d] m^3/kg	Soil Screening Action Level Systemic Toxicant mg/kg	Soil Screening Action Level Carcinogen mg/kg	Water Screening Action Level Systemic Toxicant µg/l	Water Screening Action Level Carcinogen µg/l[e]	Air Screening Action Level Systemic Toxicant $\mu g/m^3$	Air Screening Action Level Carcinogen $\mu g/m^3$	CRQL[f] mg/kg and µg/l
Manganese, 7439-96-5	0.1	ND, D	0.00011	ND, D		8,000		3,500		0.39		3, 15
Mercury, 7439-97-6	0.0003[i]	ND, D	8.6e-5[i]	ND, D		24				0.30		0.04, 0.2
Nickel, 7440-02-0	0.02			0.84, A		1,600					0.0042	8, 40
Nitrate	1.6[k]					130,000						
Nitrite, 14797-65-0	0.1					8,000						
Potassium9, 7447-40-7												1000, 5000
Selenium, 7782-49-2	0.005	ND, D		ND, D		400						1, 5
Silver, 7440-22-4	0.005					400		170				2, 10
Sodium9, 7647-14-5												1000, 5000
Thallium, 7440-28-0	0.00008[i]					6.4						2, 10[h]
Vanadium, 7440-62-2	0.007[i]					560		240				10, 50
Zinc, 7440-66-6	0.3	ND, D		ND, D		24,000		10,000				4, 20

TABLE J-3

TOXICOLOGICAL INFORMATION FOR ESTABLISHING SCREENING ACTION LEVELS FOR POTENTIAL CHEMICALS OF CONCERN IN SOIL, WATER, AND AIR FOR ENVIRONMENTAL CHARACTERIZATION OF LOS ALAMOS NATIONAL LABORATORY[a]

Chemicals[b]	Chronic Oral RfD mg/kg-day	Oral Carcinogenic Slope Factor $(mg/kg\text{-}d)^{-1}$ and Group[c]	Chronic Inhalation RfD mg/kg-d	Inhalation Carcinogenic Slope Factor $(mg/kg\text{-}d)^{-1}$ and Group[c]	VF[d] m^3/kg	Soil Screening Action Level Systemic Toxicant mg/kg	Soil Screening Action Level Carcinogen mg/kg	Water Screening Action Level Systemic Toxicant µg/l	Water Screening Action Level Carcinogen µg/l[e]	Air Screening Action Level Systemic Toxicant $\mu g/m^3$	Air Screening Action Level Carcinogen $\mu g/m^3$	CRQL[f] mg/kg and µg/l
Volatile Organic Compounds												
Acetone, 67-64-1	0.1				1.4e+04	8,000		3,500				0.01, 10
Benzene, 71-43-2		0.029, A		0.029, A	5.7e+03		0.67[m]				0.12	0.01, 10[h]
Benzoic acid, 65-85-0	4	ND,D		ND,D		320,000		140,000				100, —
Bromodichloromethane, 75-27-4	0.02	0.062, B2		ND, B2	8.0e+02	1,600	11	700	0.56			0.01, 10[h]
Bromoform, 75-25-2	0.02	0.0079, B2		0.0039, B2		1,600	89	700	4.4		0.90	0.01, 10[h]
Bromomethane, 74-83-9	0.0014	ND, D	0.0014	ND, D	3.9e+02	0.43[m]		49		4.9		0.01, 10
2-Butanone (Methyl ethyl ketone), 78-93-3	0.6	ND, D	0.29	ND, D	1.9e+04	4,000[m]		1,700		1,000		0.01, 10
Carbon disulfide, 75-15-0	0.1		0.0029[i]		3.2e+03	7.4[m]		3,500		10		0.01, 10
Carbon tetrachloride, 56-23-5	0.0007	0.13, B2		0.053, B2	3.3e+03	56	0.21[m]				0.066	0.01, 10[h]
Chlorobenzene, 108-90-7	0.02	ND, D	0.0057[i]	ND, D	1.5e+04	67[m]				20		0.01, 10
Chloroethane, 75-00-3			2.9		1.4e+03	3,300[m]				10,000		0.01, 10
Chloroform, 67-66-3	0.01	0.0061, B2		0.081, B2	4.8e+03	800	0.21[m]	0			0.043	0.01, 10[h]
Chloromethane, 74-87-3		0.013, C[i]		0.0063, C[i]	1.2e+03		6.4[m]		27		5.6	0.01, 10

TABLE J-3

TOXICOLOGICAL INFORMATION FOR ESTABLISHING SCREENING ACTION LEVELS FOR POTENTIAL CHEMICALS OF CONCERN IN SOIL, WATER, AND AIR FOR ENVIRONMENTAL CHARACTERIZATION OF LOS ALAMOS NATIONAL LABORATORY[a]

Chemicals[b]	Chronic Oral RfD mg/kg-day	Oral Carcinogenic Slope Factor $(mg/kg\text{-}d)^{-1}$ and Group[c]	Chronic Inhalation RfD mg/kg-d	Inhalation Carcinogenic Slope Factor $(mg/kg\text{-}d)^{-1}$ and Group[c]	VF[d] m^3/kg	Soil Screening Action Level Systemic Toxicant mg/kg	Soil Screening Action Level Carcinogen mg/kg	Water Screening Action Level Systemic Toxicant µg/l	Water Screening Action Level Carcinogen µg/l[e]	Air Screening Action Level Systemic Toxicant $\mu g/m^3$	Air Screening Action Level Carcinogen $\mu g/m^3$	CRQL[f] mg/kg and µg/l
Dibromochloromethane, 124-48-1	0.02	0.084, C		ND, C		1,600	83	700	4.2			0.01, 10[h]
1,1-Dichloroethane, 75-34-3	0.1[i]	ND, C	0.14[i]	ND, C	3.8e+03	410[m]		3,500		500		0.01, 10
1,1-Dichloroethene, 75-35-4	0.009	0.6, C		0.12, C	2.1e+03	720	0.59[m]				0.29	0.01, 10[h]
1,2-Dichloroethane, 107-06-2		0.091, B2		0.091, B2	5.5e+03		0.20[m]				0.038	0.01, 10[h]
cis-1,2-Dichloroethene, 156-59-2	0.01				4.6e+03	800						0.01, 10
trans-1,2-Dichloroethene, 156-60-5	0.02					1600						0.01, 10
1,2-Dichloropropane, 78-87-5		0.068, B2[i]	0.0011	ND, B2[i]	7.1+03	6.5[m]	10			4.0		0.01, 10[h]
cis-1,3-Dichloropropene, 10061-01-5	0.0003	0.18, B2[i]	0.0057	0.13, B2[i]	6.8+03	14[m]	0.17[m]	11	0.19	20	0.027	0.01, 10[h]
trans-1,3-Dichloropropene, 10061-02-6	0.0003	0.18, B2[i]	0.0057	0.13, B2[i]	6.8+3	14[m]	0.17[m]	11	0.19	20	0.027	0.01, 10[h]
Ethyl benzene, 100-41-4	0.1	ND, D	0.29	ND, D	2.2e+04	3,100[m]				1000		0.01, 10
n-Hexane, 110-54-3	0.06[i]			0.057		4,800		2,100				
2-Hexanone9, 591-78-6					5.5e+04							0.01, 10
Methanol, 67-56-1	0.5					40,000		18,000				
4-Methyl-2-pentanone (MIK), 108-10-1	0.05[i]		0.023[i]		3.2e+04	510[m]		1,700		80		0.01, 10

TABLE J-3

TOXICOLOGICAL INFORMATION FOR ESTABLISHING SCREENING ACTION LEVELS FOR POTENTIAL CHEMICALS OF CONCERN IN SOIL, WATER, AND AIR FOR ENVIRONMENTAL CHARACTERIZATION OF LOS ALAMOS NATIONAL LABORATORY[a]

Chemicals[b]	Chronic Oral RfD mg/kg-day	Oral Carcinogenic Slope Factor $(mg/kg\text{-}d)^{-1}$ and Group[c]	Chronic Inhalation RfD mg/kg-d	Inhalation Carcinogenic Slope Factor $(mg/kg\text{-}d)^{-1}$ and Group[c]	VF[d] m^3/kg	Soil Screening Action Level Systemic Toxicant mg/kg	Soil Screening Action Level Carcinogen mg/kg	Water Screening Action Level Systemic Toxicant µg/l	Water Screening Action Level Carcinogen µg/l[e]	Air Screening Action Level Systemic Toxicant $\mu g/m^3$	Air Screening Action Level Carcinogen $\mu g/m^3$	CRQL[f] mg/kg and µg/l
Methylene Chloride, 75-09-2	0.06	0.0075, B2	0.86[i]	0.0016, B2	2.9e+03	1,400[m]	5.6[m]			3000	2.2	0.01, 10[h]
Styrene, 100-42-5	0.2		0.29		1.8e+04	16,000						0.01, 10[h]
1,1,2,2-Tetrachloroethane, 79-34-5		0.2, C		0.2, C	2.9e+04		3.9[m]		1.8		0.18	0.01, 10[h]
Tetrachloroethene, 127-18-4	0.01	0.052, B-C[n]		0.002, B-C[n]	6.0e+03	800	5.9[m]				1.8	0.01, 10[h]
Toluene, 108-88-3	0.2	ND, D	0.40	ND, D	1.1e+04	890[m]				380		0.01, 10
1,1,1-Trichloroethane, 71-55-6	0.09[i]	ND, D	0.29[i]	ND, D	5.1e+03	1,000[m]				1,000		0.01, 10
1,1,2-Trichloroethane, 79-00-5	0.004	0.057, C		0.056, C	1.1e+04	320	6.3[m]				0.63	0.01, 10[h]
Trichloroethene, 79-01-6		0.011, B-C[n]		0.006, B-C[n]	5.8e+03		3.2[m]				0.58	0.01, 10[h]
Vinyl Chloride, 75-01-4		1.9, A[i]		0.294, A[i]	1.1e+03		0.013[m]				0.012	0.01, 10[h]
Xylene (Total), 1330-20-7	2				9.6e+03	160,000						0.01, 10

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Semi-Volatile Organic Compounds												
Acenaphthene, 83-32-9	0.06				3.4e+05	4,800		2,100				0.33, 10
Acenaphthylene[g], 208-96-8					6.1e+04							0.33, 10
Anthracene, 120-12-7	0.3	ND, D		ND, D	1.8e+05	24,000		10,000				0.33, 10
Benzo[a]anthracene, 56-55-3		1.1[o], B2		NA, B2			0.64					0.33, 10
Benzo[b]fluoranthene, 205-99-2		1.1[o], B2		ND, B2			0.7					0.33, 10
Benzo[k]fluoranthene, 207-08-9		0.48[o], B2		ND, B2			1.5					0.33, 10
Benzo[ghi]perylene, 191-24-2		0.16[o], D		ND, D			44					0.33, 10
Benzo[a]pyrene, 50-32-8		7.3, B2		6.1, B2[i]			0.10				0.00057	0.33, 10[h]
alpha-BHC, 319-84-6		6.3, B2		6.3, B2			0.1		0.0056			
beta-BHC, 319-85-7		1.8, C		1.9, C			4		0.19			
Bis(2chloroethoxy)methane[g] 111-91-1		ND, D		ND, D								0.33, 10
Bis-(2-chloroethyl)ether, 111-44-4		1.1, B2		1.1, B2	4.9e+04		0.13[m]		0.032		0.0032	0.33, 10[h]

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Bis(2-ethylhexyl)phthalate, 117-81-7	0.02	0.014, B2		ND, B2		1,600	50					0.33, 10[h]
4-Bromophenyl-phenylether[g], 101-55-3												0.33, 10
Butyl benzyl phthalate, 85-68-7	0.2	ND, C		ND, C		16,000						0.33, 10
Carbazole, 86-74-8		0.02, B2[i]		ND, B2[f]			35		1.8			0.33, 10
Chlordane, 57-74-9	0.00006	1.3, B2		1.3, B2		4.8	0.54					0.017, 0.05
4-Chloroaniline, 106-47-8	0.004					320		140				0.33, 10
4-Chloro-3-methylphenol (p-chloro-m-cresol), 59-50-7	2[i,p]					16,000		7,000				0.33, 10
2-Chloronaphthalene, 91-58-7	0.08				1.4e+05	6,400		2,800				0.33, 10
2-Chlorophenol, 95-57-8	0.005					400		170				0.33, 10
4-Chlorophenyl phenylether[g], 7005-72-3												0.33, 10
Chrysene, 218-01-9		0.032[o], B2		ND, B2			22					0.33, 10
DDD, 72-54-8		0.24, B2					2.9		0.15			0.03, 0.1
DDT, 50-29-3	0.0005	0.34, B2				40	2.1	18	0.1			0.03, 0.1
Dibenzo[a,h]anthracene, 53-70-3	0.09[k]	8.1[o], B2		ND, B2			0.086					0.33, 10
Dibenzofuran[g] 132-64-9												0.33, 10

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Chemicals[b]	Chronic Oral RfD mg/kg-day	Oral Carcinogenic Slope Factor $(mg/kg\text{-}d)^{-1}$ and Group[c]	Chronic Inhalation RfD mg/kg-d	Inhalation Carcinogenic Slope Factor $(mg/kg\text{-}d)^{-1}$ and Group[c]	VF[k] m^3/kg	Soil Screening Action Level Systemic Toxicant mg/kg	Soil Screening Action Level Carcinogen mg/kg	Water Screening Action Level Systemic Toxicant µg/l	Water Screening Action Level Carcinogen µg/l	Air Screening Action Level Systemic Toxicant $\mu g/m^3$	Air Screening Action Level Carcinogen $\mu g/m^3$	CRQL[d] mg/kg and µg/l
Di-n-butylphthalate, 84-74-2	0.1	ND, D		ND, D		8,000		3,500				0.33, 10
1,2-Dichlorobenzene, 95-50-1	0.09		0.057[i]		4.5e+04	1,600[m]				200		0.33, 10
1,3-Dichlorobenzene, 541-73-1	0.09[k]				3.3e+04	7,200						0.33, 10
1,4-Dichlorobenzene, 106-46-7		0.024, C[l]	0.2[i]	ND, C	3.6e+04	5,800[m]	290			700		0.33, 10
3,3'-Dichlorobenzidine, 91-94-1		0.45, B2		ND, B2			1.6		0.078			0.33, 10[h]
2,4-Dichlorophenol, 120-83-2	0.003					240		100				0.33, 10
Diethylphthalate, 84-66-2	0.8	ND, D		ND, D		64,000						0.33, 10
Dimethylformamide, 68-12-2	0.1[i]		0.0086			8,000		3,500				
2,4-Dimethylphenol, 105-67-9	0.02			ND, D	1.1e+05	1,600		700				0.33, 10
Dimethyl phthalate, 131-11-3	1[v]	ND, D		ND, D		80,000		35,000				0.33, 10
4,6-Dinitro-2-methylphenol9 (4,6-dinitro-o-cresol), 534-52-1												0.8, 25
2,4-Dinitrophenol, 51-28-5	0.002					160		70				0.8, 25
Di-n-octyl phthalate, 117-84-0	0.02[i]					1,600		700				0.33, 10
Endosulfan, 115-29-7	0.00005 i, q					4		1.8				
Ethyl acetate, 141-78-6	0.9					72,000		32,000				
Ethylene glycol, 107-21-1	2					160,000		70,000				

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Fluoranthene, 206-44-0	0.04	ND, D		ND, D		3,200		1,400				0.33, 10
Fluorene, 86-73-7	0.04				5.1e+05	3,200		1,400				0.33, 10
Hexachlorobenzene, 118-74-1	0.0008	1.6, B2		1.6, B2		64	0.44				0.0022	0.33, 10[h]
Hexachlorobutadiene, 87-68-3	0.002[f]	0.078, C		0.077, C		160	90	70	4.5		0.45	0.33, 10[h]
Hexachlorocyclopentadiene, 77-47-4	0.007		0.00002[i]			560				0.07		0.33, 10
Hexachloroethane, 67-72-1	0.001	0.014, C		0.014, C		80	500	35	25		2.5	0.33, 10
Indeno[1,2,3-cd]pyrene, 193-39-5		1.7[o], B2		ND, B2			0.41					0.33, 10
Isophorone, 78-59-1	0.2	0.00095, C		ND, C		16,000	7,400	7,000	370			0.33, 10
2-Methylnaphthalene[g], 91-57-6					1.9e+05							0.33, 10
2-Methylphenol (o-cresol), 95-48-7	0.05	ND, C		ND, C		4,000		1,700				0.33, 10
4-Methylphenol (p-cresol), 106-44-5	0.05[f]	ND, C		ND, C		4,000		1,700				0.33, 10
Naphthalene, 91-20-3	0.04[f]				6.8e+04	3,200		1,400				0.33, 10
2-Nitroaniline, (o-nitroaniline) 88-74-4	6.0e-05[f]		5.7e-05[i]			4.8		2.1		0.20		
3-Nitroaniline(m-nitroaniline)[g], 99-09-2												0.8, 25
4-Nitroaniline(p-nitroaniline)[g], 100-01-6												0.8, 25

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Nitrobenzene, 98-95-3	0.0005	ND, D	0.00057[l]	ND, D	1.3e+04	5.3[m]		18		2.0		0.33, 10
2-Nitrophenol[g], 88-75-5												0.33, 10
4-Nitrophenol[g], 100-02-7					1.9e+04							0.8, 25
N-Nitrosodiphenylamine, 86-30-6		0.0049, B2		ND, B2			140		7.1			0.33, 10[h]
N-Nitrosodi-N-propylamine, 621-64-7		7, B2		ND, B2			0.10		0.0050			0.33, 10[h]
2,2-Oxybis(1-chloropropane) (bis[2-chloroisopropyl]ether), 108-60-1	0.04	0.07, C[l]		0.035, C[l]		3,200	100	1,400	0.50		1.0	0.33, 10
PCB (aroclors), 1336-36-3		7.7, B2					0.09					0.033, 1
Pentachlorophenol, 87-86-5	0.03	0.12, B2		ND, B2		2,400	5.8					0.8, 25[h]
Phenanthrene[g], 85-01-8		ND, D		ND, D	4.4e+05							0.33, 10
Phenol, 108-95-2	0.6					48,000		21,000				0.33, 10
Pyrene, 129-00-0	0.03	ND, D		ND, D		2,400		1,000				0.33, 10
1,2,4-Trichlorobenzene, 120-82-1	0.01	ND, D	0.0026[l]	ND, D	9.5e+04	160[m]				9.0		0.33, 10
2,4,5-Trichlorophenol, 95-95-4	0.10					8,000		3,500				0.8, 25
2,4,6-Trichlorophenol, 88-06-2		0.011, B2		0.011, B2			64		3.2		0.32	0.33, 10[h]

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High Explosives												
2-amino-2,6-DNT (aminodinitrotoluene)[g]												
4-amino-2,6-DNT (amino-dinitrotoluene)[g], 19406-51-0												
Ammonium nitrate[g], 6484-52-2												
Barium nitrate (soluble barium)	0.07	ND, D	0.00014[l]	ND, D		5,600				0.49		40,200
CEF (tri(b-chloroethyl)-phosphate)[g], 115-96-8												
1,3-DNB (dinitrobenzene), 99-65-0	0.0001	ND, D		ND, D		8		3.5				
2,4-DNT (dinitrotoluene), 121-14-2	0.002	0.68, B2[i]		ND, B2		160	1	70	0.05			0.33,10[h]
2,6-DNT (dinitrotoluene), 606-20-2	0.001[k]	0.68, B2[i]		ND, B2		80	1	35	0.05			0.33,10[h]
DPA (diphenylyamine), 122-39-4	0.025					2,000		880				
HMX (cyclotetramethylenete-tranitramine), 2691-41-0	0.05			ND, D		4,000		1800				

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Nitrocellulose (non-toxic)[g/k], 9004-70-0												
Nitromethane[g], 75-52-5												
NP (bis(2,2-dinitropropyl) acetal/formal)[g], 5917-61-3												
PETN (pentaerythritolletra-nitrate), 78-11-5	0.02[s]					1,600		700				
RDX (trimethylenetri-nitramine), 121-82-4	0.003	0.11, C		ND, C		240	64	110	3.2			
TATB (triaminotrinitro-benzene)[g] 3058-38-6												
Tetryl (N-methyl-N,2,4,6-tetranitrobenzeneamine), 479-45-8	0.01					800		350				
1,3,5-TNB (trinitrobenzene), 99-35-4	0.00005					4		1.8				
2,4,6-TNT (trinitrotoluene), 118-96-7	0.0005	0.03, C		ND, C		40	230	18	12			

a. SALs based on methodologies given by EPA (1990, 0432; EPA 1991, 0302). Reference dose (RfD) and carcinogenic slope factor data obtained from EPA (1993, 1062), unless otherwise noted. SALs are rounded to two significant figures. Water SALs are used for both groundwater and surface water. ND = not determined.
b. Target Analyte List (TAL), Target Compound List (TCL), High Explosive List, with associated Chemical Abstract Service numbers, as given by EPA (1991, 0814, 1991, 0779; 1991, 1074).
c. Carcinogens grouped as follows: Group A—human carcinogen; Group—B probable human carcinogen; Group C—possible human carcinogen; Group D—not classifiable as to human carcinogenicity.
d. Soil-to-air volatilization factor; calculated based on equation given by EPA (1991, 0302) and chemical-specific parameters given by Strenge and Peterson (1989, 0837) and EPA (1988, 0747). The volatilization factor (VF) is given only for substances with molecular weight less than 200 and Henry's Law constant greater than 10^{-5} atm/m^{3}·mole.
e. Water SALs not calculated for compounds with MCLs (Table J-1, Chemical-Specific MCLs).
f. Contract Laboratory Program, Contract-Required Quantitation Limits (CRQLs) for soil (mg/kg) and water (µg/l), respectively. CRQLs are provided as an indicator of the analytical method detection limit and are not to be viewed in an absolute sense as a standard of performance for a given sample. CRQLs are not available for air.
g. Toxicity data (e.g., RfDs and/or slope factors) were not available; therefore, SALs were not calculated.
h. The SAL is less than the CRQL; therefore, special analytical services may be required.
i. Toxicity data obtained from EPA (1992, 0833).
j. Oral RfD for cadmium in food/solids.
k. EPA 1993, 1071.
l. Oral RfD for thallium (I) sulfate.
m. Soil SAL incorporates inhalation pathway (only for substances with both an inhalation RfD or slope factor and a VF listed). The equation is given below.
n. Values obtained from the Superfund Health Risk Technical Support Center (1992, 1070).
o. Carcinogenic oral slope factor calculated based on relative potency estimates for polycyclic aromatic hydrocarbons (ICF-Clement 1988, 1063).
p. Based on subchronic RfD divided by 10; chronic RfD for 4-chloro-3-methylphenol not available.
q. Oral RfD was withdrawn on December 1, 1992, until further review (EPA 1993, 1062).
r. Oral RfD was withdrawn on May 1, 1993 until further review (EPA 1993, 1062).
s. Acceptable dose rate for oral route of exposure (Layton et al. 1987, 1060), p. 5.

General Equations for Calculating SALS

Systemic Toxicants

SAL = (THI x RfD x BW x CF)/(I x A), where

SAL = soil screening action level (mg/kg for soil SALs; µg/L for water SALs; µg/m^3 for air SALs).
THI = target hazard index; 1.
RfD = chronic reference dose (mg/kg/day): oral RfD used for soil and water SALs; inhalation RfD used for air SA
BW = body weight; 16 kg for child (used for soil SAL): 70 kg for adult (used for water and air SALs).
CF = conversion factor: 10^6 mg/kg for soil SAL; 1,000 ug/mg for water and air SALs.
I = intake assumption: 200 mg/day for soil SAL (child); 2 L/day for water SAL; 20 m^3/day for air SAL.
A = absorption factor: 1.

Carcinogenic Constituents

SAL = (R x BW x LT x CF)/(SF x I x A x ED), where

R = target risk: 10^{-6} for Class A and B carcinogens; 10^{-5} for Class C carcinogens.
BW = body weight: 70 kg.
LT = assumed lifetime: 70 yr.
CF = conversion factor: 10^6 mg/kg for soil SAL; 1000 µg/mg for water and air SALs.
SF = slope factor (mg/kg/day)$^{-1}$: oral SF used for soil and water SALs; inhalation SF used for air SALs.
I = intake assumption: 100 mg/day for soil SAL; 2 L/day for water SAL; 20 m^3/day for air SAL.
A = absorption factor: 1.
ED = exposure duration: 70 yr.

Equations for Calculating Soil SALs for Volatile Contaminants

Systemic Toxicants

SAL = (THI x BW)/((1/RfD$_O$ x 10^{-6} kg/mg x ING) + (1/RfD$_i$ x INH x (1/VF + 1/PEF)), where

THI = target hazard index: 1.
BW = body weight: 16 kg.
RfD$_O$ = chronic oral reference dose (mg/kg/day).
RfD$_i$ = chronic inhalation reference dose (mg/kg/day).
ING = ingestion intake assumption: 200 mg/day.

VF = soil-to-air volatilization factor (m^3/kg; chemical-specific).
INH = inhalation intake assumption: 20 m^3/day.
PEF = particulate emission factor (4.63×10^9 m^3/kg;) (EPA 1991, 0302).

Carcinogens

SAL = (R x BW x LT)/ED x [(SF_O x 10^{-6} kg/mg x ING) + (SF_i x INH x (1/VF + 1/PEF))], where

R = target risk: 10^{-6} for Class A and B carcinogens; 10^{-5} for Class C carcinogens.
BW = body weight: 70 kg.
LT = assumed lifetime: 70 yr.
ED = exposure duration: 70 yr.
SF_O = oral slope factor $(mg/kg/day)^{-1}$.
ING = ingestion intake assumption: 100 mg/day.
SF_i = inhalation slope factor $(mg/kg/day)^{-1}$.
INH = inhalation intake assumption: 20 m^3/day.
VF and PEF as defined above.

TABLE J-4

PUBLISHED US AVERAGE EFFECTIVE DOSE EQUIVALENT RATES[a] AND ESTIMATES FOR THE LOS ALAMOS AREA FROM NATURAL BACKGROUND RADIATION[b]

Radiation Source	US Average (mrem/yr)	Los Alamos (mrem/yr)
Cosmic Rays	27	58
Cosmogenic Radiation	1	1
External Terrestrial	28	39
Radionuclides in Body	40	40
Inhaled Radionuclides	200	200
Rounded Total	300	340

a. The US average data are from Table 9.7 (NCRP 1990, 0985, p. 148).

b. With the exception of the cosmogenic source, the Los Alamos data come from "Environmental Surveillance at Los Alamos during 1990" (Environmental Protection Group 1992, 0740). The cosmic and external terrestrial components were based on measurements; the balance of the values in the report were obtained from the National Council on Radiation Protection (NCRP 1990, 0985).

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■ APPENDIX H

Statistical Sampling and Data Analysis for Environmental Restoration

1.0 INTRODUCTION

The remediation of hazardous waste sites must be carried out with much less than perfect knowledge of true site conditions. Statistical methods are designed to deal with such uncertainties. The statistical methods discussed in this appendix are applied in the context of the decision framework described in Chapter 4. This approach requires that sampling and analysis plans be designed to provide information to make a well-specified decision and that the investigators assess data quality and use statistical data evaluation to determine whether the data suffice to support that decision.

2.0 MODELS AND DATA IN THE RCRA PROCESS

A model captures current understanding of a site or process and describes the framework within which new information is interpreted. The types of models used range from implicit models (sets of assumptions about the environment and its interactions with the site under study, which are often based on expert professional judgment but are sometimes poorly examined) through qualitative conceptual models to quantitative numerical or probabilistic models. Both qualitative and quantitative models play an important role in environmental restoration (ER) work because it is important that all assumptions be made explicit so that they can be reviewed by all stakeholders in the decision process. Implicit models are not sufficient for the decisions required under the Resource Conservation and Recovery Act (RCRA). The Environmental Protection Agency's (EPA's) data quality objectives (DQO) process provides a forum for eliciting and recording these assumptions.

The central model proposed in this Installation Work Plan (IWP) to organize information during the RCRA process is a conceptual exposure model (Appendix K). This model describes contaminant sources, potential current and future receptors, exposure pathways linking the sources and receptors, and the toxicological link between exposure and risk. These components are evaluated to estimate the risks associated with a potential release site (PRS). Although not all ER decisions are risk-based, a conceptual exposure model provides a useful framework within which to organize information about a site and to identify significant gaps in that information. Depending on the complexity of the site, refining and quantifying the conceptual exposure model throughout the RCRA process may entail constructing quantitative auxiliary models such as

- decision models (Appendix I) to evaluate decision alternatives and the impact of remaining uncertainties,
- statistical models (this appendix) to describe the relationship between the data and the environment,
- environmental transport models to predict potential exposure at points removed from the source of contamination in space and/or time,
- dose/response models for assessing the consequences of exposure under a postulated scenario, and

- engineering calculations to predict the effectiveness of proposed corrective measures as a function of detailed design alternatives.

The goal of site characterization is to provide the environmental data needed for these models at the level of detail needed to make the required decisions. There are several points during the RCRA process at which environmental (and possibly other) data will be collected. Site characterization is initiated during the RCRA field investigation (RFI), during which enough information is collected to perform a baseline risk assessment and to define site conditions for the corrective measures study (CMS). Additional data may be necessary to complete detailed remedial design and monitoring for unanticipated site conditions, as well as for the verification sampling or monitoring that will accompany the corrective measures implementation (CMI).

RCRA guidance for the RFI recommends a phased approach to ensure that a site is investigated in a manner that is cost-effective and that complies with the Hazardous and Solid Waste Amendments (HSWA) Module of the Laboratory's permit to operate under RCRA (EPA 1990, 0306). Each phase of the RFI concludes with a decision about the next step to be taken in the RCRA process based on evaluation of the data available at that point and on the conceptual model refined to reflect the data collected in the latest phase. The first phase of RFI work at a site is described in detail in the original RFI work plan. If a second RFI phase is necessary, its scope will depend on the outcome of that initial phase and therefore cannot be described in detail in the first RFI work plan. However, the potential objectives of subsequent phases can be outlined, and alternatives to additional investigations, such as no further action (NFA) or proceeding immediately to the CMS, can be outlined, along with the criteria to be used in selecting among them.

Frequently, the first phase of RFI work is designed to support a screening decision because existing data and other information are not sufficient to determine which constituents, if any, are contaminants of concern. Thus, for most Los Alamos sites, the initial investigation is designed to establish whether contamination is present above screening action levels (SALs). Sometimes the initial goal is to determine whether voluntary corrective action (VCA) is appropriate. In other cases, an initial investigation is required to establish that action may be deferred until site closure. For a few sites, a conceptual exposure model that is already partially quantified can be constructed before beginning the RFI. In this case, the initial investigation may be designed to support baseline risk assessment or remedial design. The investigation objectives must be tailored both to the specific site and to the remaining uncertainties that prevent the investigator from completing RFI decisions. The investigator determines the appropriate level of detail, using the principles of the observational approach (Appendix G) to exploit as appropriate the opportunities for further data collection that will arise during CMI. As field investigations progress in this way from generic screening toward detailed conceptual modeling, the importance of carefully specifying the investigation and DQOs increases.

3.0 DQOs: SPECIFICATIONS FOR SAMPLING AND ANALYSIS PLANS

As presented by EPA (1992, 0981), the DQO process is part common sense, part good management practice, and part statistics. It is the purpose of this section to describe the last of these aspects, relating the products of the process to the essential requirements for specifying a statistical sampling plan. Nevertheless, even

those steps of the process that require the most statistical input (Steps 5, 6, and 7) raise many nonstatistical issues. Thus, all steps of the process require participation by a DQO planning team consisting of program managers and a variety of technical experts, as well as a statistician.

The seven steps of the DQO process (EPA 1992, 0981) are illustrated in Figure H-1. The product of Step 1 (State the Problem) is a complete description of the site, its history, and its known and suspected problems, together with resources, time, and other practical limits on data collection. As suggested above, a conceptual exposure model can be used in this step to organize existing information so that the gaps in existing knowledge that significantly affect the investigator's ability to perform the required assessments are readily identified. A decision model (Appendix I) may be superimposed on this conceptual exposure model to assist this identification process. Also during this step, the planning team should consider the potential remedial alternatives and the types of information that may eventually be required to select among them.

It is neither feasible nor necessary to address all uncertainties at once. Step 2 of the DQO process (Identify the Decision) therefore focuses on the immediate decisions that need to be made—those that define the current phase of the project. The product of Step 2 is a statement of choices among alternative courses of action, framed as narrowly and as specifically as possible. The decisions must be stated in a way that makes it clear what the role of data will be in selecting among these alternatives. This focus differentiates data collection for environmental decision making, as required under RCRA, from data collection for research purposes, where the objective is simply to learn more about a site or phenomenon.

Occasionally, these first two steps may lead to a "decision" that can be made immediately—that is, archival information may indicate only one reasonable course of action, such as the NFA decision mentioned in Section 4.1.1. (Detailed criteria for proposing NFA based on archival information are discussed in Appendix I.) In these cases, it is not necessary to proceed further with the DQO process.

Otherwise, Step 3 of the DQO process (Identify Inputs to the Decision) begins to turn the decision statement into a set of specifications for a sampling and analysis plan. The product of this step is a list of types of information required to make the decision. These decision inputs are the environmental variables or parameters to be measured (called *outcome variables* in the statistical survey sampling literature). If none of the required inputs are environmental parameters for which new data must be collected, then again it is possible to exit the DQO process after the required existing information has been assembled.

When new environmental data are required, an additional series of questions must be addressed in order to complete the specification of the sampling and analysis plan to acquire them. These questions are developed in Steps 4, 5, and 6 of the DQO process. Step 4 (Define the Study Boundaries) specifies the *target population(s)* for environmental study. Both the spatial and temporal boundaries of the population to be sampled, as well as the media of interest, must be described. Examples of outcome variables and target populations are

- radionuclide concentrations in the top 6 in. of soil in a residential exposure unit, where the radionuclides of interest are assumed to be sufficiently stable that temporal boundaries need not be specified;

- concentrations of semivolatile organic compounds in a shal-

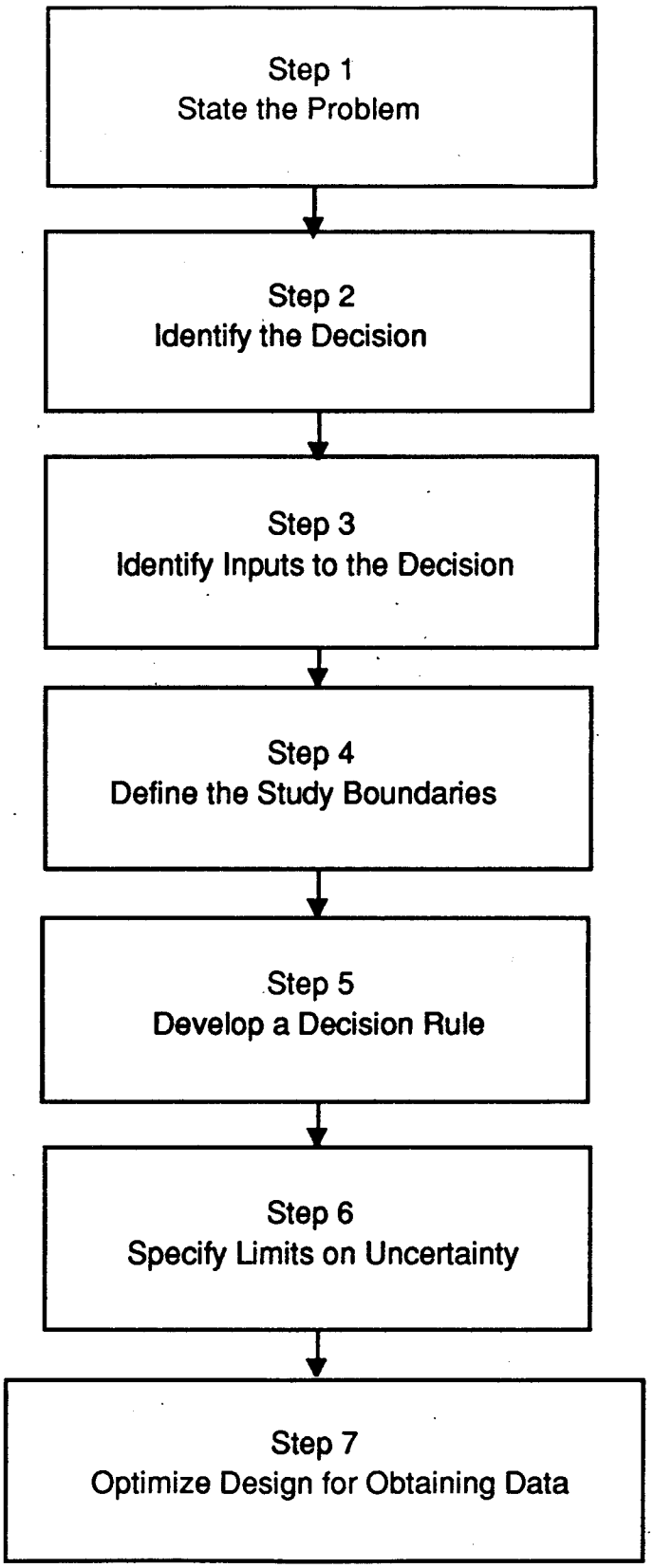

Figure H-1. The seven-step DQO process.

low alluvial aquifer beneath and for 200 ft downgradient from a PRS; and

- particle density and size distribution in air within 500 m of the site's perimeter as a function of the time of year.

It is also necessary to specify quite precisely the physical methods that will be used to collect the sample and how measurements on this sample are assumed to be related to the population parameters of interest. Sometimes this relationship is fairly complex, as when filters left on a site for days, weeks, or months are used to sample particles in air. Even for surface soil, sieving or other methods of preparing samples may result in a sample whose relationship to the target population is not simple. The product of Step 5 (Develop a Decision Rule) is a statement that defines how environmental data will be aggregated and summarized (i.e., a statement that specifies the *statistic* or statistics to be calculated) and used to make the decision (the *criterion* for a statistical *hypothesis test*). The decision rule can vary from simple to very complex. For example, the data might be summarized by the sample maximum, which can be compared directly with a SAL. At the other extreme, concentration data might be interpolated on a three-dimensional grid and used in a numerical transport model to predict how long it will take for the contaminant to move offsite, and this predicted travel time is compared with regulatory requirements or contaminant decay times.

Step 6 (Specify Limits on Uncertainty) is necessary because environmental data are incomplete (decisions must be based on observations of a small fraction of the selected target population) and subject to errors of many kinds (errors introduced during sample collection and preparation, as well as analytical error). Thus, there is always a nonzero probability that use of the decision rule developed in Step 5 will produce the wrong answer, which, in turn, leads to selecting an incorrect decision in Step 2. The investigator must consider the impacts of various types of errors in the Step 2 decision:

- What are the possible decision errors: cleaning up a site that presents no significant risk to human health or the environment? failing to detect a significant release?

- What are the consequences of each type of error: excessive monetary costs? legal liability? negative public perception? unnecessary restrictions on Laboratory operations?

- How averse are decision makers to each type of error ? Specifically, in what situations is either decision acceptable? At what extremes do errors become highly unacceptable?

Turning these decision requirements into *design criteria* for the sampling and analysis plan is generally a difficult task, involving some assumptions about the likely sampling variability and probable site conditions. Nevertheless, some attempt should be made to address these questions because their answers provide some basis for determining sample sizes and analytical requirements that are both adequate and reasonable.

Step 6 completes the specifications for a sampling and analysis plan: what is to be measured? for what population? how will the data be used? and what is the margin for error? The seventh and final step of the DQO process (Optimize the Design for

Obtaining Data) is to design a sampling and analysis plan to meet these specifications efficiently. Here, a number of further options, such as the following, can be considered:

- How can relatively inexpensive field surveys and field screening results be used to direct the selection of samples for laboratory analysis or to supplement those analytical results?
- Should the target population be stratified to reduce the variability of the computed statistics?
- Can samples be composited to decrease analytical costs or to decrease decision error rates by increasing site coverage for the same cost?
- What level of analytical precision is required, and what analytical methods guarantee such levels?

4.0 SCREENING ASSESSMENT

The first phase of most investigations at Los Alamos consists of investigations to support a screening assessment. The usual criterion for determining that a release of contaminants to the environment has occurred is the presence at the site of contaminant concentrations in environmental media above the corresponding contaminant- and media-specific SALs; however, this decision criterion may require modification for some sites. When the medium of interest is soil or tuff whose natural constituents include elements at concentrations above the calculated SALs, a comparison of site observations with natural background levels is more appropriate for those constituents (Section 4.4, below). When multiple contaminants are present, a constituent whose concentration is not above the SAL may nevertheless be identified as a contaminant of concern because of its potential impact in combination with other constituents (Appendix J).

The objective of collecting data for screening assessments is to provide evidence about the nature of contamination at the site (that is, which of the potential contaminants are actually present above background levels) and about the range of concentrations relative to contaminant- and media-specific criteria. This objective contrasts with collecting data to support (1) a risk-based decision, which requires information about the distribution of a contaminant of concern throughout the site in order to compare the associated human health or environmental risks with a criterion risk level (Section 5 of this appendix) or (2) a remedial decision, which may require detailed information about the extent of the contaminated volume in order to evaluate the feasibility or effectiveness of a proposed corrective action.

The ER Program at Los Alamos is currently using three sampling strategies for screening assessments. These strategies include a nonstatistical strategy, a classical statistical approach, and a Bayesian statistical approach. Both of the statistical strategies use formal statistical models to determine the number of samples and other design parameters, based on the expected consequences of making incorrect decisions and on available information (if any) about the distribution of potential contaminants of concern. The approaches differ in their use of prior information, including expert opinion and existing data, and also in the way the conclusions are stated. Data collected using a design based solely on professional judgment cannot be evaluated statistically; however, the ER Program recognizes

that nonstatistical modes of inference play a significant role in much scientifically sound work.

4.1 Professional Judgment as a Basis for Sampling Design

Use of professional judgment assumes that knowledge about the process that was responsible for the potential problem, together with knowledge about the behavior of the potential contaminants in the environment, is sufficient to specify the design of a sampling and analysis plan. That is, professional judgment can be used to determine both the number and placement of samples and the more qualitative aspects of the design such as the selection of analytical methods. For well-defined sites (the interiors of septic tanks, small spills where soil contamination is visible to the eye or to field instruments, and similar small problems), statistical design principles are often not very useful, especially when the problem has been formulated as a screening decision.

More often, professionals are comfortable with selecting sample locations but lack a judgmental basis for determining the appropriate number of samples. Therefore, a common alternative to a completely judgmental specification is the use of a statistical method to determine the number of samples needed, together with professional judgment or auxiliary information such as field survey data to determine the placement of those samples. The underlying assumption is that biasing the sample locations in this way increases the probability of detecting contaminants of concern, if present. Like other design assumptions, this one could be tested as part of a quality assurance sampling program (Section 7 of this appendix).

4.2 Binomial Sampling Strategy

This statistical strategy assumes that the decision maker can specify the minimum probability with which contamination above the SAL should be detected in the sample as a function, $P_{min}(f)$, of the unknown fraction f of the site that is actually contaminated above the SAL. Because the consequences of failing to detect widespread contamination are more serious than the consequences of failing to detect contamination that affects only a small fraction of the site, P_{min} is always an increasing function of f, but the exact shape of this function can vary from one site to another. For example, for a spatially heterogeneous, highly toxic constituent, the contamination of even a small fraction of the site could be of large concern. Conversely, when contamination, if present, can be expected to be relatively homogeneous or of low toxicity, P_{min} increases more slowly as a function of f.

The screening decision criterion used with the binomial sampling strategy is that a constituent will be identified as a contaminant of concern if one or more sample measurements yields a result that exceeds the SAL (that is, the sample maximum exceeds the SAL). Given this decision rule, together with the design specification $P_{min}(f)$, the required sample size, n, can be derived as follows. If n samples are selected at random from the site and if measurement error is ignored, the actual probability of getting at least one observation above the SAL is

$$P_n(f) = 1 - (1-f)^n \ . \qquad (4.1)$$

Thus, n must be chosen so that $P_n(f) \geq P_{min}(f)$ for all f.

In application, P_{min} is specified for one or two representative values of f rather than for the whole range between 0 and 1. These values are selected as above on the basis of the expected heterogeneity of the site (which, in general, increases as the size of the site increases, among other factors) and the toxicity of the potential contaminants. (These assumptions should always be spelled out and are highly appropriate subjects for discussion among stakeholders.) Look-up tables, nomograms, or graphs can be used in place of Equation 4.1 to determine the required number of samples n. The n samples are then allocated in a randomized or biased fashion, depending on the investigators' confidence in available criteria for biasing. Negative results are summarized by confidence statements; the hypothesis that contamination affects more than a given fraction of the site can be rejected with a certain level of statistical confidence if none of the n observations exceeds the SAL. A single positive observation results in accepting the hypothesis that contamination is present at the site under this simple decision rule; that is, no attempt is made to control "false positives" under the binomial sampling strategy and no statistical confidence is computed for a positive result. Under rather weak conditions, measurement error increases the probability of falsely accepting the hypothesis that contamination is present but does not increase the probability of false negatives. However, analytical measurements that are biased downward can create problems, so this possibility should be minimized by quality assurance sampling.

Example

An area next to the loading dock of a machine shop has been identified as a PRS because waste oils were formerly stored there before being shipped to a permanent disposal or recycling facility. The area is about 200 ft^2, unpaved, and unvegetated. Waste oils could have been contaminated with low levels of natural or depleted uranium or beryllium. There is no record of leakage from drums stored at the site. No field surveys or sampling have ever been performed at the site.

In view of the lack of quantitative information, the decision to be made was formulated as follows:

> Determine whether soil contamination is present above SALs. If so, perform a baseline risk assessment for the site, which may involve collecting additional information to determine the average contaminant levels. If not, propose NFA.

New environmental data, specifically, soil contaminant levels at the site, are required to make this decision. The decision domain includes surface soils (0-6 in.) in the area on which drums may have been stored. The data for each contaminant (selected metals and hydrocarbons) are summarized by the observed sample maximum and are compared with the corresponding SAL. The constituents of interest are not extremely toxic. It was decided that if contamination is above SALs over more than 20% of the domain, the probability of observing it should exceed 0.85 [that is, $P_{min}(0.8) = 0.85$]; if more than 40%, the probability should rise to 0.95 [$P_{min}(0.6) = 0.95$]. Judgmental sampling based on visual inspection and a radioactivity survey will be used to bias the samples.

Table H-1 shows that eight samples ensure that at least one will fall in the most contaminated fifth of the domain with probability 0.85 or greater while providing probability of 0.98 of observing contamination that affects 60% of the site. If it can be assumed that contaminants, if present, are associated with oil stains or with above-background field radiation measurements, these probabilities can be increased or fewer samples can be taken to attain the same level of assurance.

TABLE H-1

NUMBER OF INDEPENDENT OBSERVATIONS REQUIRED TO DETECT CONTAMINATION WITH SPECIFIED PROBABILITY

		Fraction of the Site That Is Contaminated									
		0.50	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05
	0.75	2	3	3	4	4	5	7	9	14	28
	0.76	3	3	3	4	5	5	7	9	14	28
	0.77	3	3	3	4	5	6	7	10	14	29
	0.78	3	3	3	4	5	6	7	10	15	30
Probability	0.79	3	3	4	4	5	6	7	10	15	31
of Detecting	0.80	3	3	4	4	5	6	8	10	16	32
Contamination	0.81	3	3	4	4	5	6	8	11	16	33
in at Least	0.82	3	3	4	4	5	6	8	11	17	34
One Sample	0.83	3	3	4	5	5	7	8	11	17	35
	0.84	3	4	4	5	6	7	9	12	18	36
	0.85	3	4	4	5	6	7	9	12	19	37
	0.86	3	4	4	5	6	7	9	13	19	39
	0.87	3	4	4	5	6	8	10	13	20	40
	0.88	4	4	5	5	6	8	10	14	21	42
	0.89	4	4	5	6	7	8	10	14	21	44
	0.90	4	4	5	6	7	9	11	15	22	45
	0.91	4	5	5	6	7	9	11	15	23	47
	0.92	4	5	5	6	8	9	12	16	24	50
	0.93	4	5	6	7	8	10	12	17	26	52
	0.94	5	5	6	7	8	10	13	18	27	55
	0.95	5	6	6	7	9	11	14	19	29	59
	0.96	5	6	7	8	10	12	15	20	31	63
	0.97	6	6	7	9	10	13	16	22	34	69
	0.98	6	7	8	10	11	14	18	25	38	77
	0.99	7	8	10	11	13	17	21	29	44	90

However, it is impossible to quantify the improvement in detection probabilities that could result from using these field indicators. A stratified sampling plan (Section 5.2.3) that assigns some samples to areas with positive field indications and others to areas with none could be used to provide information for quantifying this improvement.◊

Example

A 2-acre area was used for temporary storage of new and used materials, including bulk metals and waste solvents in drums. Vehicle tracks and devegetation suggest which areas were most used, although no records are available and the site is no longer used. In this case, because the site is fairly large and potentially heterogeneous, it is desirable to detect contamination if it affects as little as 5% of the site with probability 0.85. Table H-1 shows that, in the absence of useful field information, 37 samples are required. Visual evidence of usage might be used to bias sampling.◊

4.3 A Bayesian Statistical Approach

Bayesian statistical methods elicit information from both decision makers and technical experts, which is used to model expectations about the distribution of contamination at the site. The result of a Bayesian analysis of screening assessment

is a direct probability statement about the chances that contaminants occur at a site at a level that exceeds SALs rather than a confidence statement that is only indirectly related to this probability.

A Bayesian approach to screening assessment requires specification of a *prior* probability distribution that models the proportion of the site, f, that is actually expected to be contaminated above SALs. The prior distribution can be determined by obtaining answers to the following types of questions:

> Before seeing any data, what is the probability that the next observation will produce an observation with concentrations less than SALs?
>
> After seeing an (hypothetical) observation with concentrations below SALs, what is the probability that the next observation will produce an observation with concentrations lower than SALs?

More generally, these questions can be asked based on a hypothetical sequence of observed concentrations. (A minimum of three such questions must be answered to complete the specification of the prior distribution. However, overspecification is encouraged to validate the inputs.)

The design specification $P_{min}(f)$ used in Section 4.2 is replaced by a loss function that specifies the costs associated with making incorrect decisions. These costs do not have to be stated in dollar terms, but they do need to reflect the relative consequences of making a false negative decision—such as proposing NFA when the site does contain areas of contamination above SALs—and of making a false positive decision—such as proposing further action when the site does not contain areas of contamination above SALs.

Sample sizes are selected to minimize the expected loss associated with each decision, as measured by the loss function adjusted by the probability of each hypothesis. After measurements have been made, the prior probability distribution is updated by the new data. For the screening assessment decision, as more observations at concentrations below SALs are recorded (assuming no observations at concentrations greater than SALs), the expected loss under the NFA decision decreases. At the point at which the expected loss under the NFA decision becomes less than the expected loss under the "further action" decision, sufficient samples have been taken to justify a proposal of NFA. As in Section 4.2, if any observation should result in a concentration greater than the SAL, further action could be required.

The probabilistic prior model for the distribution of concentrations and the loss function representing the consequences of false decisions can be obtained through consultation with all interested parties, including the operable unit (OU) teams and the regulatory stakeholders. If little is known about the site, this lack of knowledge can be reflected by choosing a relatively flat or "uninformative" prior probability model. The resulting number of samples is a consequence of these choices. In general, the less informative the prior probability model, the more samples are required.

4.4 Statistical Methods for Background Comparisons

During screening assessment, the levels of some constitutents must be compared with natural background values, as shown in Figure 4-2. If this comparison indicates that the sample values for a particular constituent are not different from background values, no further evaluation of that constituent is necessary, even if these natural background values exceed the SALs (which is the case for the elements arsenic, beryllium, and thorium.) Background comparisons may also be reported for constituents whose background range is below the SAL. Finally, the methods described below can be applied in comparing observations from a specific PRS with observations obtained from nearby areas unaffected by that PRS (such as OU-specific background data) in order to determine whether elevated levels are related to the PRS in question or are part of a more widespread release.

Concentrations that are above background will be compared with SALs. No adjustment for nonzero background concentrations is performed during such a screening assessment. However, background values may be taken into account in performing risk assessments for carcinogens and radionuclides to determine whether incremental amounts of these constituents pose an unacceptable risk. For noncarcinogens, only the total concentration values are considered in the risk analysis (Appendix K).

Comparisons of sample values with background distributions may be performed using a series of three tests described by Gilbert and Simpson (1990, 0972). The use of three different tests is recommended to allow detection of different types of deviations from the background distribution. The proposed tests are nonparametric, that is, they do not require specification of a specific functional form for the distribution of a particular constituent. They can also accommodate observations that are below detection limits.

The Wilcoxon rank sum test [also called the Mann-Whitney test (Conover 1980, 1050)] is used to assess whether two distributions are significantly different. This test is especially effective for detecting elevated concentrations throughout the site, even when the shift above background is small. The first step in performing the Wilcoxon rank sum test is to construct an ordered list from smallest to largest of the data set obtained by combining the background measurements and the sample values. The values are ranked starting with 1 for the smallest value. The sum of the ranks corresponding to the sample values is then compared with tabled values [e.g., Table A7 (Conover 1980, 1050)] to determine whether the sample values are likely to have come from the same population as the that of the background measurements.

The quantile test (Johnson et al. 1987, 0973) also tests for differences between two distributions. The quantile test is designed to detect differences in the upper tails of the distributions, which could occur if the data represented a site of which only a small part was contaminated. The first step in the quantile test is the same as that for the Wilcoxon rank sum test: ranks are assigned to the combined background and sample values, assigning the rank 1 to the smallest value. Then, from the largest r values from the combined data set, a count, k, is determined of the number of values that come from the sample values rather than from the background values. The value of k is compared with tabled values. If k is sufficiently large, the sample values are determined to be above background.

To protect against individual extreme values that may not be flagged by either the Wilcoxon rank sum test or the quantile test, Gilbert and Simpson (1992, 0974) also recommend a "hot-measurement" test. This test simply flags individual measurements that will be subjected to further evaluation, even if the other tests do not reveal significant distributional differences. The critical level used in this test may be based on a variety of criteria, including professional judgment, regulatory limits, SALs, and extreme quantiles of the background distribution.

The series of three tests described above is designed to detect differences in sample values from a reference background distribution without assuming a specific functional form of the background distribution. For some situations, sufficient information may exist to characterize the distributions of the sample values and the reference background distribution as members of a specific family of probability distributions (e.g., the log normal family). Use of this information to construct a parametric test can result in a test that is more powerful, i.e., a test that is more likely to detect a difference in the two distributions if they are actually different; however, this advantage is lost if the parametric assumptions are incorrect.

Distribution-dependent techniques that may be useful for normally distributed data include the two-sample t-test and normal tolerance limits. The two-sample t-test is used to detect a difference in the means of two populations. Normal tolerance limits are used to specify an upper limit so that a given proportion of the observations in a random sample from the reference population lie below that level with specified confidence. EPA guidance (1989, 0794) discusses the use of these and similar methods for environmental sampling decisions. Odeh and Owen (1980, 0975) provide extensive tables for computing normal tolerance limits.

Data for background comparisons may be derived from a variety of sources. Results of background studies conducted under the auspices of the ER Program are summarized in Appendix F. These studies analyzed background soil and tuff samples for many constituents that are expected to have nonzero concentration levels, even in the absence of releases attributable to Laboratory operations. Data from earlier studies [Ferenbaugh et al. (1990, 0099) and Purtymun et al. (1987, 0211)] provide additional background information. National background data may also be useful when regional values are unavailable; Shacklette and Boerngen (1984, 0418) provide information on background levels of several elements using data collected across the United States. At selected sites, site-specific background values may be available from locations where a release is unlikely to have occurred. OU background data may be used to determine whether elevated values at a PRS are caused by a localized release or by more general OU-wide contamination (e.g., from airborne stack releases). Gilbert and Simpson (1990, 0794) and a DOE report (DOE 1992, 0976) point out that reference areas for background data must be selected with care. Determining appropriate background data may involve historical information, data availability, information on soil types, other site-specific information, and professional judgment.

5.0 RISK-BASED DECISIONS

The presence of contaminant concentrations above SALs may not in itself warrant corrective action for any of a number of reasons. SALs are purposely set at very low levels, levels at which human health effects are unlikely even under worst-case exposure assumptions. The actual extent and overall level of contamination may preclude negative impacts under any realistic exposure scenario, or the available remediation alternatives may be far more destructive of the ecosystem than any

historical release. Thus, in general, further evaluation of the site, which may include further sampling to characterize not only contamination but also other environmental parameters, is required to determine whether corrective action is desirable. In general, this decision is risk-based, although non-risk-based criteria may be more appropriate for certain sites.

Sampling to support decisions beyond the screening decision must be guided by well-specified decision statements. Decision criteria can then be derived, based, for example, on the need to estimate the risk associated with existing contamination or on the need to determine the volume of soil to be removed. Risk-based decisions take into consideration not only contamination levels at the site but also the mechanisms by which organisms (human or other) might be exposed to this contamination, either by their activities at the site or as a result of migration of contaminants away from the site. Thus, specifications for a sampling and analysis plan to support such a decision include a detailed description of the scenario to be used for risk assessment.

5.1 Data Quality Objectives for Risk-Based Decisions

The risk associated with contamination depends on the actual dose to the assumed receptors, which, in turn, is proportional to the intake of contaminants integrated over both the spatial domain and temporal duration of exposure under the assumed exposure scenario. Sampling must therefore be designed to ensure that data are adequate to support decisions at the exposure unit scale. As described in Appendix K, both current and future uses of the site need to be considered during Step 4 of the DQO process in order to select the appropriate exposure unit, which, in turn, determines the spatial and sometimes also the temporal scale of the investigation. Current EPA guidance (EPA 1989, 0305) recommends using an upper 95% confidence limit for the mean concentration of contaminants at a site or portion thereof (that is, within an exposure unit). This guidance suggests that a false negative decision error rate on the order of 5% can be tolerated if the true risk is equal to the target risk level. Among sampling plans that achieve this decision error rate at the target risk level, further optimization is possible to ensure even smaller error rates when the true risk significantly exceeds the target risk level and also to decrease the rate of false positive decisions when the true risk is less than the target risk level. If the recommended statistic is used, these error rates depend on the precision of the estimate of the mean, which, in turn, is a function of the sample size. Specifications for desired decision error rates are elicited during the DQO process and depend on many nonenvironmental considerations.

Completing the design of a sampling plan to collect data for estimating the mean concentration in exposure units requires further knowledge or assumptions. In particular, the magnitudes of significant components of error—population variability, sampling error, and analytical error—must be known or estimated to calculate the number of samples required to achieve the specified decision error rates. This information may be available from the initial site investigation or from other sources (Section 6.1 of this appendix), or quality assurance sampling may be designed to test the assumptions (Section 7 of this appendix).

5.2 Sampling Strategies for Risk-Based Decisions

Because sampling to estimate means is the usual goal of classical survey sampling, many well-developed strategies are discussed in statistical literature. Strategies that

are particularly useful for environmental work are discussed in the following subsections and also by Gilbert (1987, 0506).

The Los Alamos ER Program is currently developing additional sample allocation schemes for risk assessment in both the classical and Bayesian statistical frameworks. Developments in both areas build on the classical work by including existing information about distributions of contaminants of concern and evaluation of the consequences of making incorrect decisions as more explicit factors in the design. As for screening assessment, some distinctions arise between the classical and Bayesian approaches to statistical inference. For example, in the Bayesian approach, the results of the data analyses are presented as probabilities that the hypotheses obtain, while, in the classical approach, they are presented as confidence levels for accepting or rejecting a null hypothesis (Berger 1985, 0977).

5.2.1 Simple Random Sampling

Simple random sampling is easy to conceptualize in the case of finite populations, where the population units available for sampling can be enumerated and a randomization mechanism can be used to select n units in such a way that each possible set of n units has an equal chance of being chosen (the "simple" aspect of this design). In practice, simple random sampling is only approximated in most environmental work. Common modifications are restriction of potential sampling locations to the nodes of a grid and spatial stratification to ensure covering the site. Most discussions of statistical sampling, environmental or otherwise, recommend using some kind of randomization in selecting samples for both theoretical and practical reasons. The practical argument for randomization is that it should result in a more "representative" sample of the whole population, unbiased either consciously or unconsciously by the judgment of the investigator. Extrapolation of results from a small but randomly allocated sample to the whole population is a more satisfactory procedure than it would be if the sampling locations were selected at the whim of the investigator, no matter how objective he/she might be.

The reasons for not using randomization in the field also appear to be practical—sites chosen at random often turn out to be unsuitable for sampling for one reason or another (too rocky, underneath a concrete pad, next to a beehive, etc.), and it is more time-consuming to survey in random locations than to survey a regular grid. EPA has many practical techniques for overcoming these objections (EPA 1989, 0794, Chapter 5). One of the simplest randomization schemes is to use a regular grid, randomizing only the starting point and the orientation. Additional randomization, rather than the judgment or convenience of the field team, should be used to replace a grid point that turns out to be unsuitable for sampling. Simple methods are also available for randomizing each sampling location, starting from a surveyed grid that can be applied on the spot by a field team equipped with nothing more elegant than a pair of dice (or a similarly low-tech method for generating random numbers), a compass, and a tape measure.

When the observations are based on a simple random sample, the standard estimator for the mean of the sampled population is the sample mean,

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \,, \qquad (5.1)$$

where x_i is the measurement of the outcome variable on the ith sample. Again, assuming statistical independence of the observations, this estimator has variance

$$\frac{\sigma^2 + \theta^2}{n}, \qquad (5.2)$$

where σ^2 is the between-sample variance and θ^2 is the variance of the analytical error. If the observations are correlated, Equation 5.2 does not hold; however, if the between-sample correlations can be estimated [based, for example, on an estimated spatial covariance function (Section 5.4)], this expression can be modified. As Equation 5.2 shows, the precision with which a population mean can be estimated depends not only on the sample size but also on the population variance (about which there is often no information), as well as on analytical error variance, which may or may not be reliably provided by the laboratory or by the instrument manufacturer. Therefore, determining an appropriate sample size involves making some reasonable assumptions about the variances of the measured outcome variables. Frequently, analytical error is insignificant compared with the population variance, σ^2; however, if not, one way to reduce θ^2 is to make multiple measurements on each sample.

Sampling for the purpose of estimating a mean differs from screening investigations in some important respects. For one thing, biased sampling of the target population results in biased estimates of the mean, which increases the false positive decision error rate. For some sites, this drawback may be considered an acceptable price to pay to avoid revisiting the site. However, it becomes even more critical to test the assumption that the principles used to bias the sample do in fact bias the results upward by appropriate quality assurance sampling. Such sampling is likely to take the form of including a few samples from areas thought to be less contaminated; therefore, as an alternative to biased sampling, the investigator might consider a stratified sampling design (Section 5.2.3, below).

Example

Screening investigation of the example of the former drum storage area described in Section 4.2 began with a site inspection and a radiological survey, whose results were to be used to bias subsequent sampling. If there are no positive results from these surveys, the investigator could select samples at random from the surface soil of the PRS and might anticipate performing a baseline risk assessment using the mean values of the contaminants of concern identified by the screening assessment, if any. How precise will the estimates of these means be if based on the screening assessment sample of size 11?

The fact that there were no positive field indications might be used to bound the concentration of some of the contaminants at the site and their variability as well. For example, if the radiological survey instrument should be able to detect uranium concentrations above 20 pCi/gm in surface soil, it may be concluded that the average concentration at the site is below that level, and the standard deviation is unlikely to exceed half of this amount. (Distributions with coefficients of variation as large as 0.5 are very rare, although they could occur at sites with small but highly contaminated hot spots.) Thus, the standard deviation of the mean of the proposed 11 samples should be less than $10\sqrt{11}$ or about 3 pCi/gm (assuming that the analytical error is negligible by comparison with 10 pCi/gm), which would allow estimating the

mean with a 95% confidence interval not larger than ±6 pCi/gm (and probably a great deal smaller because the sample standard deviation is likely to turn out to be quite a bit less than 3 pCi/gm).◊

5.2.2 Composite Sampling

As a general rule, the larger the population variance, the more samples are needed to estimate a mean with given precision. This subsection and the following two subsections present sampling strategies that, correctly applied, can increase the precision of the estimate of the mean without increasing the number of laboratory analyses required.

One way to reduce sampling variability is to form composite samples. A composite sample is generally made up in the field. Grab samples [called "increments" in the statistical literature on composite sampling (Elder et al. 1980, 0795)] are collected as usual following the appropriate procedures, except that less material may be required in each grab sample than if each were to be analyzed separately. The material from several grab samples is combined and homogenized to form a composite sample from which subsamples (seldom more than two) are removed and packaged as usual for laboratory analysis. Clearly, this brief description passes over some significant practical details. In particular, it is desirable that each grab sample contribute an equal amount to the composite and to the subsamples, which suggests that any sieving to remove rocks and other debris should be done before the increments are composited. Homogenization should be as thorough as possible. If volatile contaminants are of concern, compositing should not be used.

In order to estimate the population mean from composite samples, the following assumptions are made:

- The estimate is computed as the average of $n = r \times s$ subsamples, that is, Equation 5.1 is used with the measurements on s subsamples from each of r composites. (Equation 5.3, below, can be modified if not all composites have the same number of subsamples.)

- The volume of each composite is equal to that of s subsamples. (If $s = 1$, that is, if the entire composite is analyzed to produce one measurement per composite, the last term in Equation 5.3 should be ignored.)

- Each composite is formed from $m \geq 1$ grab samples. Equation 5.3 assumes that each grab sample is homogeneous; however, modifications can be made if this is not the case.

- σ^2 is the between-grab sample variability, usually more significant than any inhomogeneity within grab samples.

- τ^2 is the variance of the contribution of the individual grab samples to the measured subsamples. Ideally, each subsample has a contribution from each increment that went into its parent composite that is 1/n of the volume of the total subsample so that τ^2 is zero and, again, the last term of Equation 5.3 vanishes.

- θ^2 is the analytical error variance.

With these assumptions, the variance of the estimate of the mean is given by

$$\frac{\sigma^2}{nm} + \frac{\theta^2}{rs} + \frac{m}{rs}\frac{S-s}{S-1}\sigma^2\tau^2 . \qquad (5.3)$$

Thus, when the variability among grab samples is the major component of variance (that is, when σ^2 is much larger than either θ^2 or τ^2), its effect on the estimate of the mean of a population can be reduced by compositing.

When collecting data for a risk-based decision, sampling designs that include physical averaging do not adversely affect the estimation of averages at the exposure unit scale, provided that the compositing design does not composite grab samples from different exposure units. However, increased precision in the estimate of the exposure unit mean using composite sampling may be attained at the expense of spatial resolution within an exposure unit. If spatial resolution on a smaller scale is important, then the selection of increments to composite should be compatible with the scale of spatial resolution required. For example, composites may be formed within quadrants or smaller fractions of exposure units and should not combine strata likely to differ significantly (e.g., material from channels with mesa-top soils in cases where contaminants may have been released to outfalls).

In some cases it is possible to recover spatial resolution using a two-phase analysis plan (Boswell and Patil 1990, 0978). In this way compositing may be used for screening assessment or "hot spot" detection. For example, 18 increments may be used to create 6 composite samples. If all 6 composite subsamples indicate concentrations below SAL-related levels, the site can be proposed for NFA. If this is not the case, then the increments that made up a high composite must be reanalyzed to determine whether the actual concentration in any one increment exceeded the SAL. (Note the expression "SAL-related levels." For composite samples SALs must be modified to account for the averaging effect of compositing. If 6 increments go into one composite but only one is above the SAL, their mean may be below the SAL. However, assuming increments of equal weights, their mean cannot be below 1/6 of the SAL, so 1/6 of the SAL can be used for screening assessments based on composites of 6 increments. Similar calculations are required when using composites for "hot spot" detection.) This procedure is not practical if the constituents of interest have short holding times, if adequate sample storage space is not available, or if time is a critical factor.

5.2.3 Stratified Sampling

A second common method for reducing sampling variability partitions the domain into comparatively homogeneous strata, allocating a certain number of samples to each stratum (generally more samples to more variable strata.) It is assumed that there are J such strata, and N_j samples are allocated to the jth stratum. If the jth stratum accounts for a fraction F_j of the domain, then the appropriate estimator for the population mean is

$$\bar{x}_s = \sum_{j=1}^{J} F_j \bar{x}_j , \qquad (5.4)$$

where $\bar{x}_j$ is the mean outcome for the samples in the jth stratum (computed as in Equation 5.1). Denoting the within-stratum variances by σ_j^2, this estimator has variance

$$\sum_{j=1}^{j} \frac{F_j^2 \sigma_j^2}{n_j} \quad , \qquad (5.5)$$

(ignoring analytical error), which can be substantially smaller than the variance of the ordinary, unstratified mean if the σ_j^2 are small compared with the variability between strata. Often, of course, it is necessary to estimate the F_j from the data, which adds another, possibly significant component of variance to Equation 5.5.

In a sense, a biased screening investigation sample could be considered a stratified sample; however, if one stratum (e.g., the stratum with no positive field indications) is not sampled at all, the corresponding estimate of the mean (but not the sample maximum) has infinite variance, from Equation 5.5.

Example

In the past, debris from several firing sites was burned in trenches about 10 ft deep that had been excavated in the alluvium in a flat canyon bottom. The last of the trenches has now been backfilled, and the entire area, less than 1 acre, has been leveled and reseeded. Although the bulk of the material brought to this site consisted of plywood and similar combustibles, this material may have been contaminated with small amounts of high explosive (HE), HE residuals, depleted uranium, and other heavy metals used at the firing sites. The screening assessment identified depleted uranium as the only contaminant of concern; depleted uranium was observed in the thin layer of ash at the bottom of one trench.

The next step, therefore, is a baseline risk assessment. Step 1 of the DQO process identifies as the most significant onsite exposure scenario exposure of individuals who are making recreational use of the area to material eroded from the trenches. Using this scenario, the mean contamination contained in the disturbed volume is estimated and used to calculate risk.

The conceptual model for the site envisions a layer of ash and debris at the bottom of the excavated trench, which is covered by fill that might be slightly contaminated and is underlain by undisturbed alluvium into which contaminants may have leached. The area is to be investigated by drilling to a depth of a few feet below the bottom of the pits. Contaminant levels in the ash and debris layer could be both significantly higher than in the other two strata and significantly more variable. Therefore, even though the ash and debris are probably only a small fraction of the total volume, the investigator allocates more samples to those strata than to the fill and alluvium.

In this example, it is also necessary to estimate F_j for each stratum. The fractions of each stratum in each drill hole through the trenches (which can be observed independently of the selection of samples for laboratory analysis) can be used for this purpose:

$$\hat{F}_j = \sum_{h=1}^{H} t_{hj} \Big/ \sum_{h=1}^{H} d_h \quad , \qquad (5.6)$$

where t_{hj} is the number of linear feet of core through the jth stratum in the hth hole and d_h is the total length of core from the hth hole. If the thicknesses of the ash and debris strata are very variable, the variance given by Equation 5.5 will be significantly inflated.◊

Example

Risk-based sampling (Seiler 1987, 0564) is a stratified sampling strategy that deserves mention because it is designed to estimate not the mean contaminant level for the population but rather a weighted mean proportional to risk. It is a form of stratified sampling; the population to be sampled is stratified according to the degree of exposure associated with each unit. Thus, for a site at which dermal contact with soil is the main exposure route, those parts of the site that are currently exposed constitute one stratum, those imminently subject to exposure by erosion another, and more deeply buried areas are assigned to other strata. If these strata are then sampled in proportion to their contribution to receptor exposure potential, the (equally weighted) sample average of the observed contamination levels is proportional to the total risk posed by this contaminant distribution.◊

5.2.4 Double Sampling

Double sampling, together with ratio or regression estimation of the population mean, is a third method for reducing the variance of the estimate without significantly increasing the number of expensive laboratory analyses required. The assumption is that there is one or more relatively inexpensive "fallible" measurement that is correlated (generally imperfectly) with more expensive "accurate" measurement(s) of the outcome variable of interest. If the fallible measurements are made on a large number, n^*, of samples from the population, and the accurate measurements are made only on a small subsample of size n, it may be possible to obtain a more precise estimate of the overall population mean by using both sets of measurements than by using the n accurate measurements alone. This estimate is calcu lated as

$$\bar{x}_R = \bar{x} + \hat{\beta}(\bar{x}_f^* - \bar{x}_f) \qquad (5.7)$$

where $\bar{x}_a$ is the mean of the n accurate measurements, $\bar{x}_f$ is the mean of the fallible measurements on the same subsample of size n, $\bar{x}_f^*$ is the mean of all n^* fallible measurements, and $\hat{\beta}$ is the slope of the estimated linear regression of accurate on fallible values, based on the subsample. Equation 5.7 is called a "regression" estimator for the population mean. Gilbert (1987, 0506) gives the formula for its variance in his Equation 9.2, which depends not only on the variability of the accurate and fallible measurements but also on the goodness of their correlation. Gilbert also provides an extensive discussion of the conditions under which use of double sampling is cost-effective.

Theory or the empirical evidence of the linear regression may suggest that the linear regression actually passes through zero, that is, the accurate measurement is zero if, and only if, the fallible measurement is zero, in which case a slight modification of Equation 5.7, called a "ratio" estimator, is appropriate. Equation 5.7 can also be extended to the case in which a combination of two or more fallible measurements is available on the large sample.

Example

Following each shot at a former firing site, debris was bulldozed into a nearby arroyo to prepare the firing pad for the next shot. Use of the site had been discontinued by 1960, but a mound of unconsolidated debris, soil, and rock, several feet thick, remains on the side of the arroyo. One of three soil samples from the base of the mound at the edge of the arroyo channel, collected during a screening investigation, showed elevated levels of depleted uranium and some other metals.

Given that depleted uranium is expected to be the only radionuclide present, field radioactivity measurements could be used to supplement analytical measurements of depleted uranium and other metals to improve the estimate of the mean contamination in this disposal area. Debris as well as fill material will be sampled, and regression estimators will be developed independently for each of these strata. For depleted uranium, a ratio estimator can be used. Concentrations of other metals may not be exactly proportional to radioactivity; therefore, the more general regression estimator should be used. For these other metals, the correlation may not be good enough to improve the estimate of the mean over the estimate provided by the usual sample mean; however, because depleted uranium is the principal contaminant of concern, sample sizes may still be determined based on the ratio estimator for depleted uranium.◊

6.0 OTHER SAMPLING AND ESTIMATION STRATEGIES

Although screening assessments and risk-based decisions are the most common types of decisions in the RFI stage of the RCRA process, other types of decisions occur both in the RFI stage and in subsequent stages. The decisions and decision criteria become much more variable, and the sampling strategies used need to make as much use as possible of information gathered in earlier phases. This section outlines some considerations and strategies that may be used.

6.1 Variance Estimation

Several of the formulas in the preceding sections indicate that the precision of the computed statistic, and hence the probability of error in testing a hypothesis and in making the resulting decision, depends not only on the sample size, which can be controlled by the investigator, but also on natural variability and measurement error. The effects of natural variability can be partially controlled by using statistical techniques, such as stratification, compositing, and replicate measurements, and by choosing appropriate sampling and analysis methods. However, natural variability is to some extent beyond the control of the investigator. Worse, there is often, at least initially, no basis for predicting the magnitude of natural variability. Therefore, one goal of the initial RFI site characterization is to collect enough data to estimate the important variance components. Accurate variance estimates are particularly important in designing a monitoring plan to meet regulatory requirements for site closure, conditional remedies, and deferred action.

6.1.1 Variance Components

Some of the specific components of variance that have appeared in the formulas above include

- the overall population variance,
- within-stratum population variances,
- subsample and between-aliquot variance, and
- error in analytical measurement.

Designing a preliminary study to estimate the magnitudes of these errors is similar to designing laboratory experiments. Balancing the design with respect to the factors of interest, avoiding a design in which two important effects are confounded, and including sufficient replication to distinguish measurement error and local heterogeneity from other variance components are important considerations. Field duplicates, splits, and other sample types that are built into a sampling plan for quality control purposes can be especially useful—field blanks and spiked samples provide a measure of analytical error; splits provide a measure of the sum of analytical error and the variance between subsamples or aliquots; and field duplicates provide a measure of the sum of analytical error, aliquot variance, and variance caused by local heterogeneities in the sampled medium. The use of quality assurance sampling is discussed further in Section 7 of this appendix.

6.1.2 Spatial and Temporal Covariance

Many of the variables of interest in site remediation—contaminant concentrations, hydrogeologic variables such as permeability and mineralization, and population densities of biota—can be expected to be spatially correlated, at least over short distances. Some variables, such as climate parameters, also have significant temporal correlations. For some forms of estimation, this correlation is not a drawback that invalidates the common expressions for variance but is an advantage that enables the investigator to predict with improved accuracy the spatial or temporal distribution of an outcome variable at unobserved points (Section 6.2).

Although an estimate of spatial or temporal correlation can be formed given almost any reasonably well-distributed sample from the population, a good estimate demands a little extra care. The optimal type of design for estimating spatial covariance is probably a radial grid with spokes (Flatman and Yfantis 1984, 0504) because this design provides collinear observations along four different axes and the opportunity to evaluate directional anisotropies as well as correlation as a function of separation. However, reasonable covariance estimates can be based on more uniformly distributed samples, provided care is taken to obtain a little extra information for estimating the correlation on a scale that is small compared with the average sampling density. This small-scale variability is critical for estimating predictability.

Spatial or temporal continuity is modeled statistically using a spatial or temporal covariance function or variogram. Important features to quantify are

- the ratio of local (microscale) variability to global variability. Both field duplicates and samples that are closer together than average are essential for estimating this ratio.
- the correlation distance, defined so that observations sepa-

rated by more than this distance in space or time appear to be uncorrelated. For the purpose of calculating this estimate, the data should contain several pairs of observations with approximately the same spacing for each of a number of different spacings.

- the overall (global) variability. Estimating global variability should not be difficult, provided that the whole domain is reasonably well represented in the sample.

Another important spatial consideration for environmental sampling is the relationship between the volume of the sample (or the support of a field observation) and the result. Often the sample volume is dictated by the analytical technique used. However, studies in which the sample volume was varied have shown, first, that smaller samples are generally much more variable and, second, that it can be very difficult to correlate measurements made on samples of different sizes. It is important to consider these relationships both in selecting analytical techniques and in making field decisions about the volume of soil to homogenize when sampling.

6.2 Prediction Approach to Sampling and Estimating

One alternative to the classical sampling methods described in Sections 4 and 5 views the problem as one of predicting the outcome variables for unsampled locations by using the observations to construct a statistical model for the outcome variables. This approach goes by various names in the statistical sampling literature—"model-based sampling," "prediction approach"—but is philosophically distinct from the more widely accepted design-based approaches that have been implicit in almost all of the discussion so far. In classical sampling, the probabilistic structure that relates the observations to the population was introduced by modeling the sampling process itself, and randomization of that process (Section 5.2) is a key concept. In model-based approaches, the probabilistic framework is introduced by means of a statistical model for the population. Of course, introducing a statistical model does not preclude randomizing the sampling plan. In application, model-based sampling must be concerned with the ability of the procedures to withstand deviations from the postulated models and can use the ideas of design-based sampling, including randomization, as safeguards against such departures (Little 1983, 0509).

Models used in the prediction approach usually incorporate *auxiliary variables* that are known or are easily measured for the entire population of interest. [Stratification is another way to use auxiliary variables: the population is partitioned into substrata based on the values of auxiliary variables such as the medium type (soil, sediment, tuff, decaying vegetation) or provenance (ash, debris, or fill, in the burning pit example).] One type of auxiliary variable that is always available in environmental work is location, given by two or three spatial coordinates and possibly a time coordinate as well. The first law of geography, cited at the beginning of Section 6.1.2, suggests that these spatial and temporal variables should not be ignored in environmental work, and some prediction approaches to sampling and estimation (such as, in particular, kriging) are explicitly designed to exploit them (Cressie 1991, 0793).

Models used for prediction approaches to sampling and estimation combine "fixed effects" and "random effects." The fixed effects represent trends in the outcome

variable with respect to the auxiliary variables and also provide a mechanism for including other aspects of the process generating the observations, such as integration over some volume by compositing or by field instrumentation. This part of the model usually includes unknown parameters (at least a population mean), whose estimation is one goal of data analysis. The random effects are modeled only by their estimated covariance.

The idea of the prediction approach, then, is (1) to use sample observations to estimate the parameters of both the covariance model and the trend component, (2) to use the resulting model to predict the unobserved outcome variables, and finally (3) to estimate population parameters of interest using these predictions when observations are not available. Ideally, estimation of the covariance structure is based on data from a preliminary survey, as discussed briefly in Section 6.1.2, because this information is needed to design an appropriate follow-up sampling and analysis plan. In practice, the same data are often used for both Steps 1 and 2.

The advantage of model-based estimation is that estimators for functionals of the population other than the global mean are easily constructed. In particular, the use of model-based procedures is almost essential for estimating the means of many small subpopulations, such as averages over many small exposure units. The design-based alternatives require a large number of samples, enough observations in each subpopulation to estimate its mean independently of the rest of the data.

Example

This example is a simplified version of the Bayo Canyon firing site, discussed in much more detail in the RFI Work Plan for OU 1079 (LANL 1992, 0783).

A large canyon-bottom area included several firing points in which shots containing small amounts of radioactive materials were fired. During the 1960s, the site was sampled and remediated under the DOE's Formerly Utilized Sites Remedial Action Program (Mayfield et al. 1979, 0818). As a result of this work, there is a good data base for residual radioactive contamination but not for other possible contaminants, particularly metals. The site is potentially suitable for residential development.

A baseline risk assessment that uses a residential exposure scenario is planned for this site, which implies that it is necessary to estimate average contamination levels over rather small exposure units (each less than 1/5 acre in size, of which several hundred are within range of the former firing points) and to make decisions about whether to clean up or to investigate further on a unit-by-unit basis. New environmental data (for metals, HE, and by-products) are needed to supplement existing radionuclide data.

Large false negative error rates cannot be tolerated for this public area. Fortunately, both the conceptual model and the existing data suggest a fairly continuous distribution of contaminants around the firing points, which can be exploited in the design of a sampling plan. Because the site is so large, the proposed approach is to use kriging to predict contaminant levels by exposure units, which requires fewer than one observation per exposure unit if the contaminant distributions are as continuous as suggested by the existing data (LANL 1992, 0783). A design-based approach to this problem would require a minimum of one composite sample per exposure unit.◊

6.3 "Hot-Spot" Sampling

At some point during the RCRA process, it may be necessary to define the problem as one of locating small but highly contaminated areas or volumes. The only known approaches to this problem are very resource-intensive unless inexpensive yet effective field survey methods are available.

Sampling designs for this "hot-spot" detection problem are usually based on regular grids (typically rectangular or triangular; the latter are somewhat more efficient). The grid spacing is determined by specifying the desired probability for detecting a contaminated area as a function of its size. Gilbert (1987, 0506, Chapter 10) discusses the determination of grid spacing, including several nomograms for determining the probabilities of detection and one graph that can be used for cost/benefit analysis.

Grid spacings must be comparable to (within about a factor of two) the radius of a contaminated area in order to have a reasonably high probability of detecting that area, and, therefore, very fine grids are required if small hot spots are of potential concern. The necessity of very fine grids limits the appropriateness of hot-spot sampling for RFI work. However, the technique may have more utility during CMS and CMI, when the area under consideration has been better delineated and it becomes important to minimize the amount of unnecessary remedial work.

6.4 Determining What Fraction of a Site Is Contaminated

The binomial sampling strategy described in Section 4.2 is the simplest form of a nonparametric approach to the problem of estimating the proportion of a site that exceeds an action or cleanup standard. In later phases of the RCRA process, particularly in verifying the attainment of cleanup standards, more data may be collected, and more efficient tests—in particular, tests that control the probability of false positives as well as false negatives—can be devised. Several such tests, including sequential versions that could be applied during site cleanup, are discussed in EPA guidance (EPA 1989 0794, Chapters 7 and 8).

An approach that is similar to binomial sampling consists of coding each observation as a 1 or a 0, depending on whether the observation exceeds the specified standard. The test statistic is then the sum of these codes, which is just the number of "exceedances" of the standard in the total sample of size n. If the proportion of zeros is sufficiently large, the site can be considered acceptably clean, even if there are some ones in the sample. This approach typically requires 30 to 100 observations (EPA 1989, 0794, Tables A.7, A.8, and A.9), depending on acceptable bounds of error.

The second approach, which requires making an assumption about the form of the probability distribution of the outcome variable (e.g., normal, log-normal), is to estimate a confidence interval for a percentile of this distribution. For the tail percentiles that are usually of interest (often the 90th or above), the correctness of the assumption is critical; thus, use of this method must be preceded by a test of the assumption, something that also requires a substantial number of observations (several tens, at least.)

7.0 STATISTICAL DATA QUALITY ASSESSMENT

Any process for assessing data adequacy must start by carefully defining what is meant by adequacy. Ideally, criteria for determining data adequacy will have been developed before designing a data collection program. Use of the DQO process ensures that a full set of design specifications is developed, including the level of uncertainty acceptable in the decision to be made. These limits on uncertainty define data adequacy (sufficiency) for decision making.

Statistical data quality assessment as described here and as developed by the EPA (van Ee 1990, 1052; Clayton 1992, 1059; Michael 1991 et al., 1051) can greatly increase the level of confidence decision makers have in deciding whether a data set is sufficient to support their decisions and whether a design should be reused for a similar application. The formal data quality assessment process described below should be applied whenever the outcome of a study is not immediately clear. If data reveal an obvious problem or nonproblem, a partial check on the design assumptions may suffice. In all other circumstances, a data quality assessment should be carried out after data have been collected but before the results are delivered to the decision maker.

Figure H-2 illustrates the three major inputs of the data quality assessment process described in this appendix: the project DQOs, the statistical assumptions made to develop a design, and an estimate of the total error associated with the data upon which a decision will be made. If an input is missing or incomplete, the process requires the assessor to develop that input before analyzing the data. For example, if the statement that defines data adequacy is missing, the process suggests that this input be elicited by working with the data users.

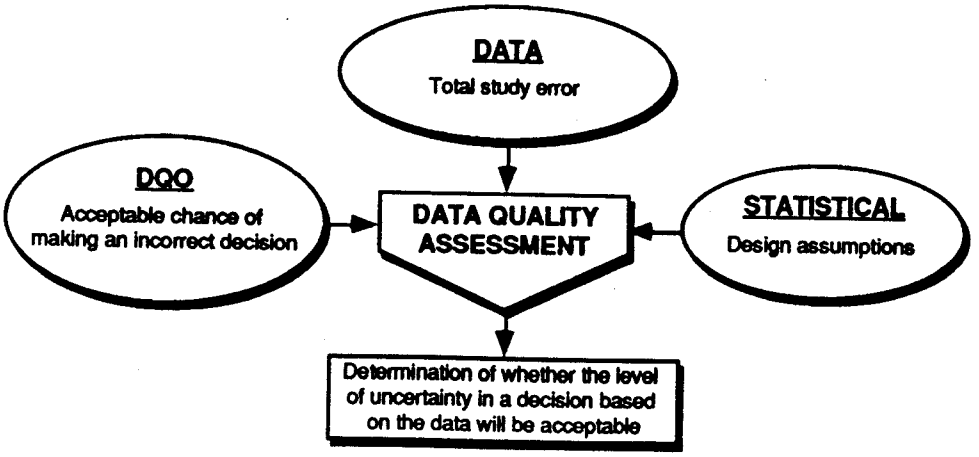

Figure H-2. Inputs to a statistical data quality assessment.

The data quality assessment process as presented here consists of six sequential steps (Figure H-3) that lead to a determination of whether the data in question are sufficient for decision making. The description that follows focuses on *what* occurs during the data quality assessment process. Each step of the process is discussed to provide the reader with a clear picture of what each step accomplishes and why each step is important. It is beyond the scope of this appendix to explain how the statistical operations that are required at each step are carried out.

7.1 Step 1: Review Design Specifications

The first step is to ensure that the purpose for which the data were collected is clearly understood so that the measures of data quality that are most critical for this purpose are evaluated. This step involves a comprehensive review of planning and design documents such as DQO documentation, statistical design documents, work plans, sampling and analysis plans, and quality assurance project plans. Understanding the basis for the design requires either a complete set of DQOs, as described in EPA guidance (EPA 1992, 0981) and Section 3 of this appendix, or the equivalent information about what data are needed, how they will be used, and how good the results need to be to support the intended use.

Two outputs of the DQO process are critical inputs for performing a data quality assessment: the decision rule and the limits on uncertainty. A decision rule provides a complete description of how data (inputs) will be combined (in a summary statistic or result) and compared with some action level (decision criterion) to make the decision for each subpopulation or area defined (the boundaries) in the DQO process. Limits on uncertainty specify the probability that the data user is willing to accept of making an incorrect decision. Limits are expressed for both false positive and false negative decision errors as a function of the magnitude of various error scenarios considered to be within the realm of possibility.

If the review of design specifications indicates that critical specifications are incomplete, a retrospective elicitation of these specifications is needed. In specifying the decision rule, a statistician should work with the data users to determine how they think data should be used. The statistician can suggest different approaches (use of means, medians, etc.), and the implications of the choices can be discussed. Limits on uncertainty should reflect the decision makers' evaluation of the consequences associated with each type of decision error. The DQO process guidance (EPA 1992, 0981) describes a step-by-step process for eliciting limits on uncertainty. It is preferable to elicit acceptable error rates before discussing the error rates actually achieved or the results of any statistical analysis on the data.

7.2 Step 2: Document Major Design Assumptions

Translating the decision rule and accompanying limits on uncertainty into a statistical design requires a number of additional assumptions. To the extent that these assumptions fail, the performance of that design may be affected. All assumptions explicit and implicit to the formulation of the problem should be clearly stated. Many of these assumptions will then be evaluated based on the field data and corresponding quality control data collected.

Some or all of the following common assumptions are used in designing a sampling plan to collect the data:

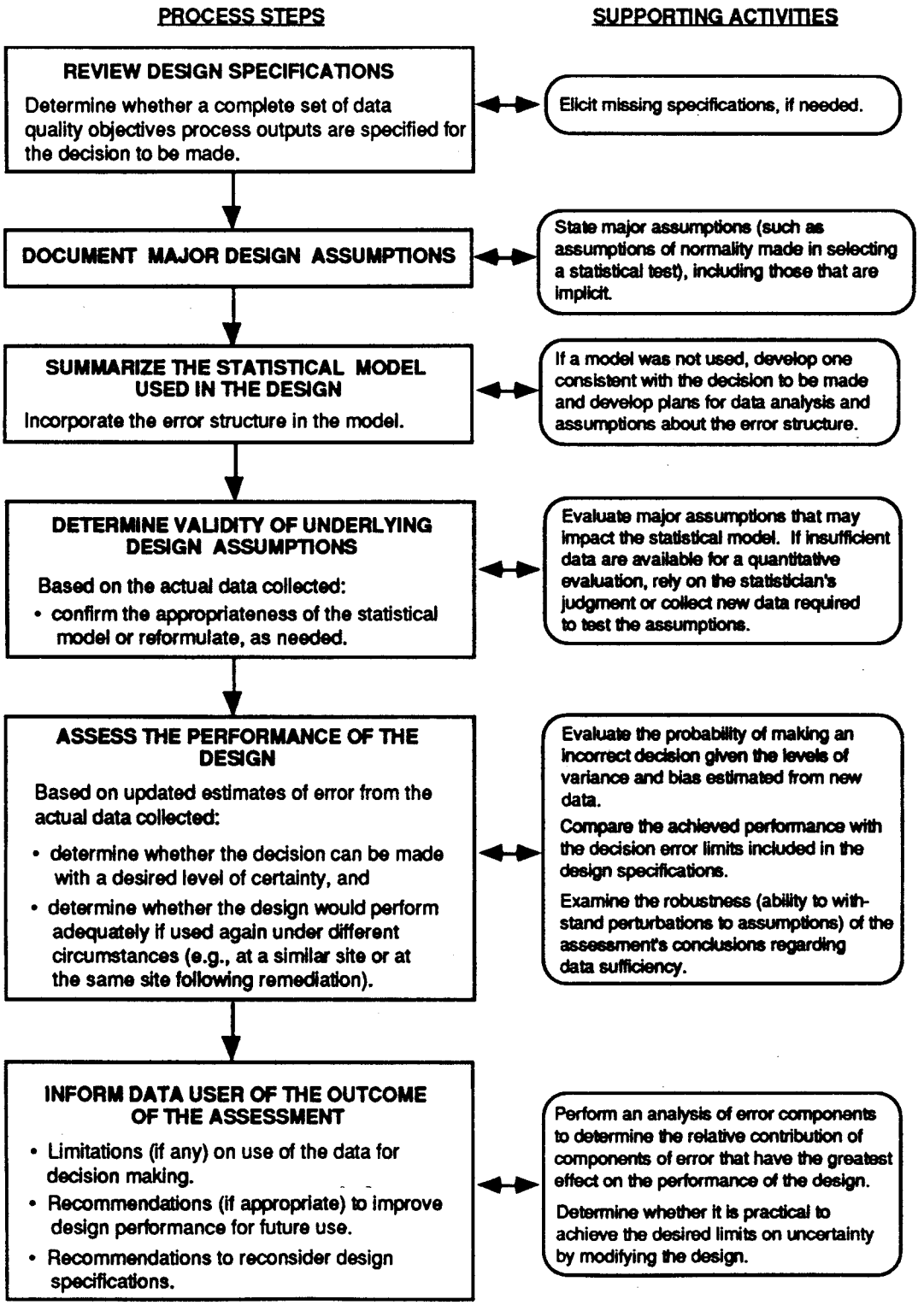

Figure H-3. Process flow in a statistical data quality assessment.

- The total study error is of a given magnitude.
- Observations are unbiased (or all data are corrected for bias).
- The distribution of the outcome variable is known (e.g., the measured variable is normally distributed).
- The observations are independent of one another.
- The sample design is randomized.

Additional assumptions might be made about homogeneity of variance among areas of interest (decision units), the degree of homogenization achievable through compositing, the structure and relationships among error components, or parameters of a nonstatistical model that might be used as part of the decision rule.

7.3 Step 3: Summarize the Statistical Model Used in the Design

After formulating the decision rule and specifying the underlying assumptions, a detailed statistical model is formulated to describe the statistical test that will be used to analyze the data. The components of this model are the statistical test to be used (e.g., a one sided t-test of the equality of two means) and the parameters that will influence the outcome of the test (e.g., the variance component of total study error and the sample size). The model should also break out the major sources of variability that contribute to the total variance term used in the statistical test, including the assumed error structure and an algorithm capable of calculating this total.

Ideally, this statistical model should be developed during the design phase so that it can be used to estimate the expected performance of alternative designs. If such a model was developed before the data were collected, the goal of Step 3 is to summarize the model used in such a manner that it can be easily exercised with the actual data generated. If no model was developed during the design phase, or if the developed model is incomplete or overly simplified, then one will need to be developed during Step 3.

Documenting the statistical model is a key step both in optimizing sampling and analysis plans and in evaluating data adequacy. The model may take the form of a simple algorithm, or it may involve a complex computer simulation, depending on the complexity of the situation, the scale of the project, and the desire to test the effect of departures from the assumed conditions through sensitivity analysis. In particular, information from sensitivity analysis can be used in designing the quality control program to focus on those components of total study error that are of the greatest relative importance.

7.4 Step 4: Determine the Validity of Underlying Design Assumptions

If the outputs of the previous three steps are readily available, as should be the case for studies that used the DQO planning process to develop a statistical design, this step is where the post-data collection data quality assessment process actually begins. Each major assumption on which the statistical design model hinges is evaluated in this step. Assuming that adequate supporting data are available, quantitative analyses are performed to test the assumptions.

If a parametric statistical model has been used to develop and evaluate the design, the assumptions that should be evaluated first are those related to the assumed error structure, the assumed zero bias, and the assumed distribution of the parameter of interest. For example, if a t-test of means is to be conducted, then, at a minimum, the statistical model assumes zero bias. It also assumes that random errors contributing to the total study variance are additive, uncorrelated, and normally distributed with homogeneous variance. To determine the validity of each underlying assumption, a series of analyses is performed. To the degree that data can support graphical analyses, plots are often useful tools for assessing assumptions. Simple histograms of the data can reveal gross departures from a symmetric, normal distribution. For models with many error terms, plots of the standard deviations for the error terms versus the group mean concentrations are useful for determining whether errors appear to be additive (the standard deviation would not appear to be correlated with concentration).

If assumptions underlying the original model (e.g., a parametric test) are found to be invalid, the data quality assessment process may nevertheless continue. Data transformations and other alterations of the statistical model may be considered to make the assumptions more reasonable. For example, nonparametric analogs that do not make distributional assumptions can be considered. However, whenever a different model is to be applied, care should be taken to document and test the validity of whatever new set of assumptions needs to be made and to consult the data user to ensure that the proposed model still addresses the environmental problem.

The amount of effort expended in verifying assumptions varies. For example, if the results reveal concentrations orders of magnitude higher than a threshold of interest, assumptions about analytical recovery do not need to be tested. However, it might be appropriate to investigate the assumption that samples have not been contaminated by analyzing blank quality control samples. If, on the other hand, concentrations are close to the threshold of interest, more attention to the validity of assumptions regarding bias is called for. If a computer simulation has been conducted to evaluate performance of the design, then the same program can, and probably should, be used to test the effect of invalid assumptions. The data quality assessment effort can then be focused on testing those assumptions to which the simulation outcome is most sensitive.

In some cases, the available data will be inadequate to perform meaningful statistical tests of assumptions. For example, if the degrees of freedom associated with a specific test are very small and the investigator is attempting to test the null hypothesis that an assumption is true (e.g., samples are independent), a very strong correlation would need to exist to reject the null. In cases where supporting data are not available, it may be necessary to rely on the judgment of the statistician or the project team, coupled with the results of a sensitivity analysis of the model in use. As a last resort, additional data can be collected specifically to test an assumption believed to be critical to the outcome of the study.

7.5 Step 5: Assess the Performance of the Design

Provided the underlying assumptions of the initial model are reasonable or the model can be reformulated to be consistent with the observed conditions, the next step of the data quality assessment process entails assessing the performance of the design. In this step, data generated as part of the study are used to obtain estimates of total study error. These estimates then become inputs to the statistical model and are used to perform the statistical test upon which the decision will be based. They

are also used to evaluate the general performance of the design. After the achieved design performance has been evaluated, one or both of the following questions can be answered:

- Can the data be used to make the decision (for each area of (interest) with the desired level of confidence?
- Does the design perform adequately over the entire range of interest specified in the DQOs for the study?

The answers to both questions are directly affected by the total study error and by the number of independent observations included in the summary statistic.

For models involving a simple hypothesis test, data are used to perform the test at a significance level consistent with limits on uncertainty expressed in the project DQOs. One of two outcomes is possible: the null hypothesis is accepted or rejected. A test might result in acceptance of the null hypothesis either because the data are too variable to disprove the conditions established as the null or because data are clearly consistent with the null. In either case, the null hypothesis is accepted. The data quality assessment evaluates the probability that accepting the null hypothesis is the wrong decision by calculating the statistical power that the test had for rejecting the null hypothesis, given the estimate of total study error and the number of independent samples taken. If a test results in the rejection of the null hypothesis at the desired significance level, the data are usually sufficient to support that decision because false positives are controlled directly through the significance level specified for the test.

Figure H-4 illustrates the expected performance of a design relative to the acceptable level of uncertainty as expressed in a discomfort curve. In this case, the data user has specified that a mean concentration value will be generated for each area of interest and will be compared with a risk-derived target concentration level to determine whether to take action. The acceptable false positive and false negative error rates (the "discomfort curves") are determined by the decision maker's

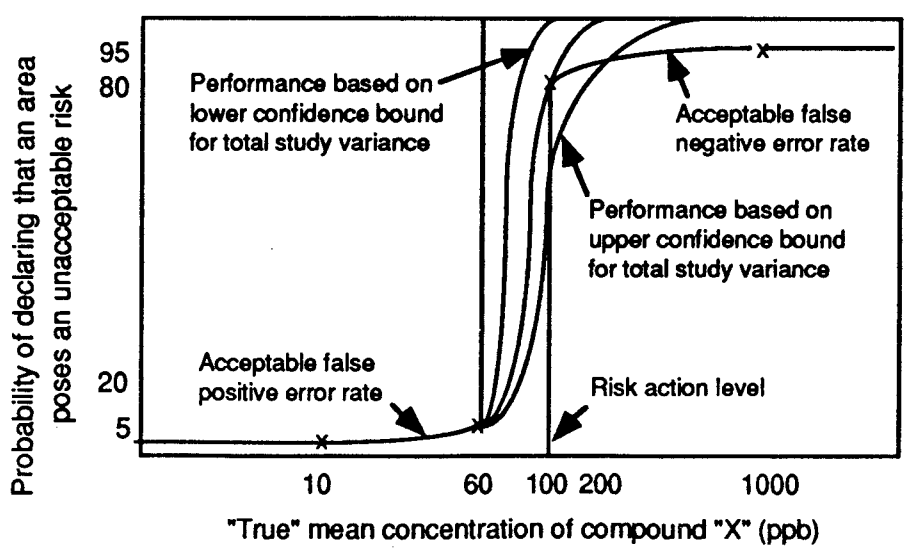

Figure H-4. Expected performance of design: power curves and acceptable error rates.

requirements as a function of a number of hypothetical "true" conditions (mean concentrations of specific compounds that might be present in the area). As this hypothetical mean value increases above the target level, the discomfort curve indicates that a higher and higher probability of data leading to a decision to take action was desired. Stated another way, the probability of deciding not to take action when action should be taken should get smaller and smaller as a function of the severity of the hypothetical problem.

To address the question of the adequacy of design performance, the expected design performance must be evaluated across the full range of conditions depicted on the X-axis of the discomfort curve. In the example shown in Figure H-4, when the point estimate of the total study variance is used to estimate the design performance, the design appears optimal in that it achieves or exceeds the desired control of false negative errors over the full range of values considered. However, when an upper-confidence-bound estimate of the total study variance is used, the design appears to fail over a small set of values ranging from approximately 100-200 ppb. Here, the probability of a false negative decision is greater than desired. Therefore, before arriving at a final decision that data are sufficient, the sensitivity of that conclusion to error in the estimate of total study error must be considered.

The fact that a design is expected to fail over some range of potential values does not necessarily mean that the data are inadequate to make a decision. For example, if the outcome of the study considered in Figure H-3 is a mean value in excess of 300 ppb or less than 100 ppb, the design achieves the desired control of decision errors. In other words, situations exist in which the answer to the first question is that data are adequate to make the decision, and the answer to the second is that the design may be inadequate under circumstances different from those observed.

If bias is detected and no correction in the data has been made, the impact of bias on design performance should also be considered. In general, uncorrected bias in the data shift the power curves in one direction or the other. The robustness of the conclusions of the data quality assessment can be determined by reassessing the design performance under a range of possible conditions (levels of total study variance and bias). If the conclusions are extremely sensitive to some error component and the confidence in that estimate is fairly low, the data quality assessment process may indicate the need to gather additional data in order to gain the desired level of confidence.

7.6 Step 6: Inform Data User of the Outcome of the Assessment

After the analytical aspects of statistical data quality assessment have been completed, the results of the assessment must be documented and communicated to the data user. A full explanation of any conclusions reached based on the assessment should be transmitted. As depicted in the example presented in Figure H-4, the answer to the question of whether the data are sufficient for decision making may not be a simple yes or no. The level of confidence in the outcome should be discussed. Any and all limitations on the intended use of the data should be included. In cases where the design may be used again, either at the same site after some cleanup has taken place (e.g., to verify cleanup) or at a similar site, the report should include recommendations for improving the design. For example, more samples may be recommended or a more efficient sample allocation strategy may be used. If the data quality assessment reveals that the data are insufficient and if information is available to permit a diagnosis of why the study failed, the outcome of these

analyses should be included to help the data user understand which assumptions were faulty and where excessive error entered the data.

In some cases, the probabilities of incurring a decision error are only slightly higher than desired. In other cases, a careful assessment of the design reveals that, to achieve the desired control on decision errors, sample sizes would need to be so much larger that it would be impractical to gather the data. In either of these cases, the report may suggest relaxing the DQOs and living with more uncertainty.

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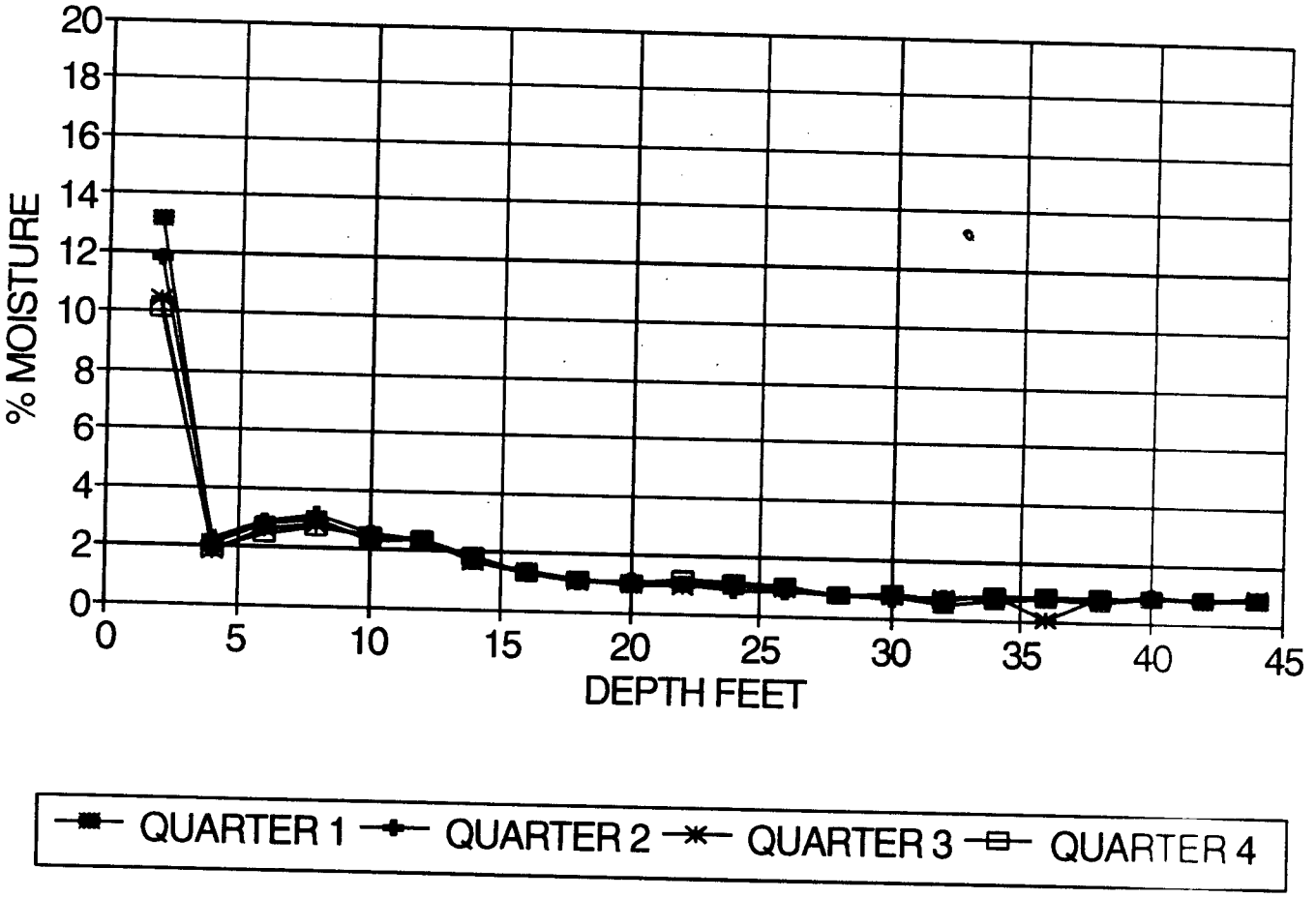

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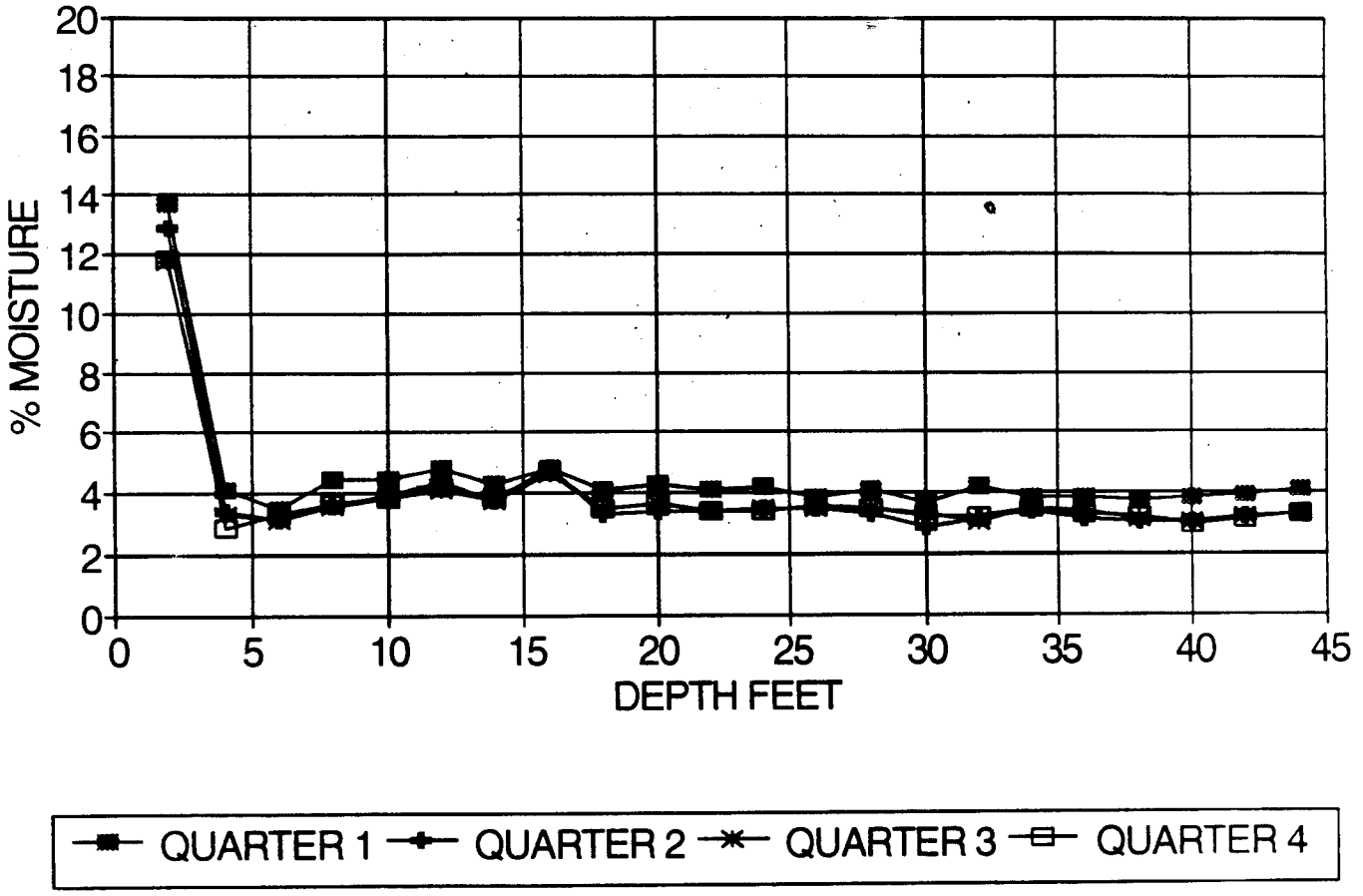

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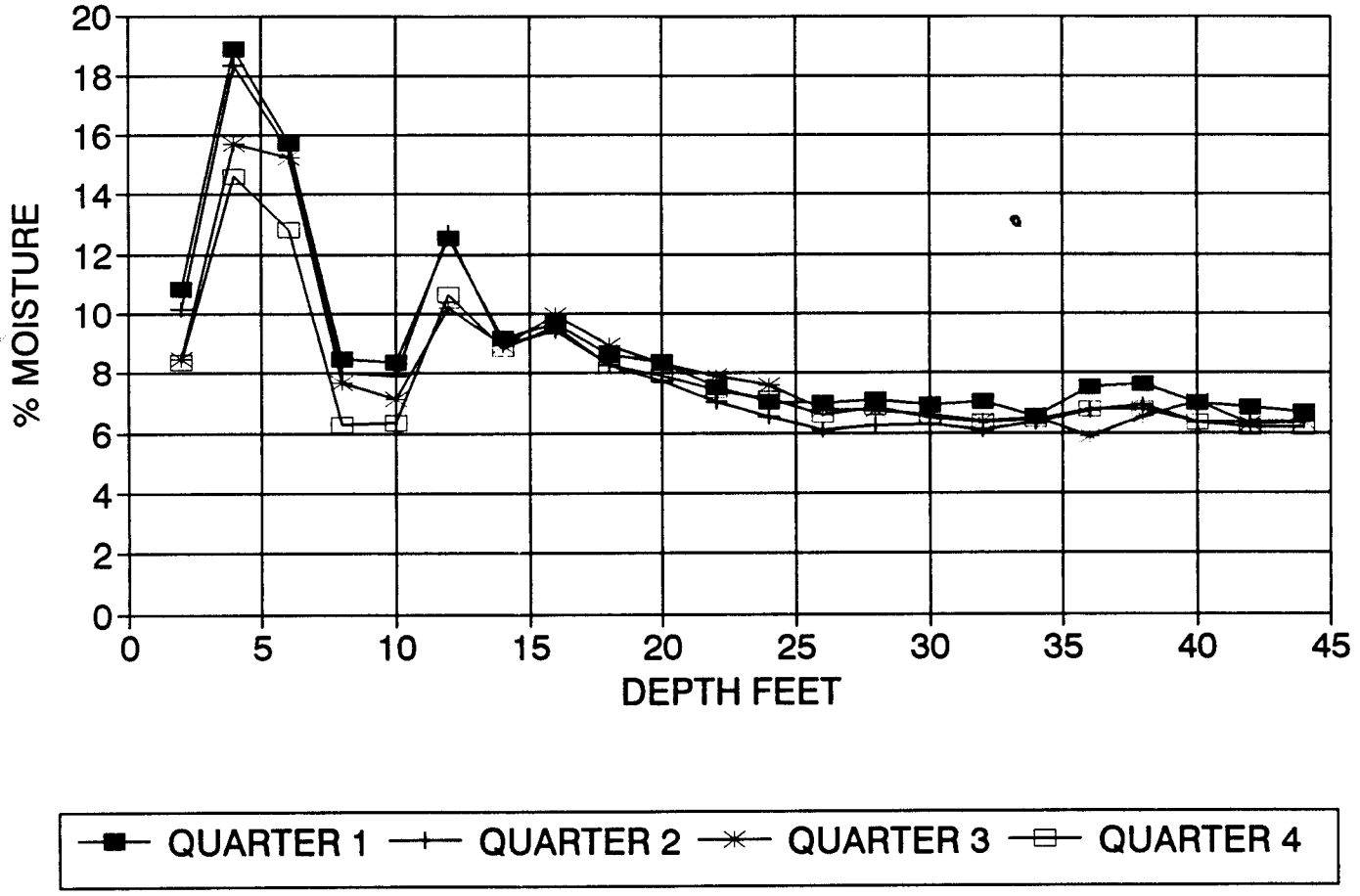

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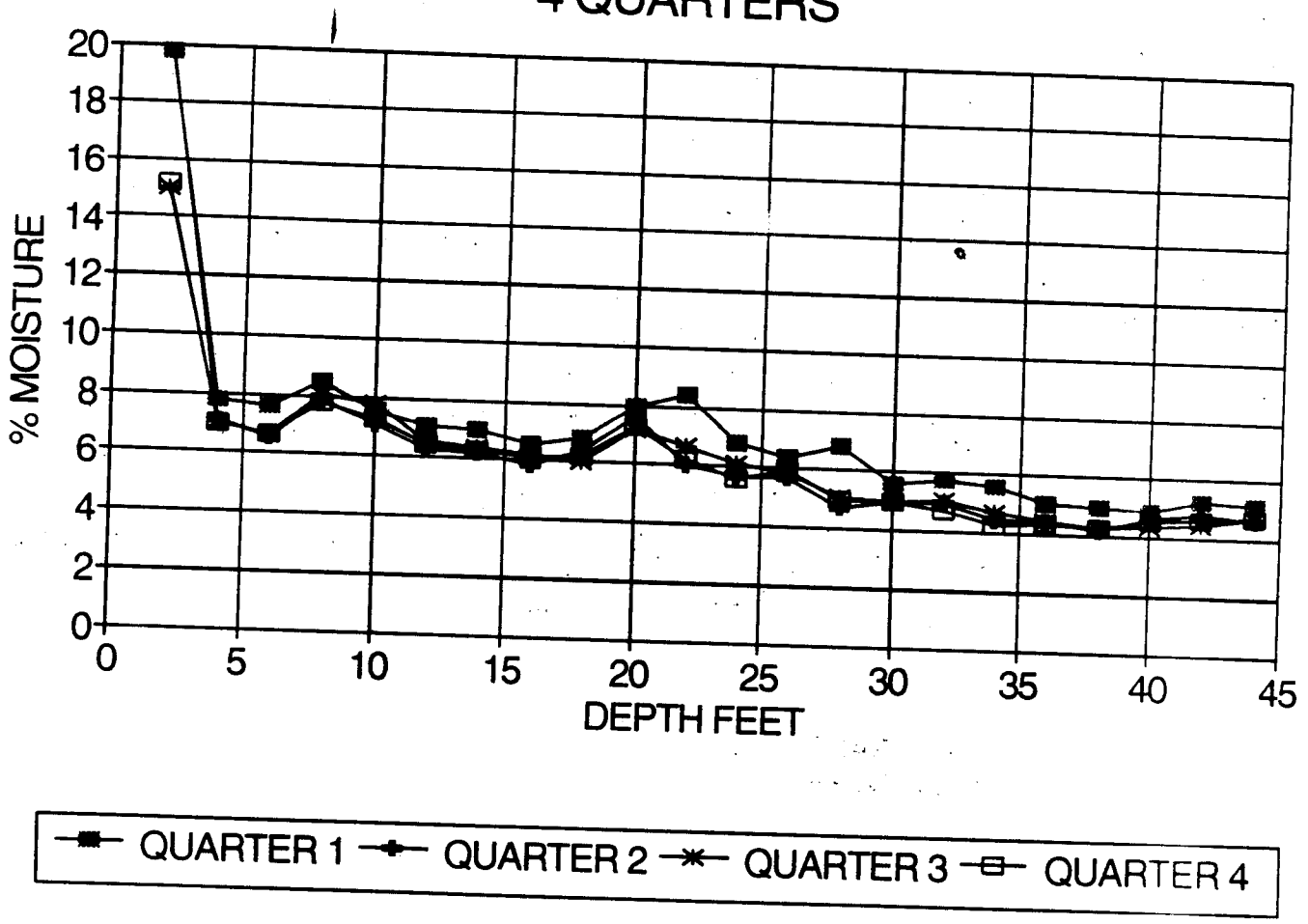
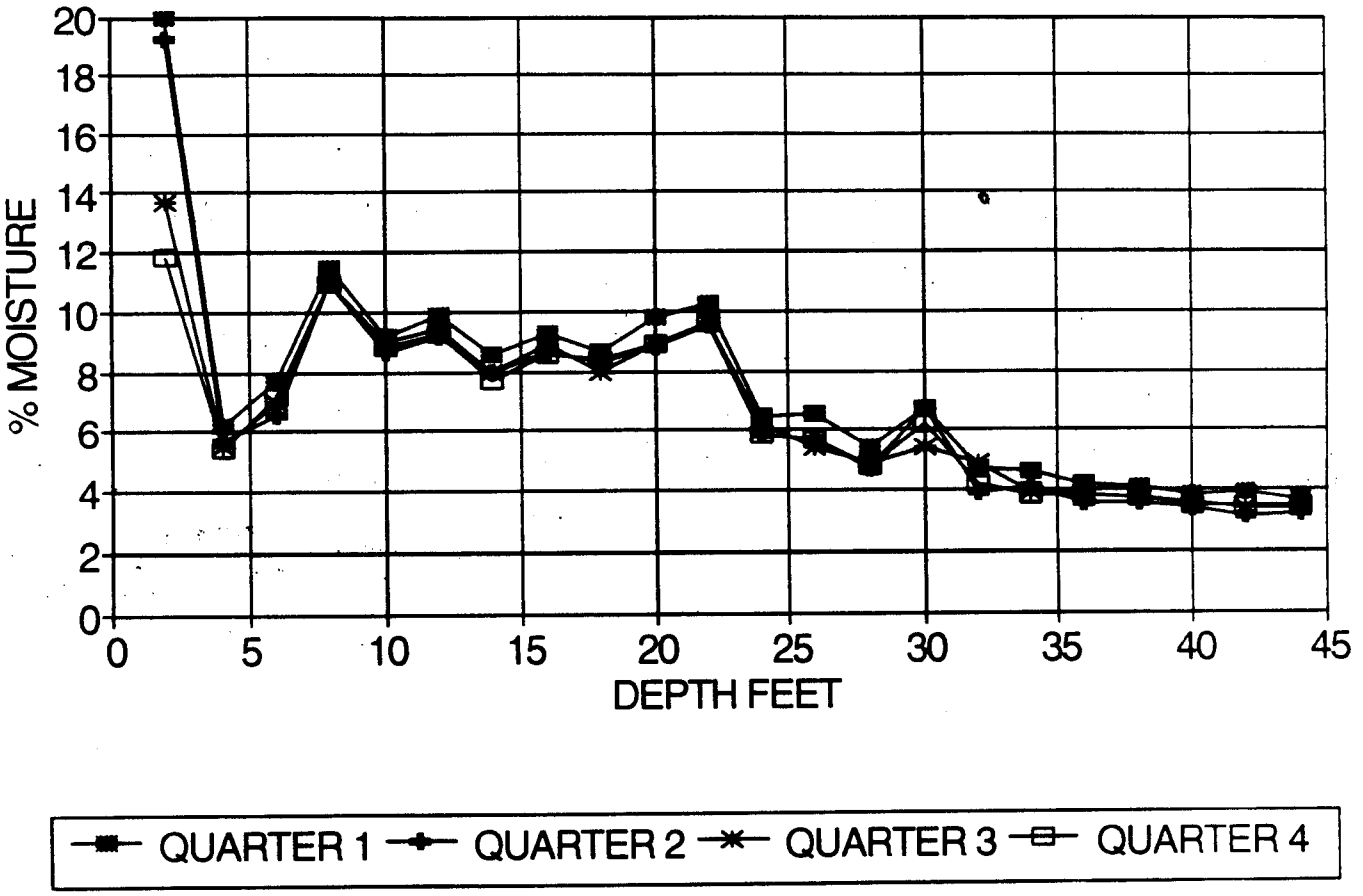
4 QUARTERS



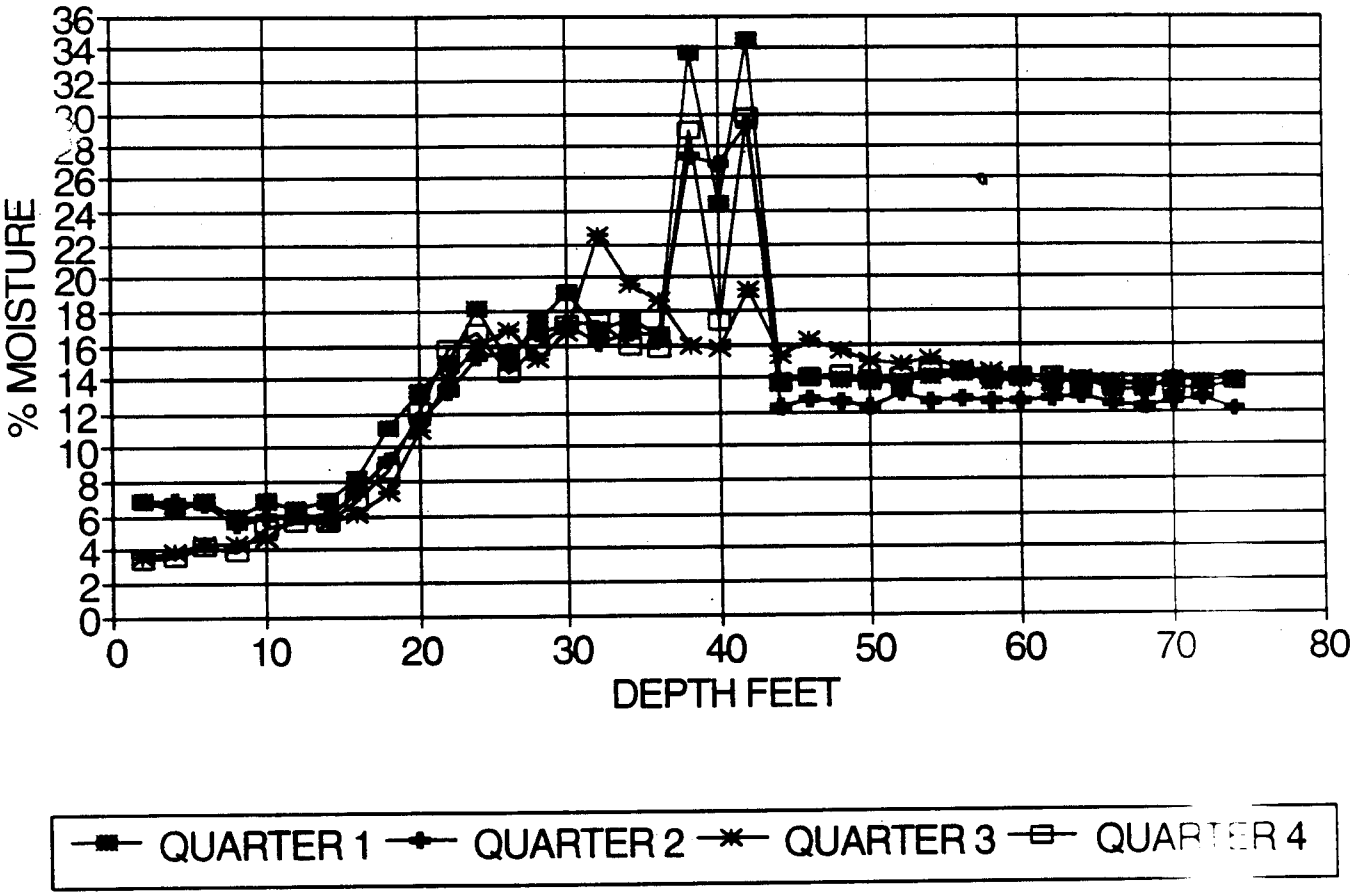
WELLS 4-53 1992

4 QUARTERS



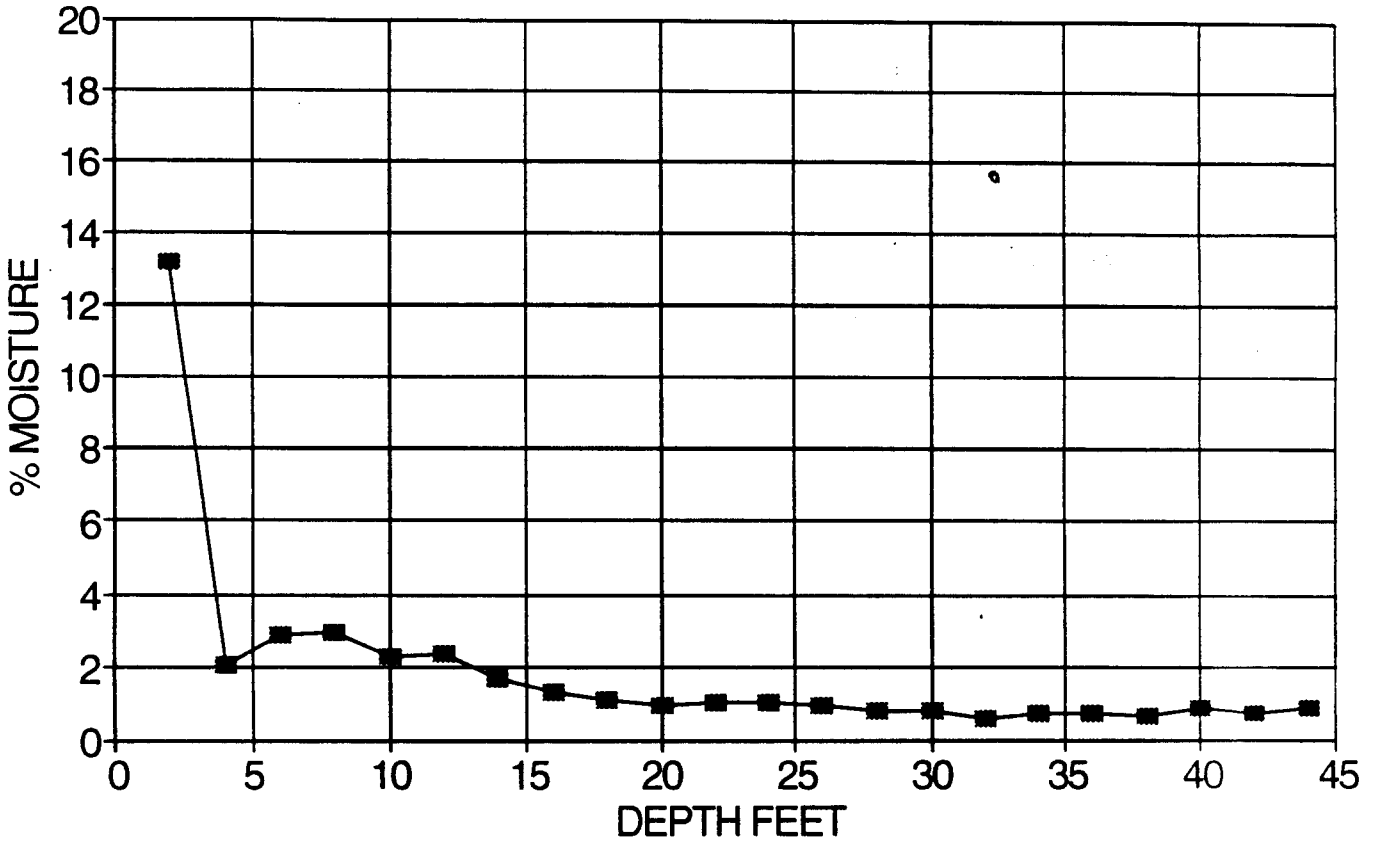
WELLS 7-53 1992

4 QUARTERS



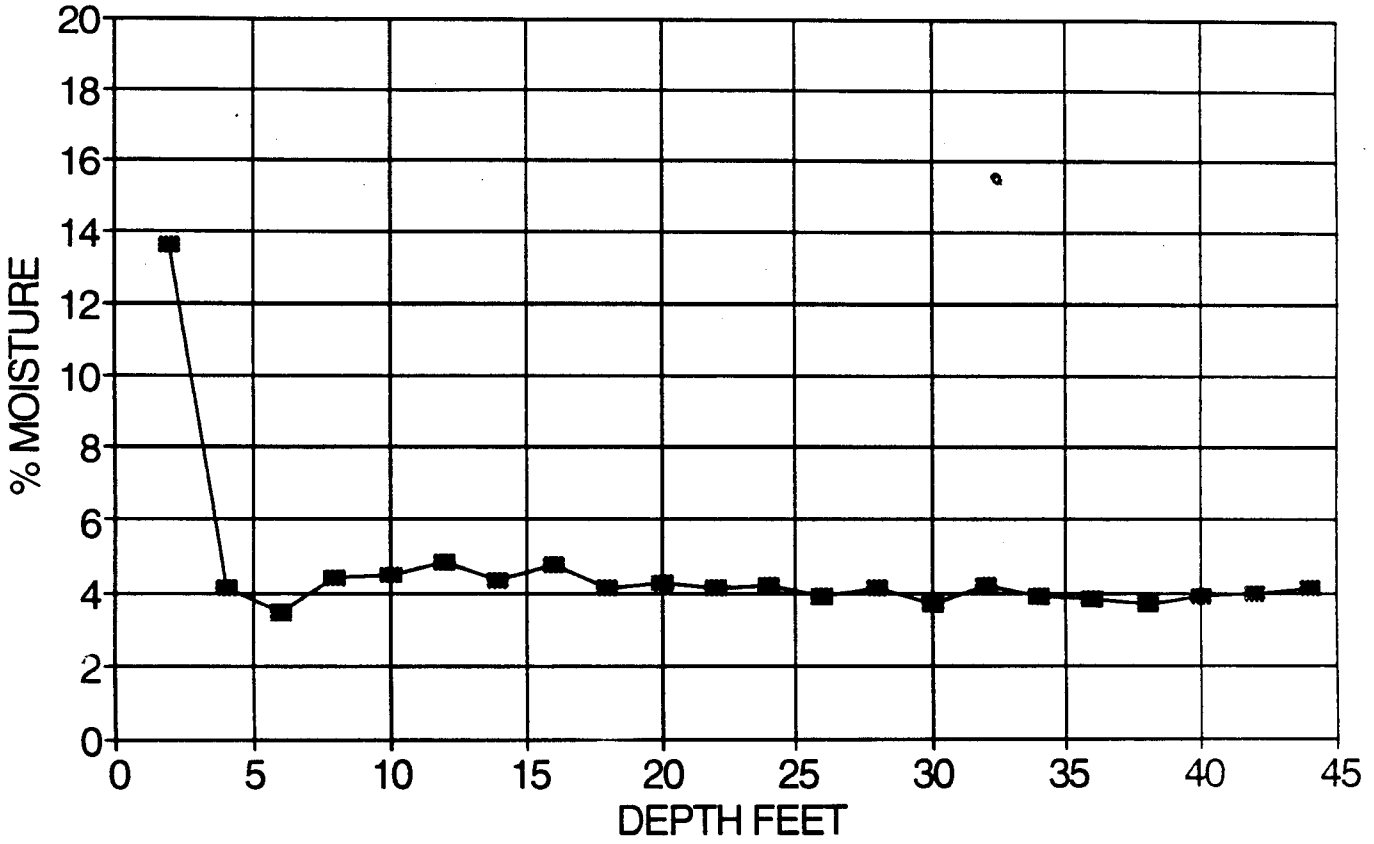
WELL B-53 TA-53

4-22-92



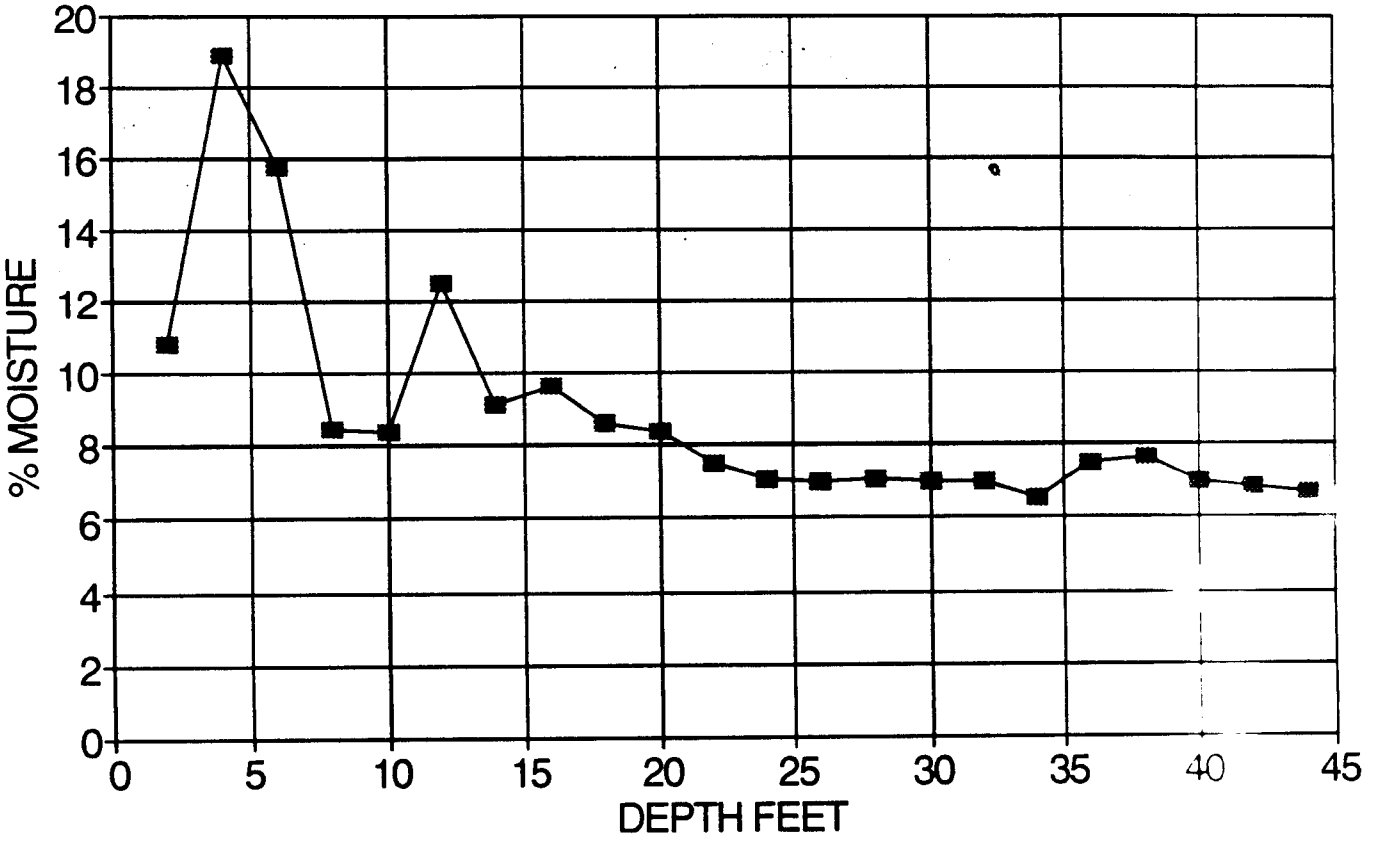
WELL 1-53 TA-53

4-23-92



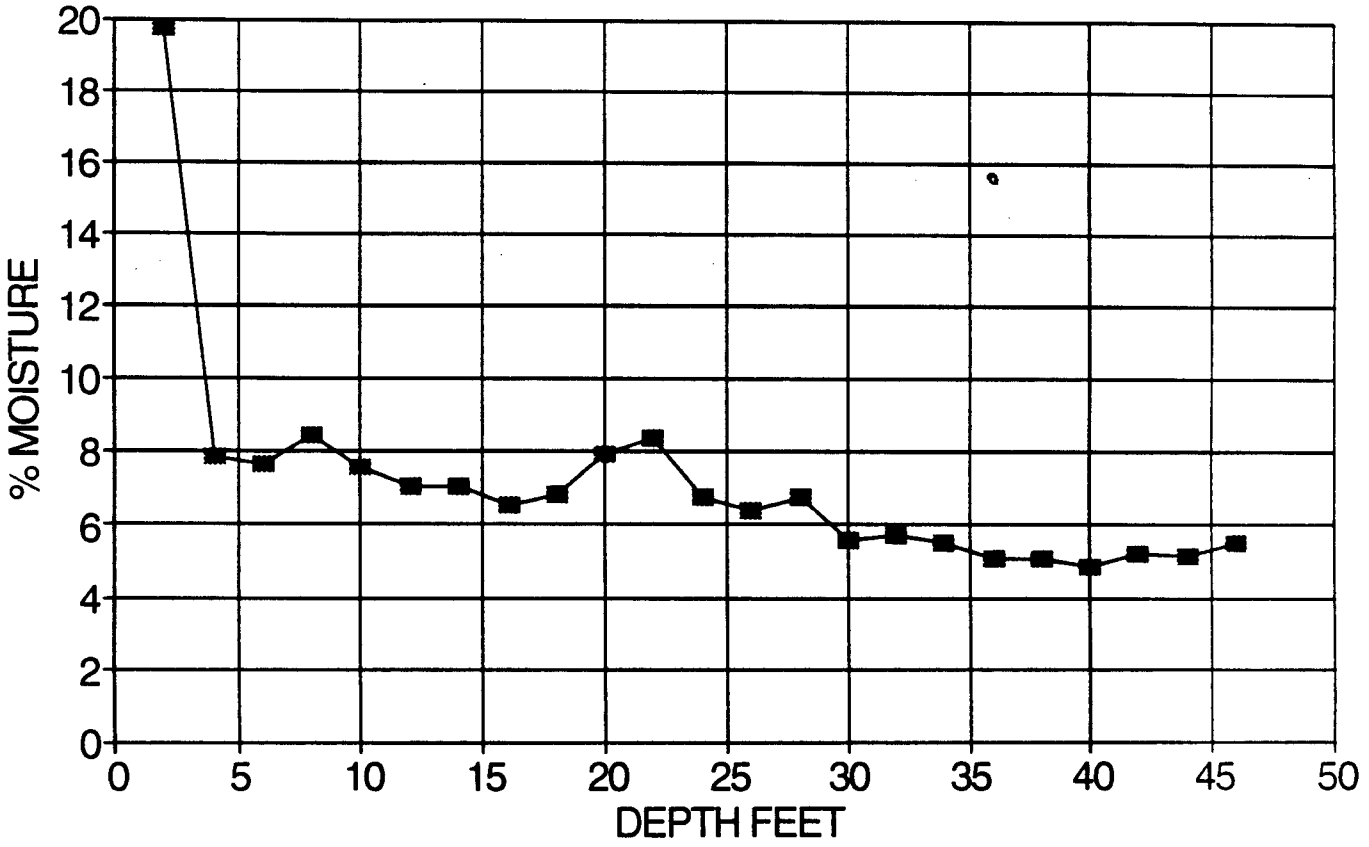
WELL 2-53 TA-53

4-23-92



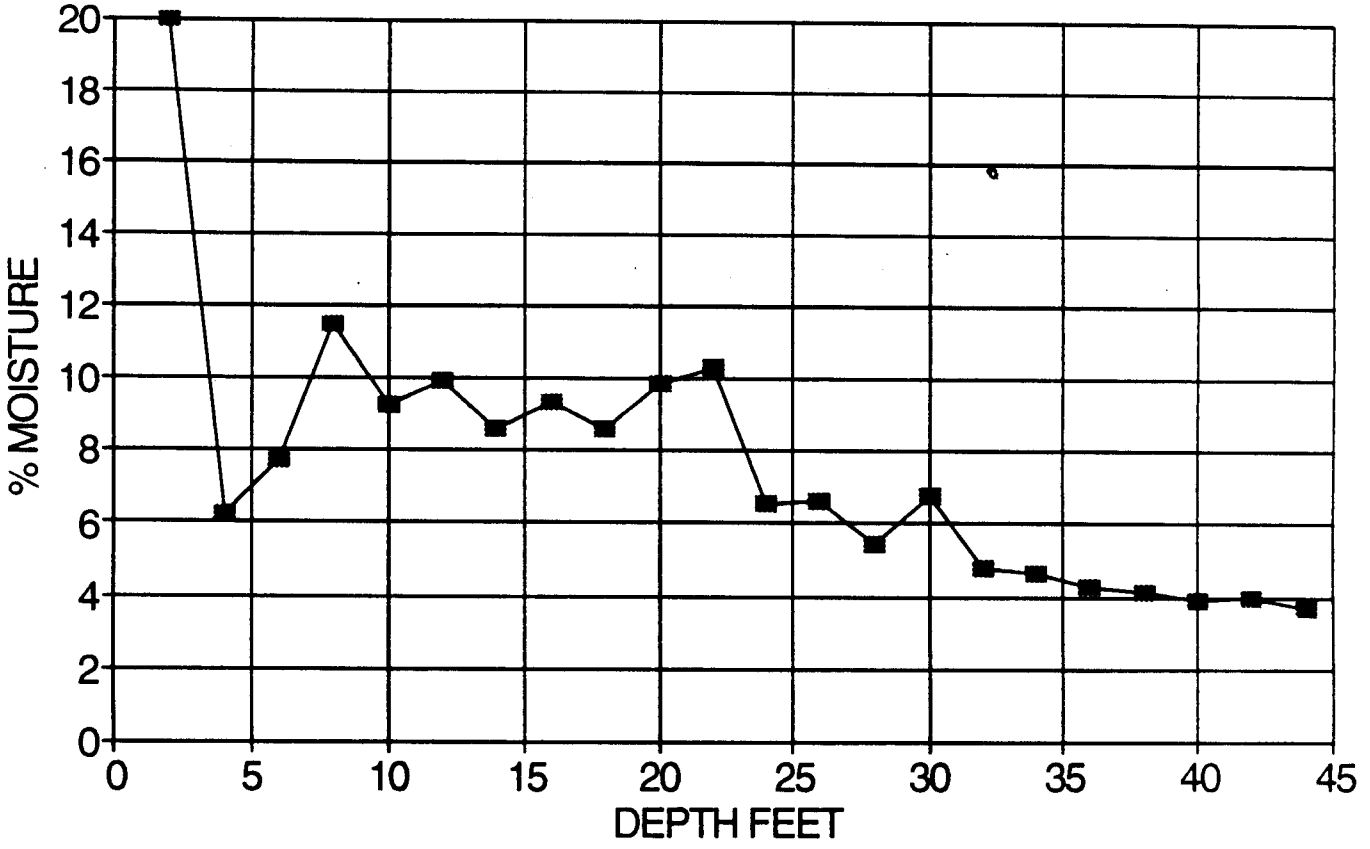
WELL 3-53 TA-53

4-23-92



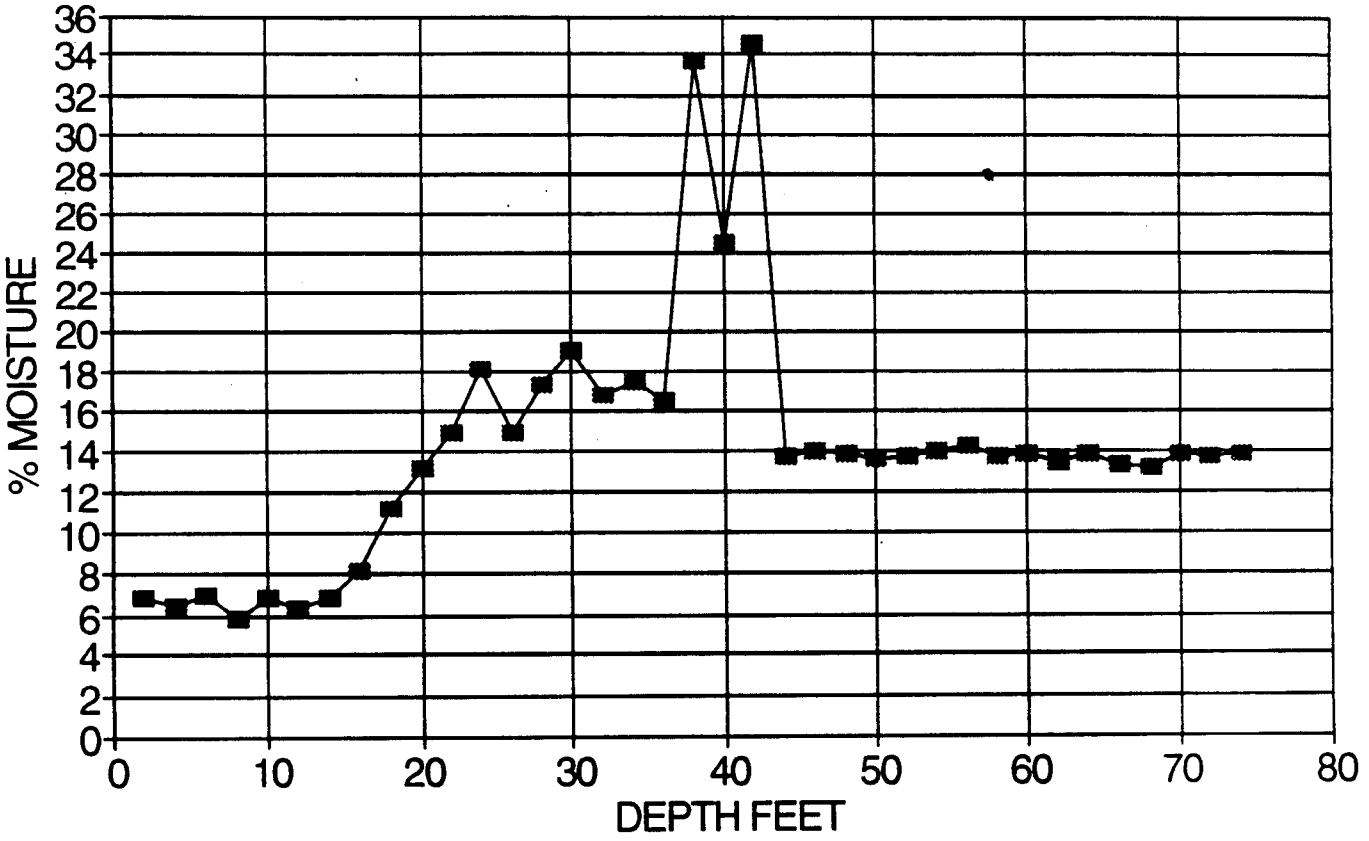
WELL 4-53 TA-53

4-23-92



WELL 7-53 TA-72

4-23-92



TA-53 WELL B-53 4-22-92

DEPTH	%VOLUM
2	13.17
4	2.08
6	2.8
8	2.92
10	2.24
12	2.31
14	1.66
16	1.3
18	1.08
20	0.93
22	1.03
24	1.02
26	0.92
28	0.77
30	0.78
32	0.51
34	0.69
36	0.7
38	0.65
40	0.84
42	0.73
44	0.86

TA-53 WELL 1-53 4-23-92

DEPTH	%VOLUM
2	13.66
4	4.08
6	3.44
8	4.41
10	4.46
12	4.81
14	4.32
16	4.79
18	4.08
20	4.28
22	4.06
24	4.13
26	3.88
28	4.1
30	3.66
32	4.18
34	3.88
36	3.8
38	3.69
40	3.86
42	3.96
44	4.11

TA-53 WELL 2-53 4-23-92

DEPTH	%VOLUM
2	10.82
4	18.86
6	15.74
8	8.44
10	8.35
12	12.52
14	9.16
16	9.63
18	8.6
20	8.36
22	7.53
24	7.01
26	6.95
28	7.07
30	6.92
32	7
34	6.55
36	7.54
38	7.6
40	6.98
42	6.81
44	6.69

TA-53 WELL 3-53 4-23-92

DEPTH	%VOLUM
2	19.77
4	7.84
6	7.6
8	8.48
10	7.55
12	7.08
14	7.06
16	6.54
18	6.82
20	7.92
22	8.38
24	6.78
26	6.39
28	6.78
30	5.56
32	5.74
34	5.54
36	5.06
38	5.01
40	4.83
42	5.24
44	5.15
46	5.49

TA-53 WELL 4-53 4-23-92

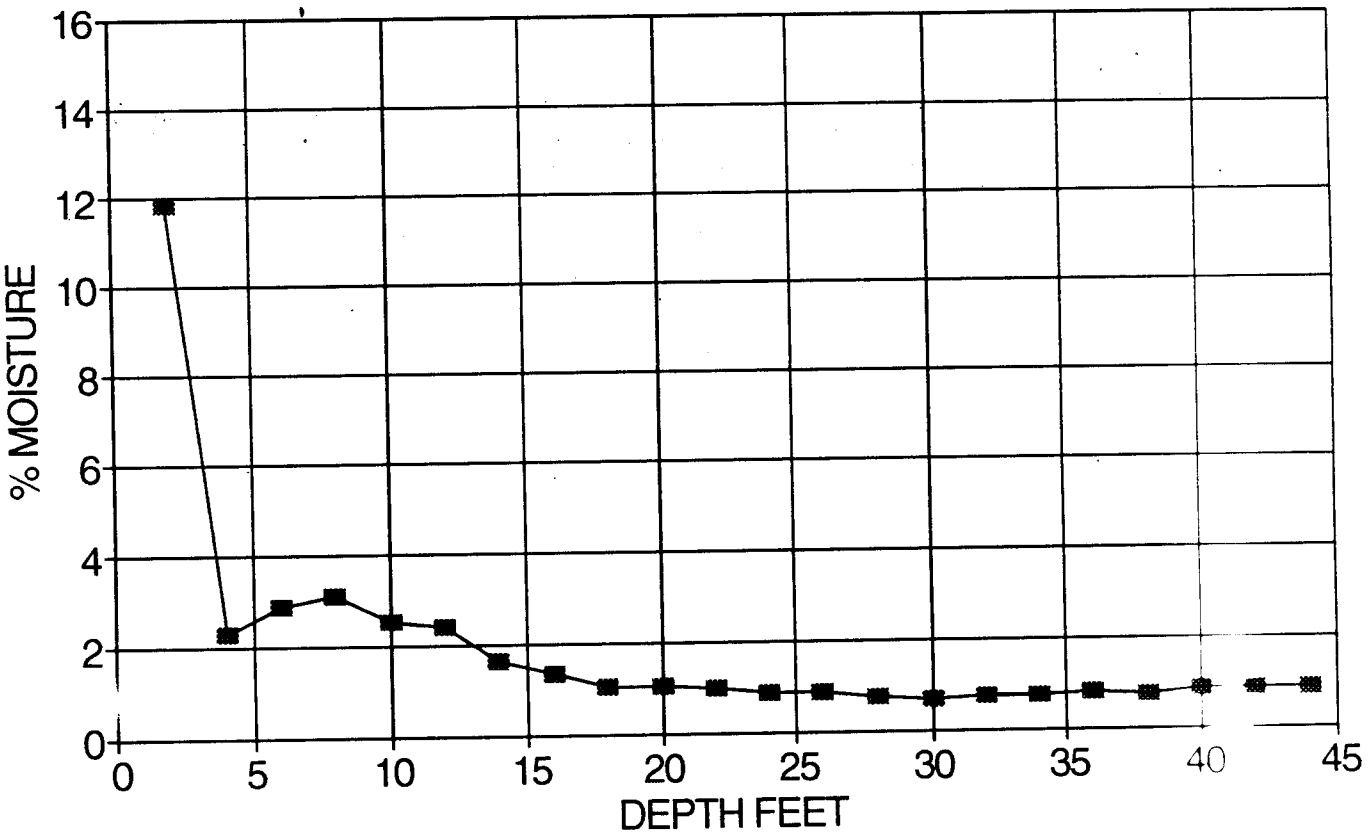
DEPTH	%VOLUM
2	19.97
4	6.24
6	7.71
8	11.48
10	9.25
12	9.9
14	8.6
16	9.34
18	8.62
20	9.85
22	10.27
24	6.51
26	6.59
28	5.39
30	6.76
32	4.73
34	4.61
36	4.21
38	4.05
40	3.84
42	3.95
44	3.66

TA-72 WELL 7-53 4-23-92

DEPTH	%VOLUM
2	6.87
4	6.51
6	6.91
8	5.85
10	6.81
12	6.36
14	6.9
16	8.12
18	11.2
20	13.2
22	14.95
24	18.1
26	14.95
28	17.3
30	19.09
32	16.85
34	17.5
36	16.55
38	33.71
40	24.46
42	34.52
44	13.78
46	13.99
48	13.89
50	13.65
52	13.72
54	14.06
56	14.23
58	13.77
60	13.85
62	13.52
64	13.85
66	13.31
68	13.27
70	13.86
72	13.75
74	13.9

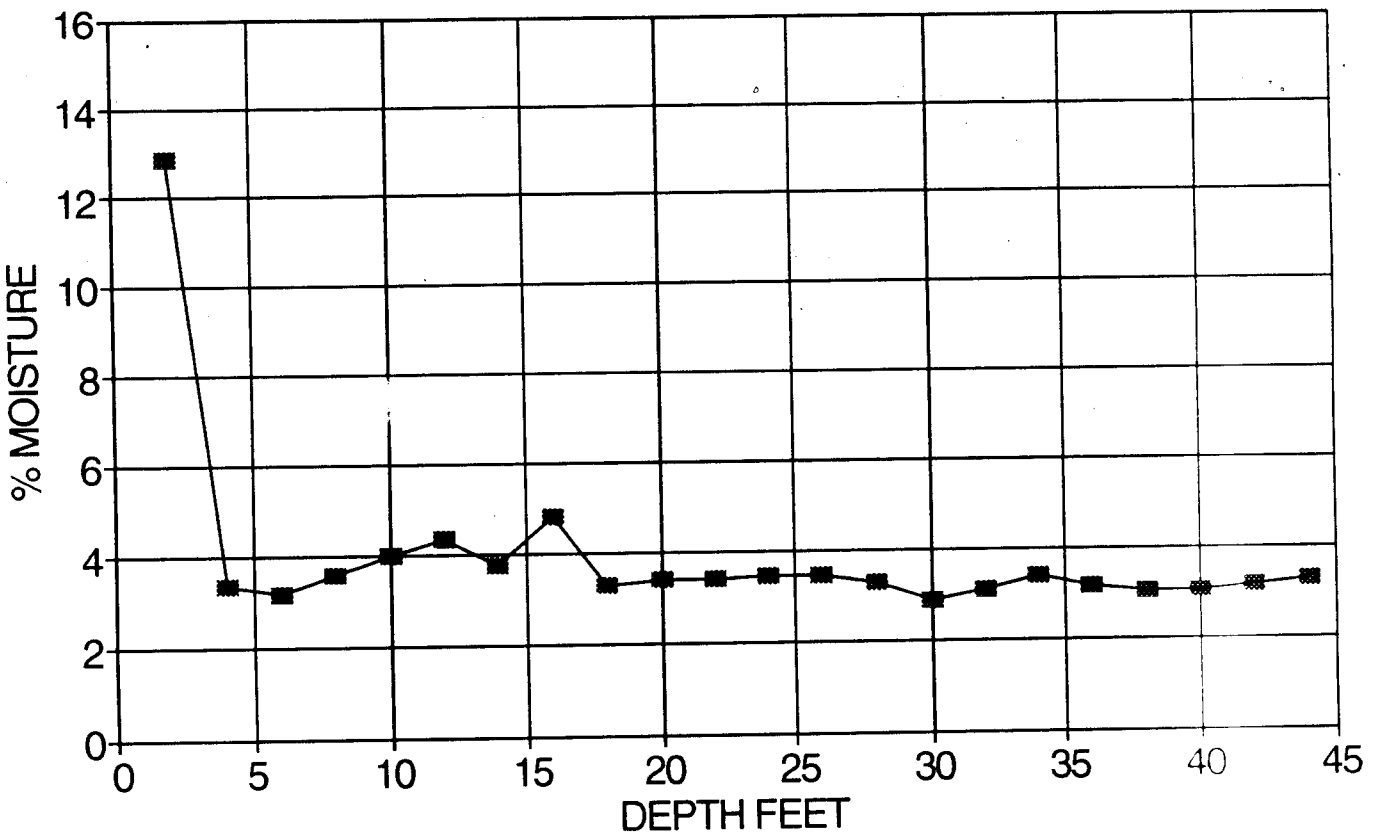
WELL B-53 TA-53

6-17-92



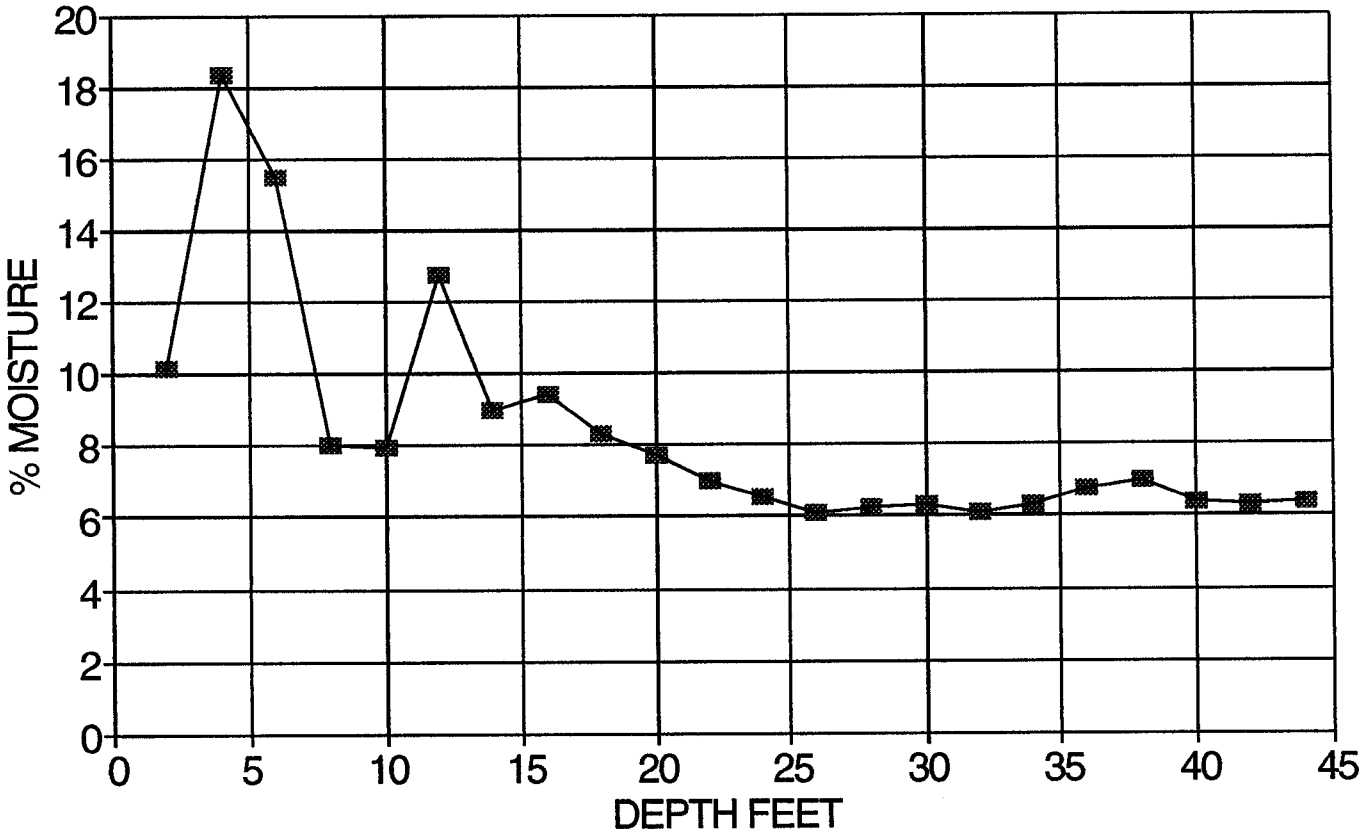
WELL 1-53 TA-53

6-17-92



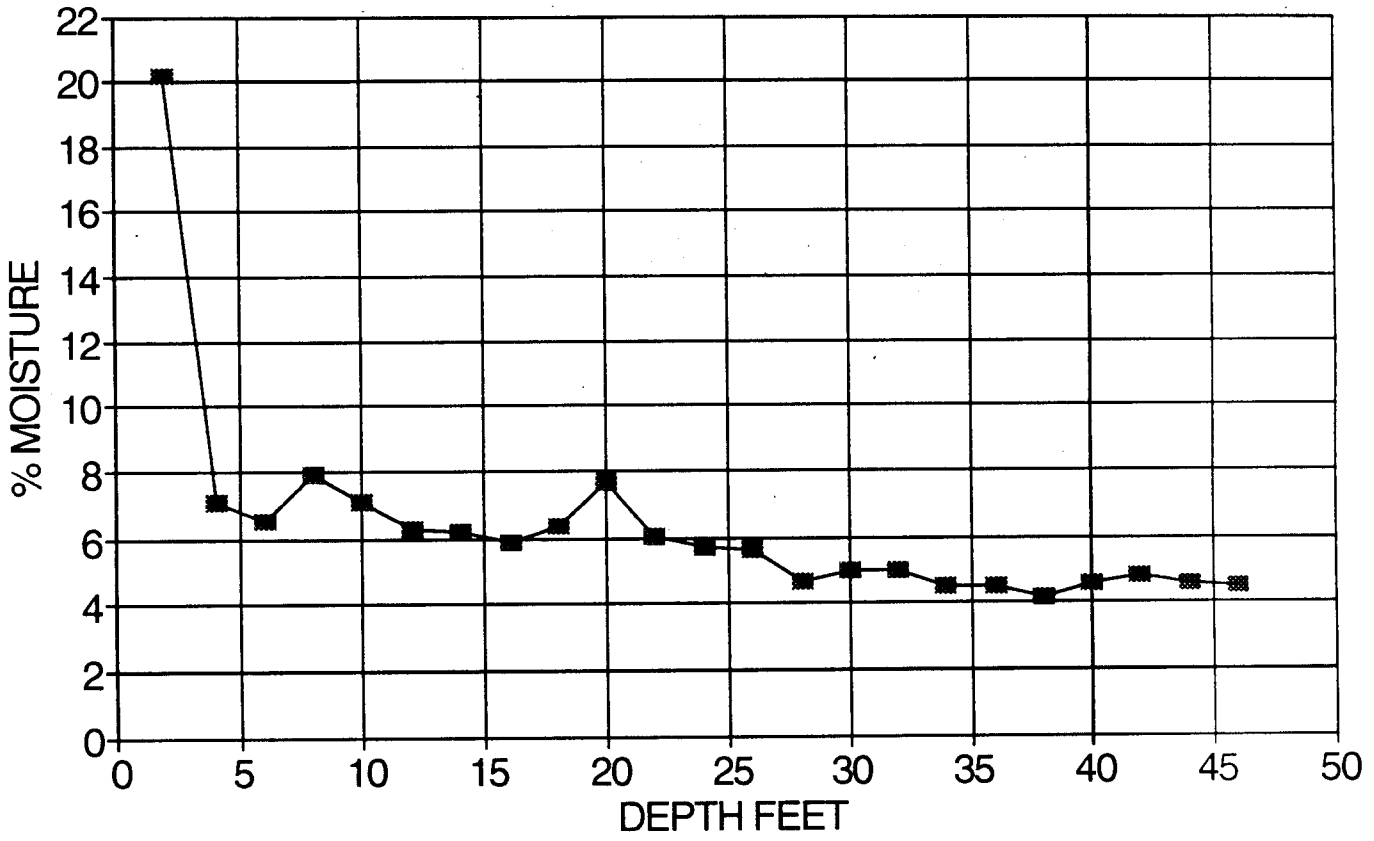
WELL 2-53 TA-53

6-17-92



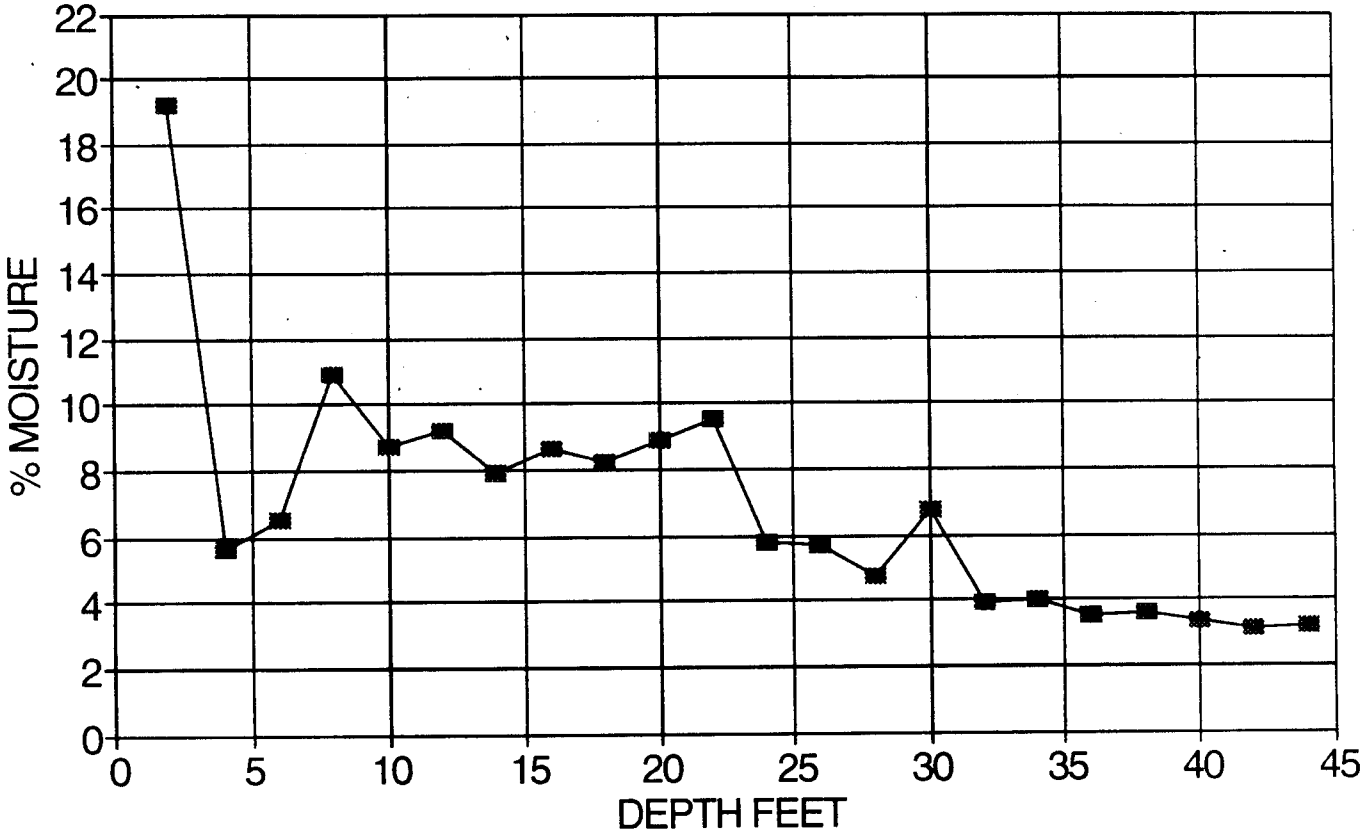
WELL 3-53 TA-53

6-17-92



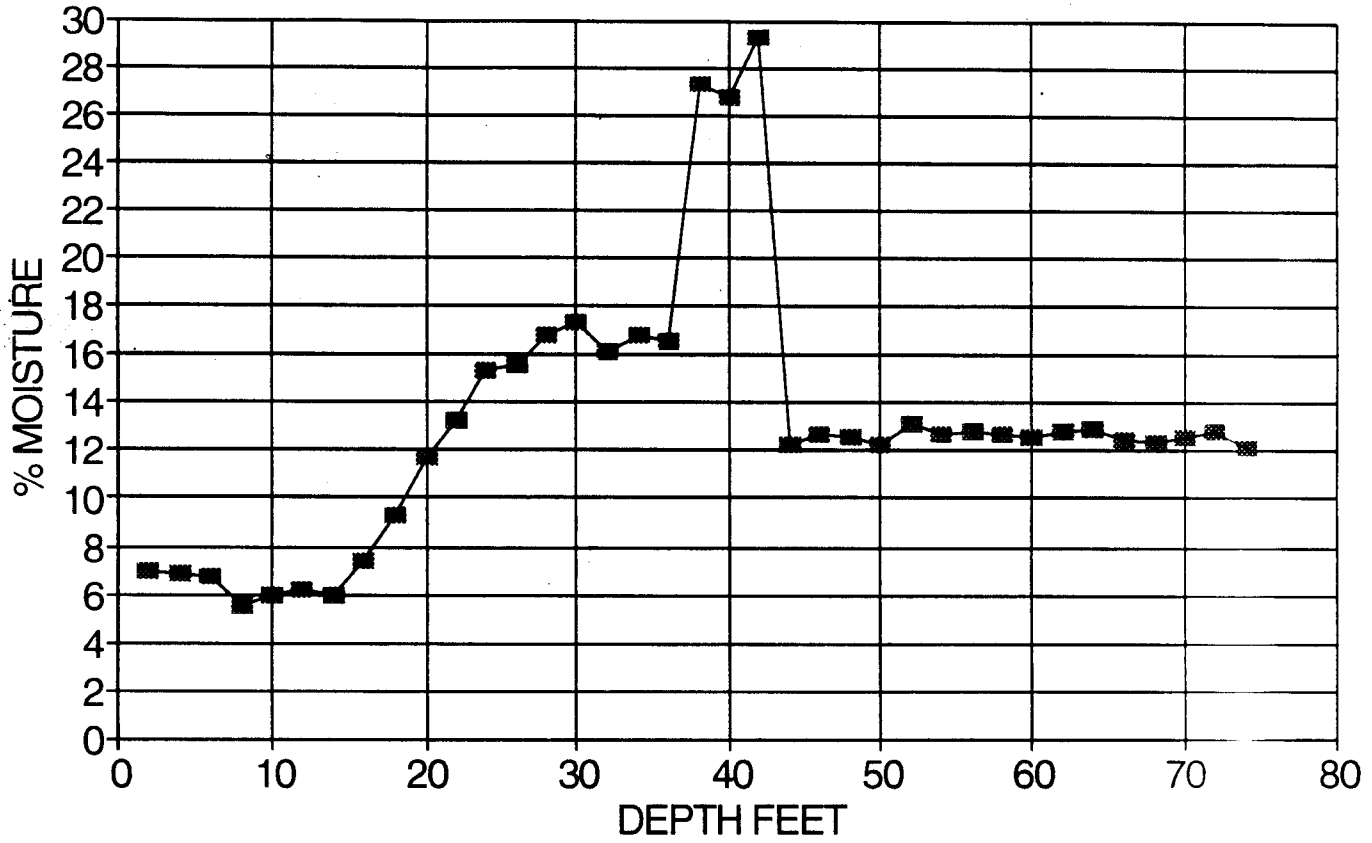
WELL 4-53 TA-53

6-17-92



WELL 7-53 TA-72

7-6-92



TA-53 WELL B-53 6-17-92

DEPTH	%VOLUM
2	11.86
4	2.24
6	2.85
8	3.09
10	2.5
12	2.37
14	1.62
16	1.36
18	1.03
20	1.05
22	0.98
24	0.85
26	0.89
28	0.76
30	0.69
32	0.73
34	0.76
36	0.78
38	0.74
40	0.9
42	0.84
44	0.86

TA-53 WELL 1-53 6-17-92

DEPTH	%VOLUM
2	12.86
4	3.36
6	3.14
8	3.56
10	3.98
12	4.35
14	3.76
16	4.79
18	3.29
20	3.43
22	3.42
24	3.44
26	3.46
28	3.29
30	2.87
32	3.13
34	3.38
36	3.14
38	3.02
40	3.03
42	3.19
44	3.3

TA-53 WELL 2-53 6-17-92

DEPTH	%VOLUM
2	10.13
4	18.34
6	15.49
8	8.01
10	7.9
12	12.71
14	8.97
16	9.42
18	8.28
20	7.74
22	7
24	6.54
26	6.1
28	6.22
30	6.3
32	6.09
34	6.31
36	6.71
38	6.92
40	6.34
42	6.33
44	6.37

TA-53 WELL 3-53 6-17-92

DEPTH	%VOLUM TA-53 W
2	20.21
4	7.09
6	6.54
8	7.91
10	7.11
12	6.3
14	6.19
16	5.91
18	6.35
20	7.65
22	6.05
24	5.71
26	5.67
28	4.68
30	4.97
32	5
34	4.45
36	4.46
38	4.2
40	4.58
42	4.8
44	4.59
46	4.51

TA-53 WELL 4-53 6-17-92

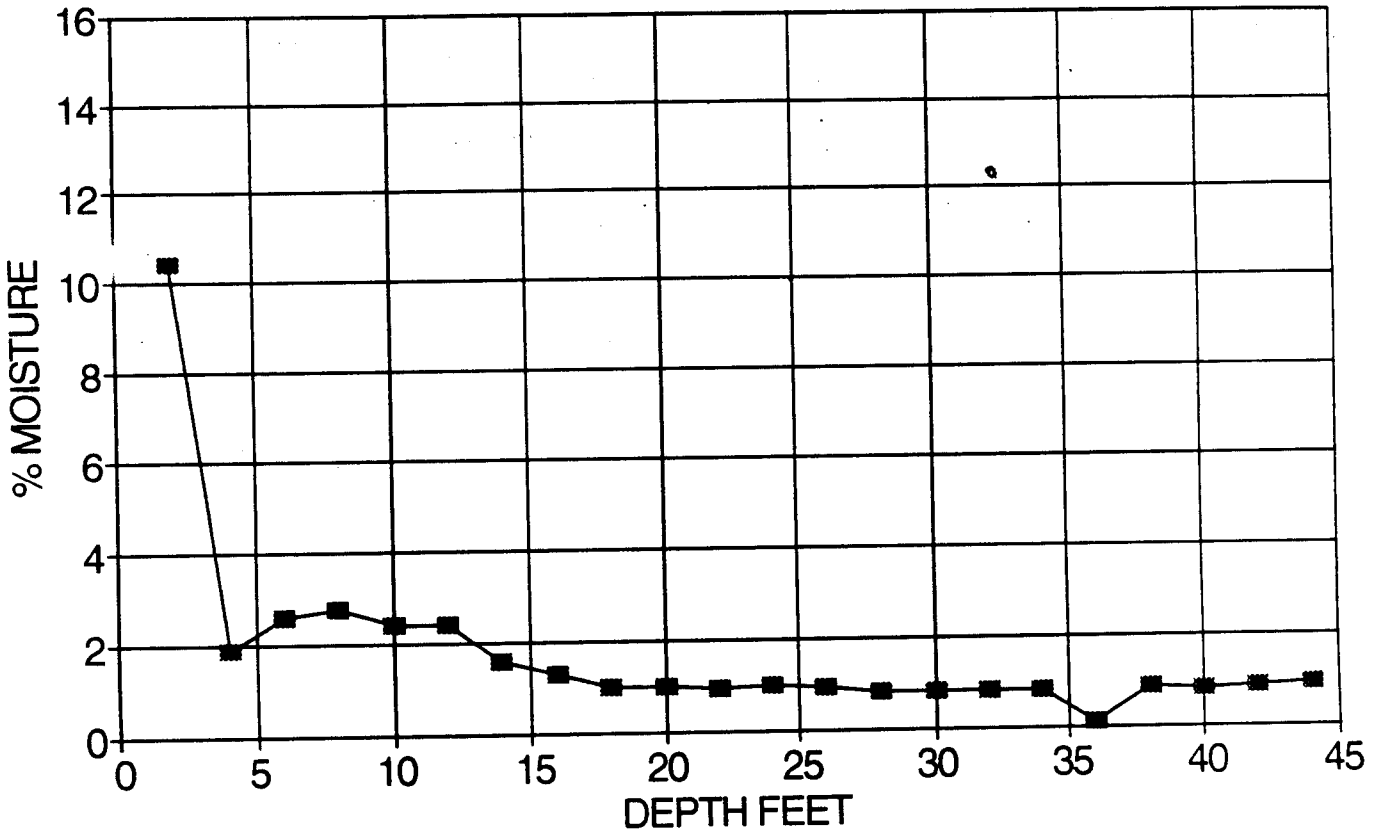
DEPTH	%VOLUM
2	19.23
4	5.63
6	6.53
8	10.94
10	8.7
12	9.24
14	7.97
16	8.63
18	8.28
20	8.87
22	9.51
24	5.86
26	5.72
28	4.75
30	6.74
32	3.92
34	4.06
36	3.56
38	3.58
40	3.39
42	3.09
44	3.19

TA-72 WELL 7-53 7-6-92

DEPTH	%VOLUM
2	6.94
4	6.82
6	6.75
8	5.54
10	5.96
12	6.17
14	5.97
16	7.32
18	9.24
20	11.68
22	13.27
24	15.36
26	15.55
28	16.75
30	17.27
32	16.08
34	16.72
36	16.54
38	27.28
40	26.78
42	29.27
44	12.25
46	12.73
48	12.56
50	12.27
52	13.09
54	12.68
56	12.78
58	12.63
60	12.54
62	12.77
64	12.82
66	12.43
68	12.32
70	12.57
72	12.78
74	12.09

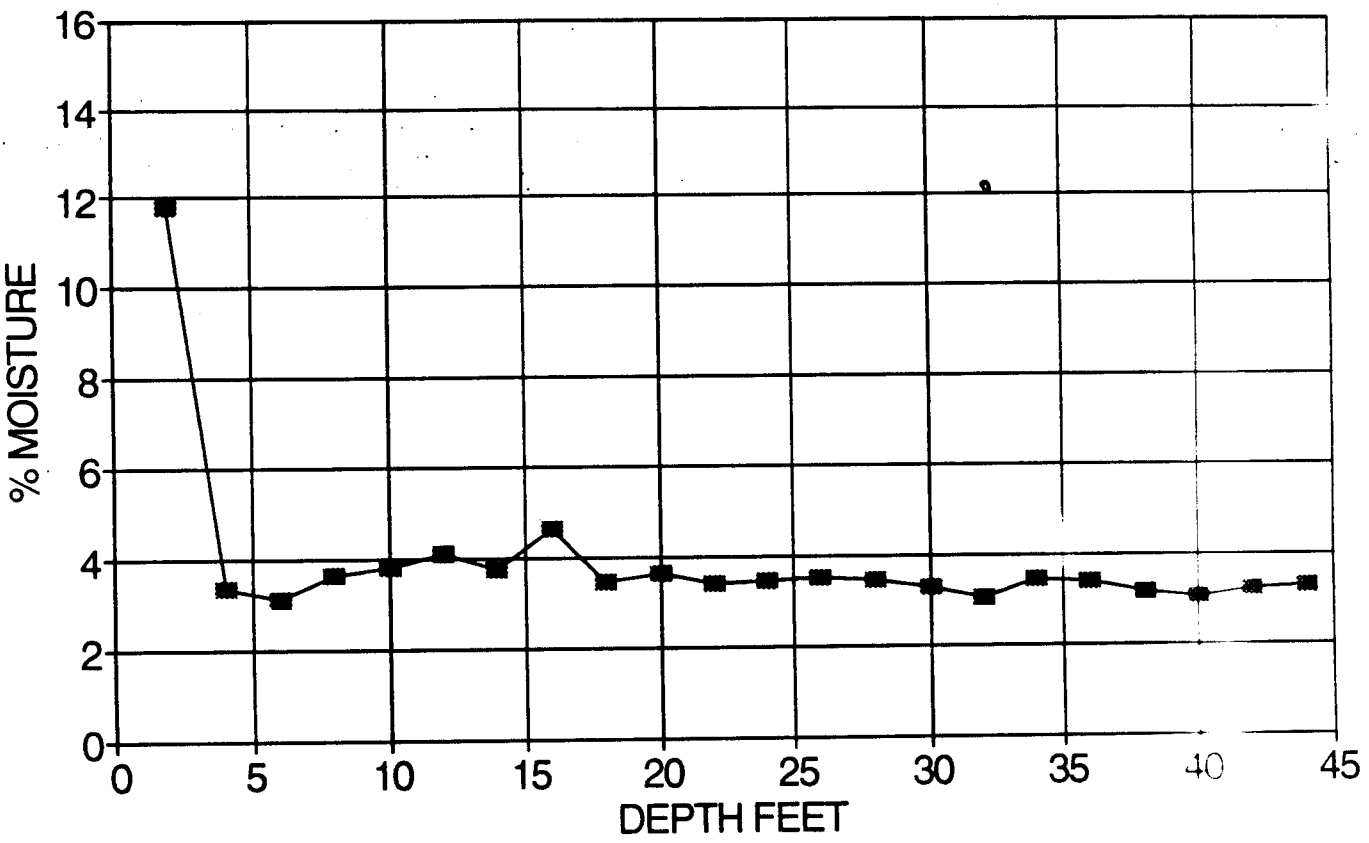
WELL B-53 TA-53

9-16-92



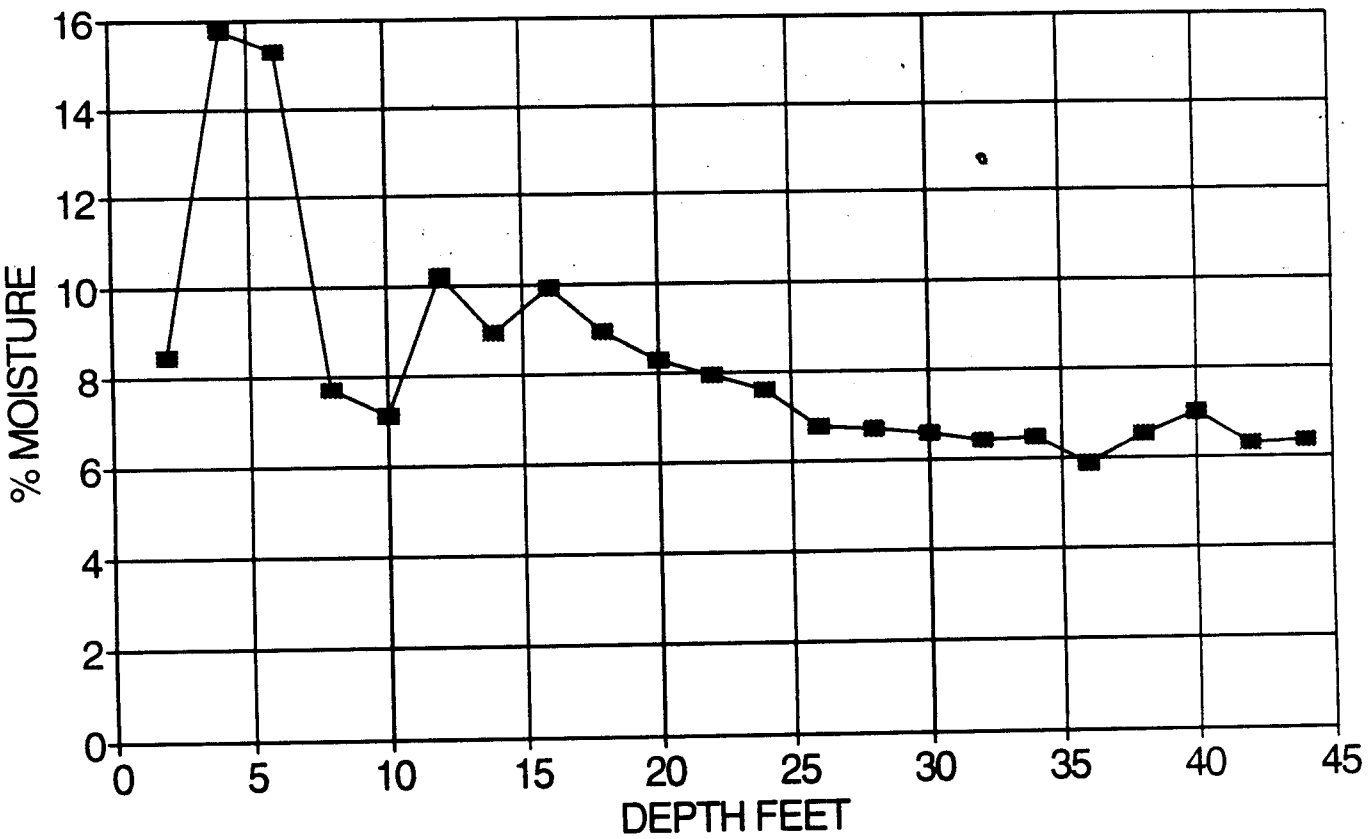
WELL 1-53 TA-53

9-16-92



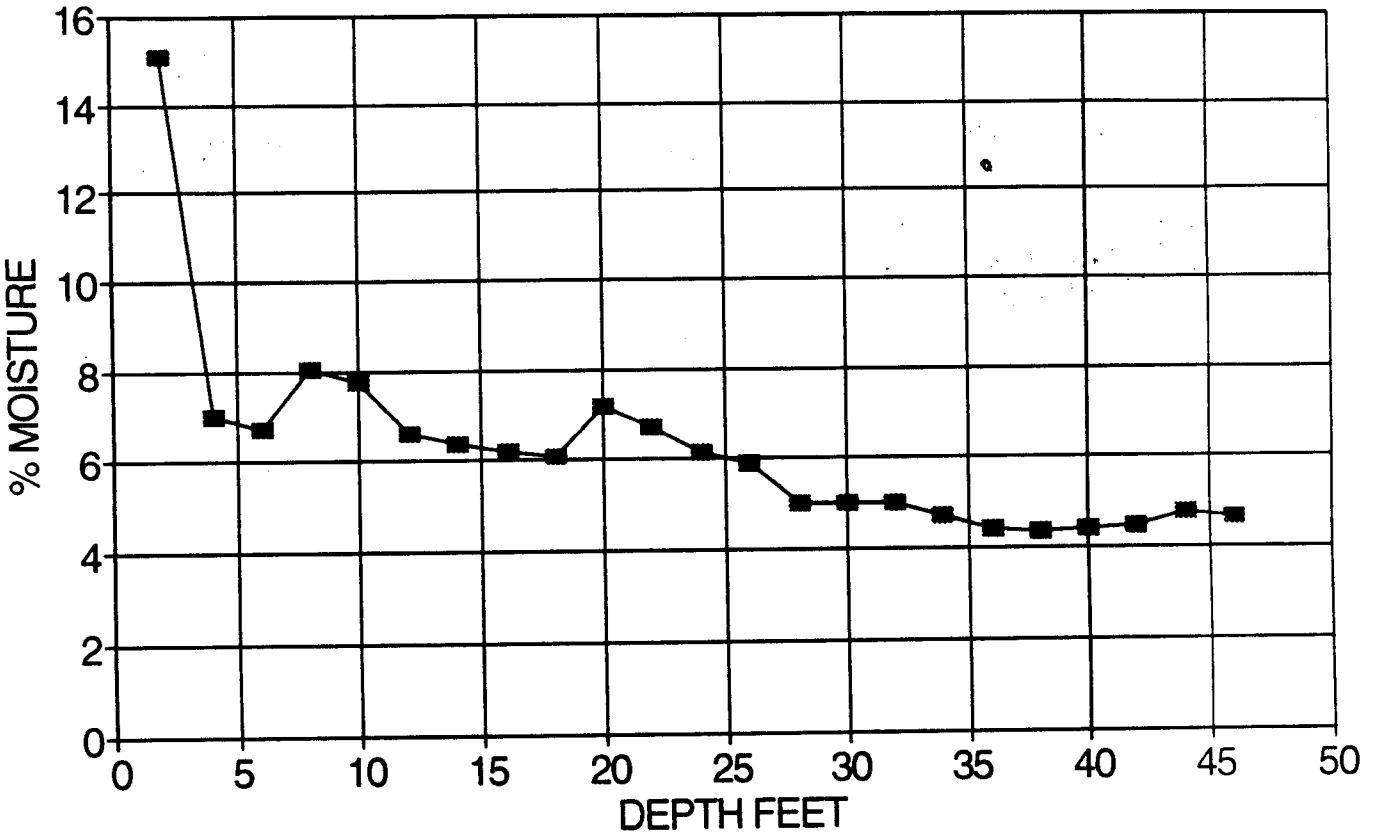
WELL 2-53 TA-53

9-16-92



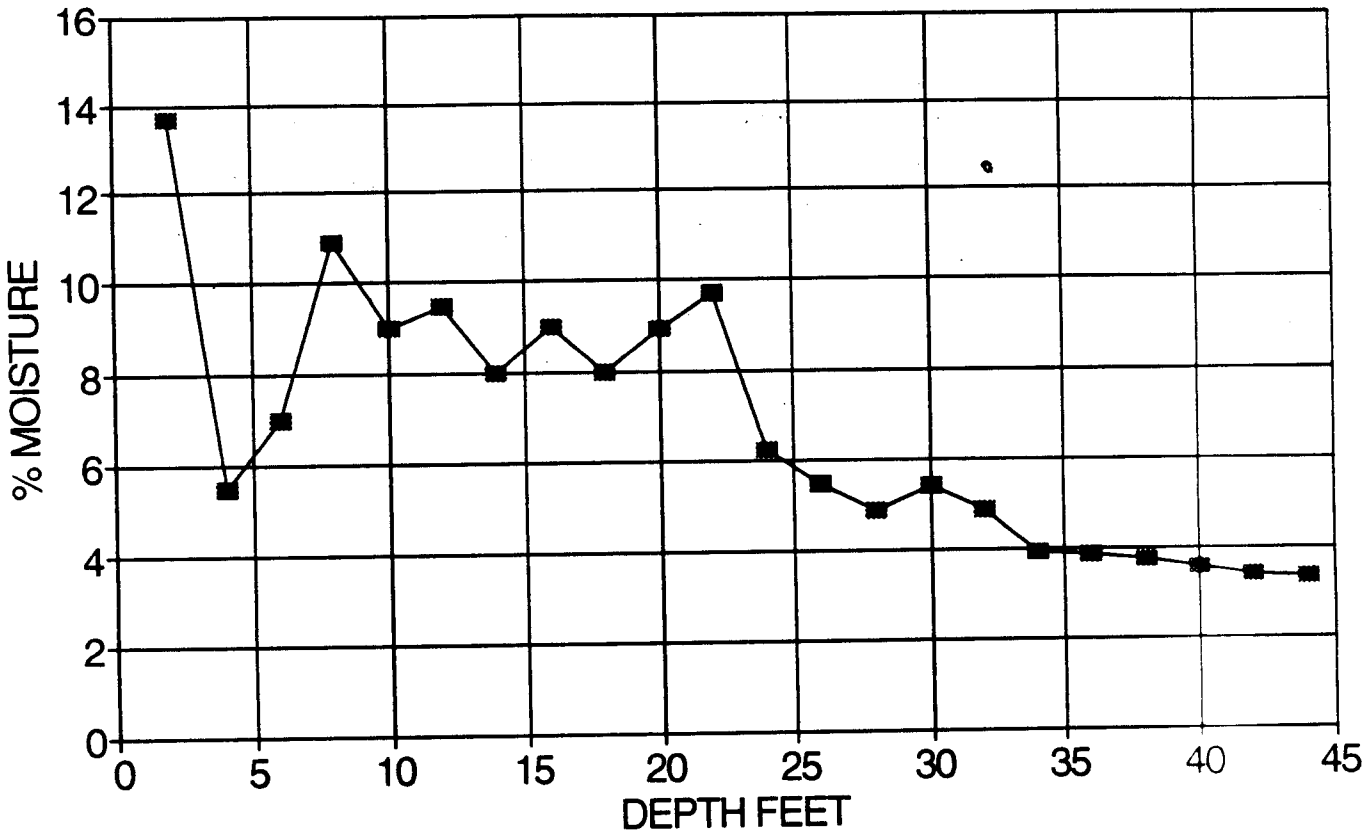
WELL 3-53 TA-53

9-16-92



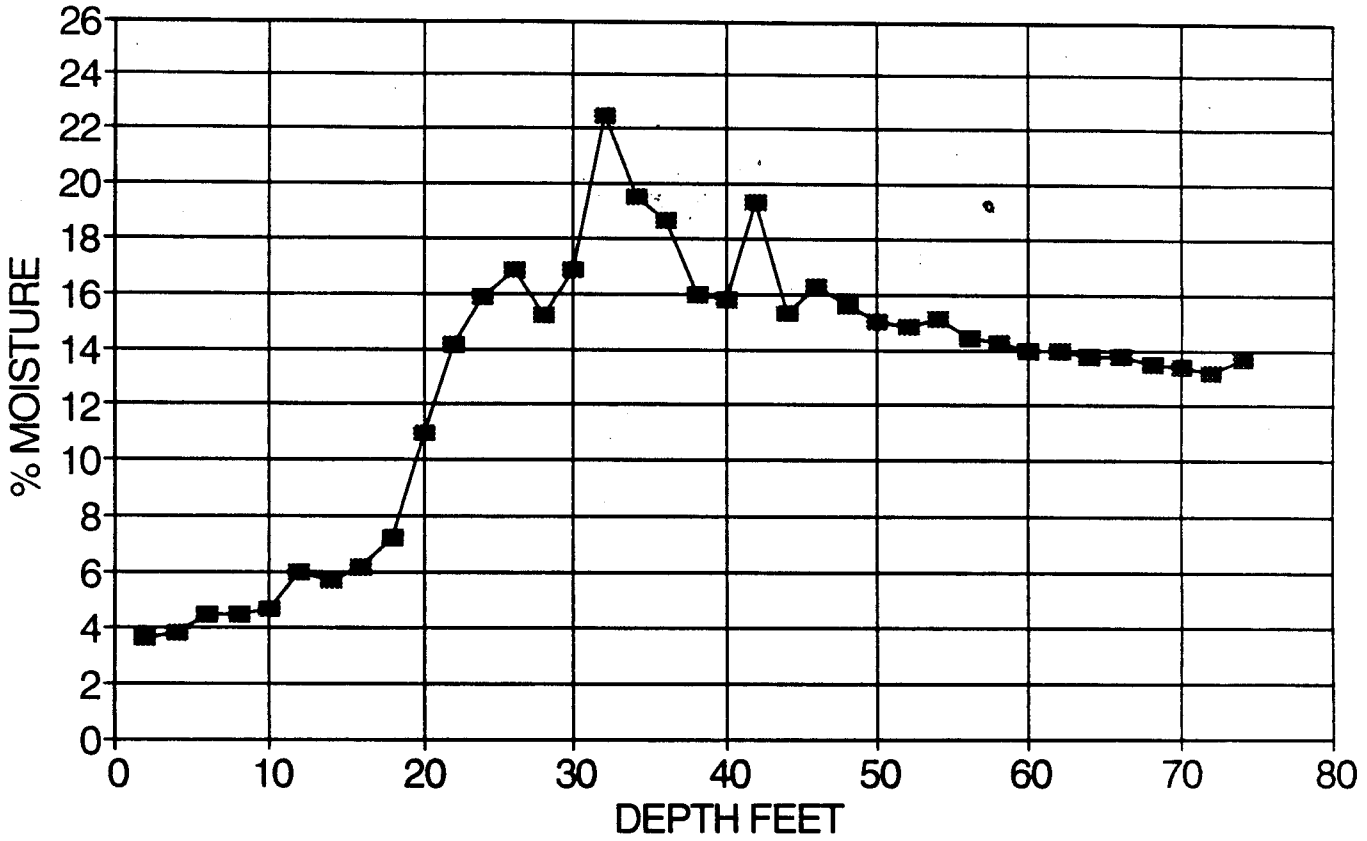
WELL 4-53 TA-53

9-16-92



WELL 7-53 TA-72

9-18-92



TA-53 WELL B-53 9-16-92

DEPTH	%VOLUM
2	10.41
4	1.84
6	2.55
8	2.74
10	2.42
12	2.37
14	1.6
16	1.27
18	0.98
20	1
22	0.93
24	1
26	0.93
28	0.77
30	0.79
32	0.79
34	0.83
36	0.088
38	0.85
40	0.82
42	0.88
44	0.93

TA-53 WELL 1-53 9-16-92

DEPTH	%VOLUM
2	11.79
4	3.31
6	3.12
8	3.62
10	3.79
12	4.12
14	3.74
16	4.64
18	3.46
20	3.64
22	3.43
24	3.45
26	3.51
28	3.44
30	3.25
32	3.03
34	3.46
36	3.41
38	3.16
40	3.05
42	3.21
44	3.26

TA-53 WELL 2-53 9-16-92

DEPTH	%VOLUM
2	8.45
4	15.71
6	15.25
8	7.68
10	7.13
12	10.21
14	8.91
16	9.96
18	8.91
20	8.31
22	7.93
24	7.57
26	6.78
28	6.73
30	6.59
32	6.38
34	6.46
36	5.9
38	6.55
40	7
42	6.27
44	6.34

TA-53 WELL 3-53 9-16-92

DEPTH	%VOLUM
2	15.07
4	7.02
6	6.67
8	8.05
10	7.77
12	6.58
14	6.32
16	6.18
18	6.06
20	7.16
22	6.68
24	6.1
26	5.84
28	5.03
30	5.01
32	5.03
34	4.68
36	4.41
38	4.31
40	4.37
42	4.45
44	4.76
46	4.66

TA-53 WELL 4-53 9-16-92

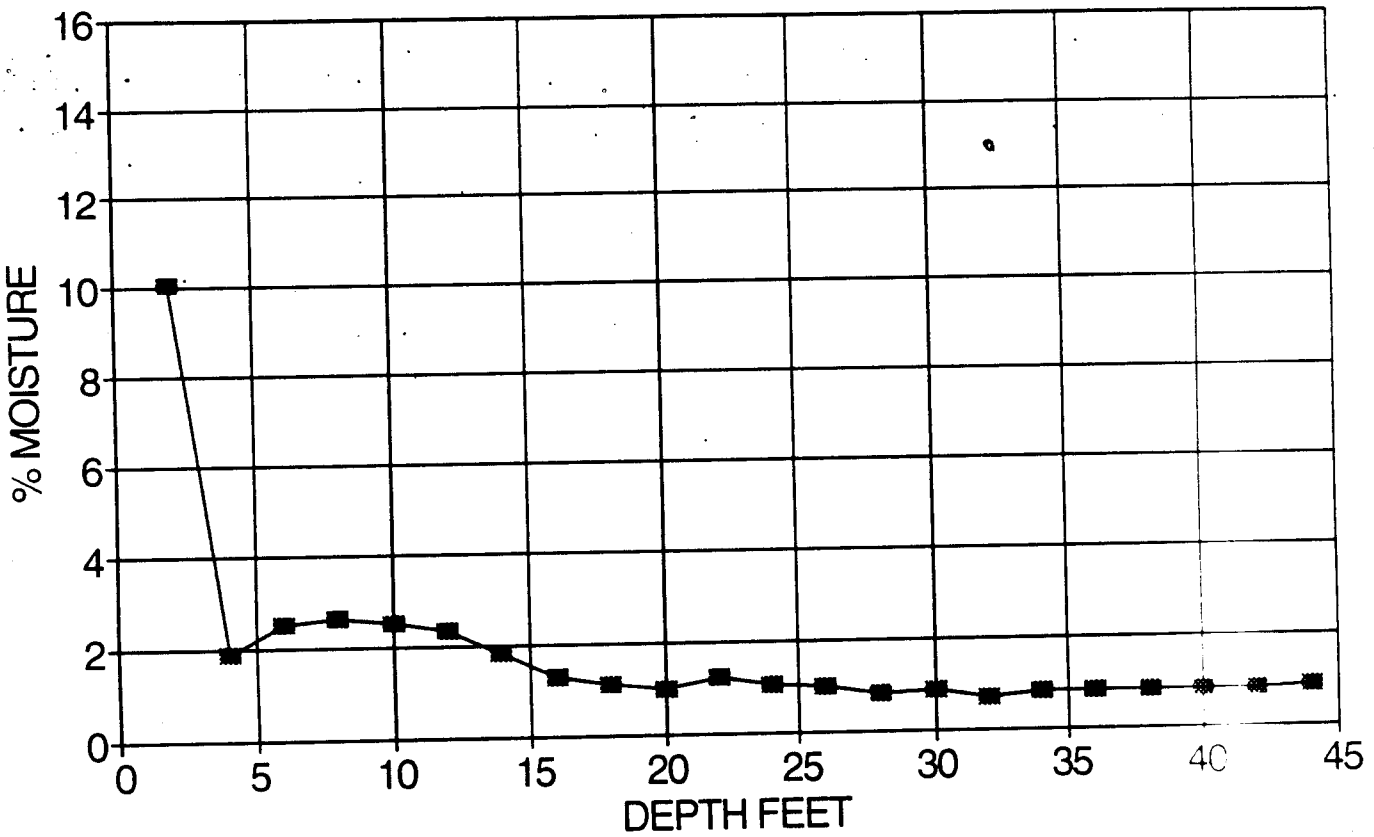
DEPTH	%VOLUM
2	13.69
4	5.49
6	7.01
8	10.91
10	9.01
12	9.5
14	7.99
16	8.98
18	7.99
20	8.95
22	9.67
24	6.24
26	5.45
28	4.85
30	5.41
32	4.88
34	3.94
36	3.87
38	3.75
40	3.57
42	3.43
44	3.34

TA-72 WELL 7-53 9-18-92

DEPTH	%VOLUM
2	3.62
4	3.82
6	4.42
8	4.47
10	4.66
12	6.04
14	5.64
16	6.15
18	7.27
20	11.04
22	14.1
24	15.9
26	16.86
28	15.19
30	16.81
32	22.51
34	19.53
36	18.66
38	15.99
40	15.75
42	19.3
44	15.31
46	16.26
48	15.63
50	15.03
52	14.83
54	15.07
56	14.46
58	14.3
60	14.01
62	14.01
64	13.81
66	13.75
68	13.53
70	13.41
72	13.21
74	13.69

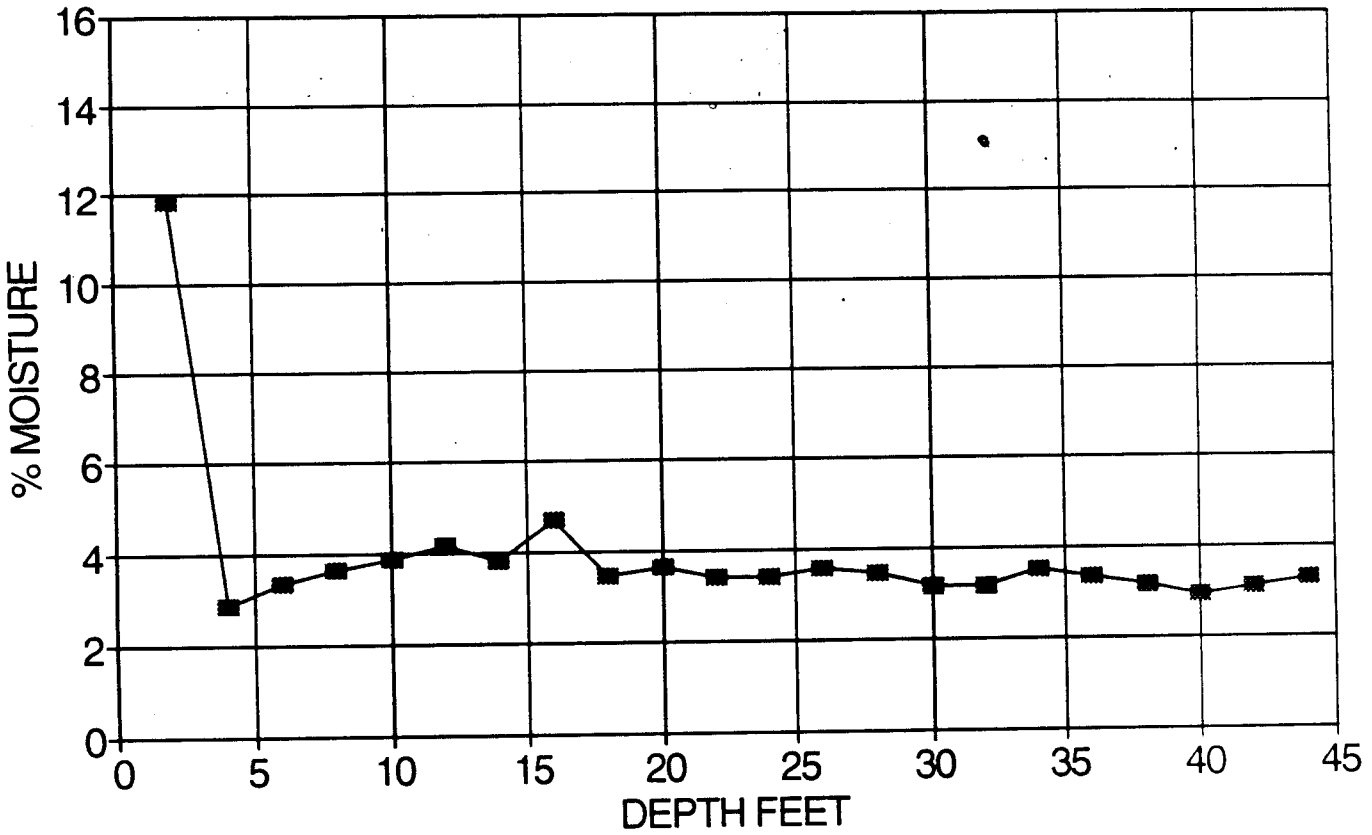
WELL B-53 TA-53

12-10-92



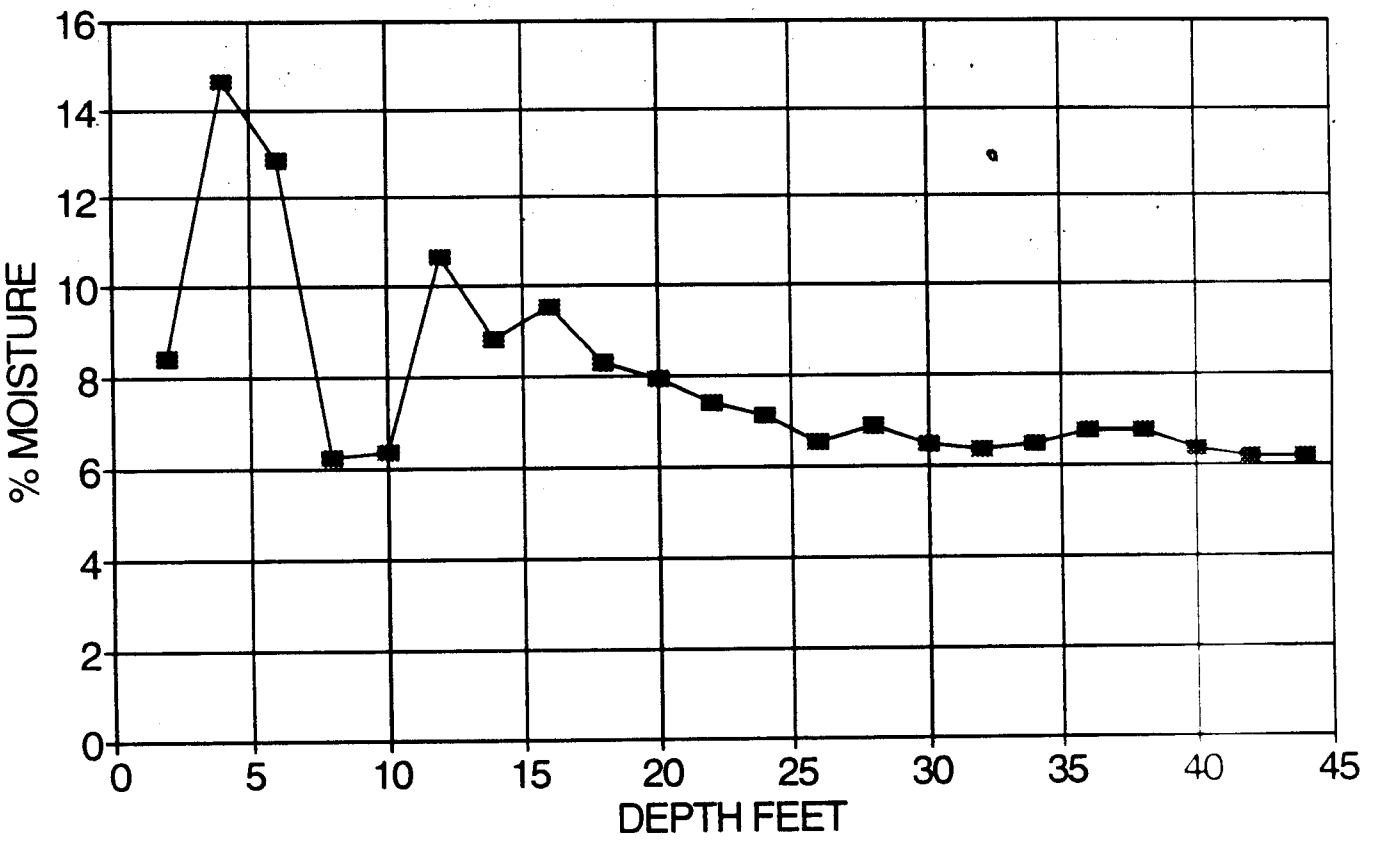
WELL 1-53 TA-53

12-10-92



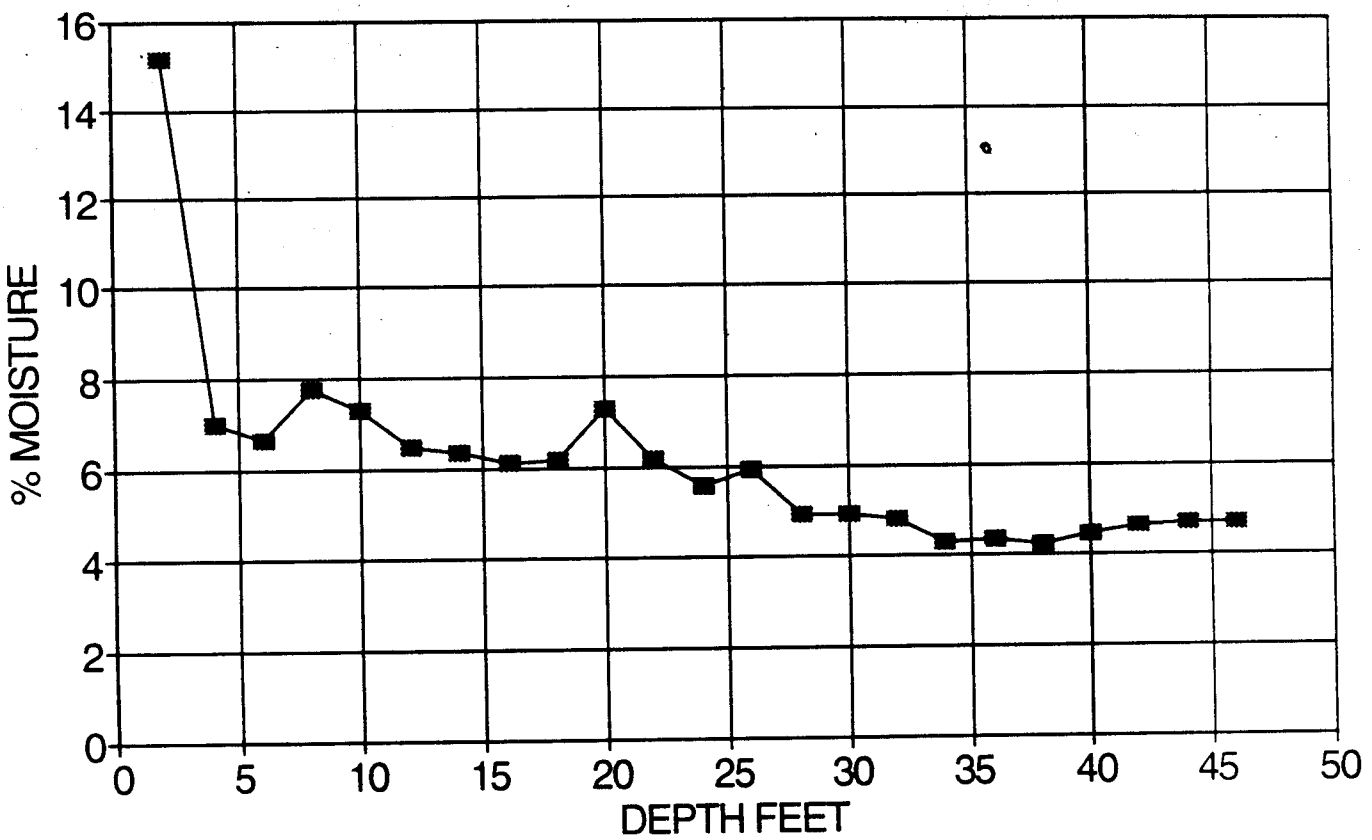
WELL 2-53 TA-53

12-11-92



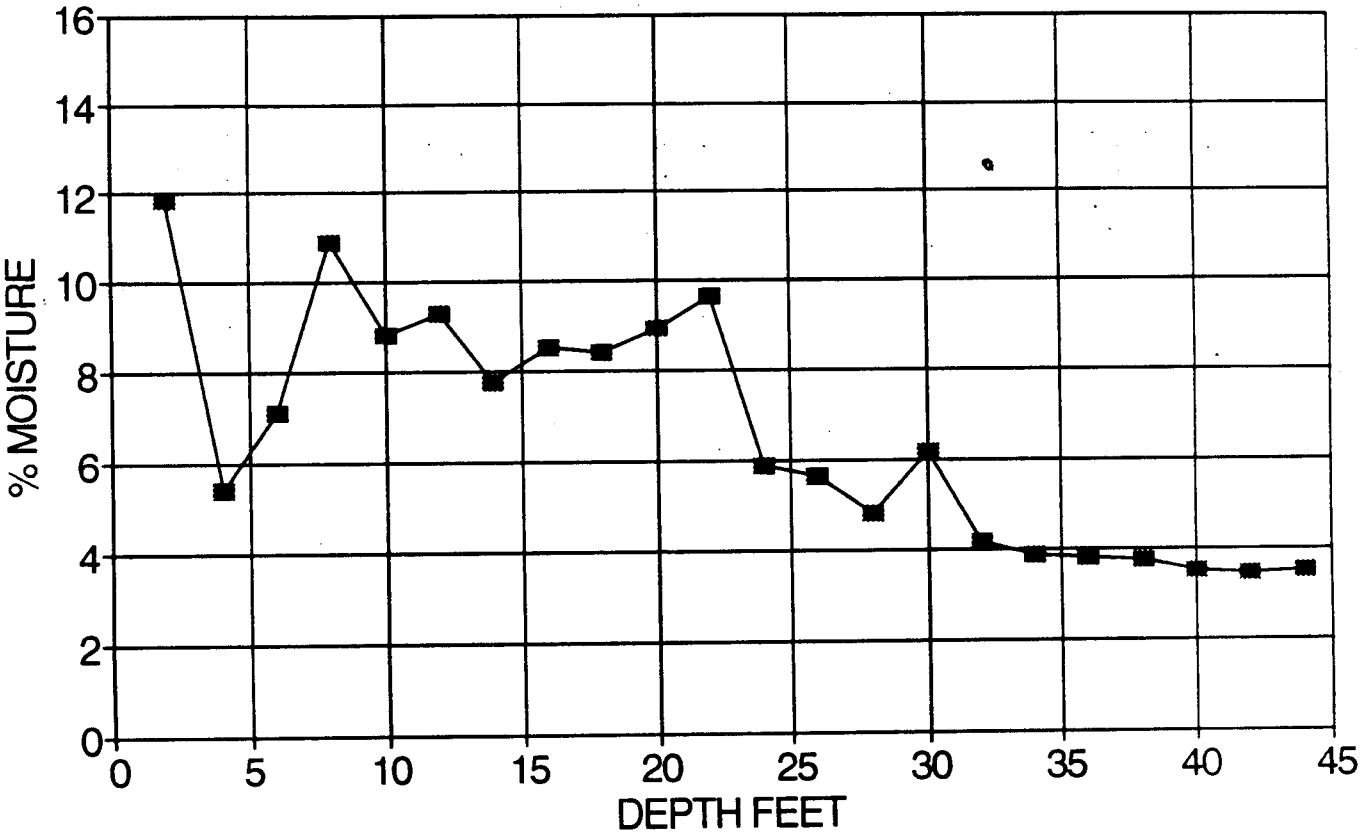
WELL 3-53 TA-53

12-11-92



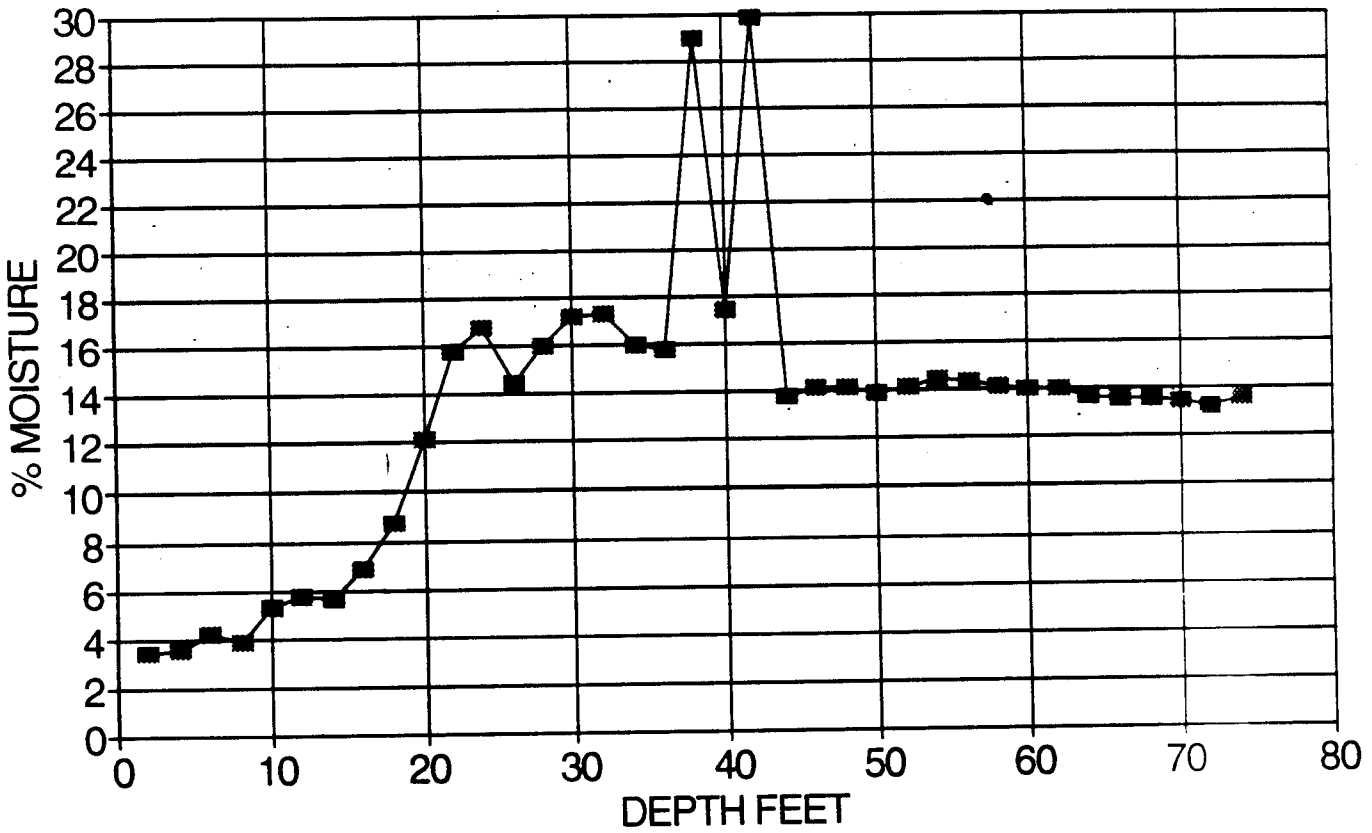
WELL 4-53 TA-53

12-11-92



WELL 7-53 TA-72

12-11-92



TA-53 WELL B-53 12=10-92

DEPTH	%VOLUM
2	10.09
4	1.87
6	2.47
8	2.65
10	2.47
12	2.36
14	1.78
16	1.29
18	1.08
20	0.99
22	1.17
24	1.05
26	0.99
28	0.78
30	0.84
32	0.69
34	0.82
36	0.82
38	0.81
40	0.81
42	0.82
44	0.84

TA-53 WELL 1-53 12-10-92

DEPTH	%VOLUM
2	11.85
4	2.86
6	3.31
8	3.64
10	3.84
12	4.17
14	3.81
16	4.68
18	3.44
20	3.64
22	3.42
24	3.41
26	3.55
28	3.45
30	3.19
32	3.19
34	3.5
36	3.33
38	3.19
40	2.94
42	3.11
44	3.26

TA-53 WELL 2-53 12-11-92

DEPTH	%VOLUM
2	8.37
4	14.62
6	12.82
8	6.26
10	6.35
12	10.64
14	8.83
16	9.55
18	8.27
20	7.94
22	7.4
24	7.13
26	6.56
28	6.84
30	6.48
32	6.35
34	6.45
36	6.76
38	6.76
40	6.32
42	6.16
44	6.18

TA-53 WELL 3-53 12-11-92

DEPTH	%VOLUM
2	15.16
4	7.01
6	6.65
8	7.77
10	7.31
12	6.47
14	6.31
16	6.09
18	6.19
20	7.3
22	6.2
24	5.6
26	5.96
28	4.95
30	4.95
32	4.77
34	4.29
36	4.34
38	4.23
40	4.48
42	4.61
44	4.73
46	4.72

TA-53 WELL 4-53 12-11-92

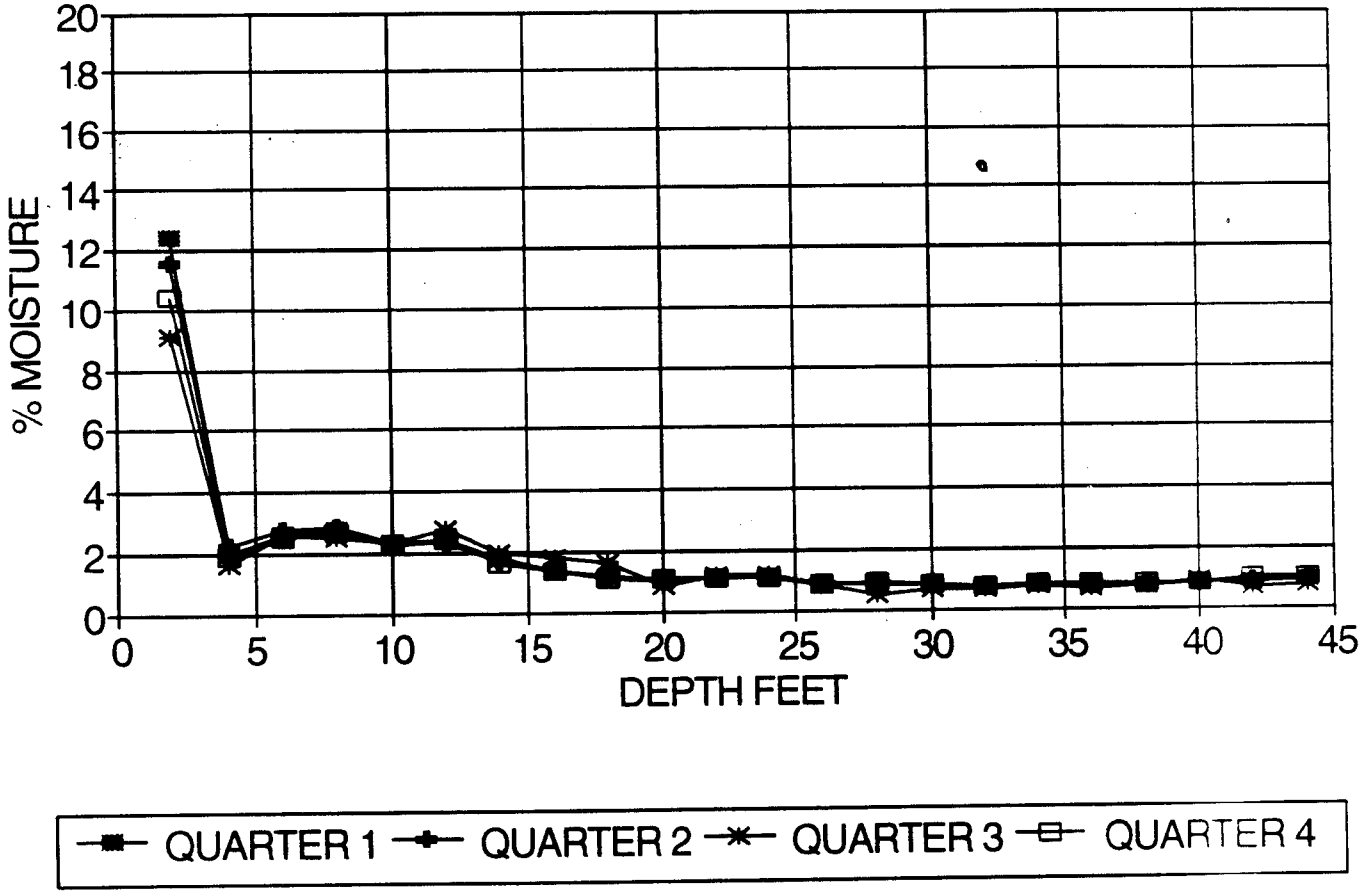
DEPTH	%VOLUM
2	11.85
4	5.38
6	7.13
8	10.9
10	8.81
12	9.31
14	7.75
16	8.56
18	8.41
20	8.94
22	9.66
24	5.89
26	5.66
28	4.8
30	6.2
32	4.18
34	3.87
36	3.82
38	3.76
40	3.53
42	3.45
44	3.52

TA-72 WELL 7-53 12=11=92

DEPTH	%VOLUM
2	3.41
4	3.56
6	4.14
8	3.77
10	5.31
12	5.63
14	5.58
16	6.87
18	8.68
20	12.11
22	15.77
24	16.77
26	14.41
28	15.97
30	17.15
32	17.29
34	16.01
36	15.81
38	28.9
40	17.43
42	29.76
44	13.79
46	14.13
48	14.15
50	13.83
52	14.12
54	14.4
56	14.26
58	14.07
60	13.99
62	13.99
64	13.69
66	13.58
68	13.53
70	13.4
72	13.28
74	13.62

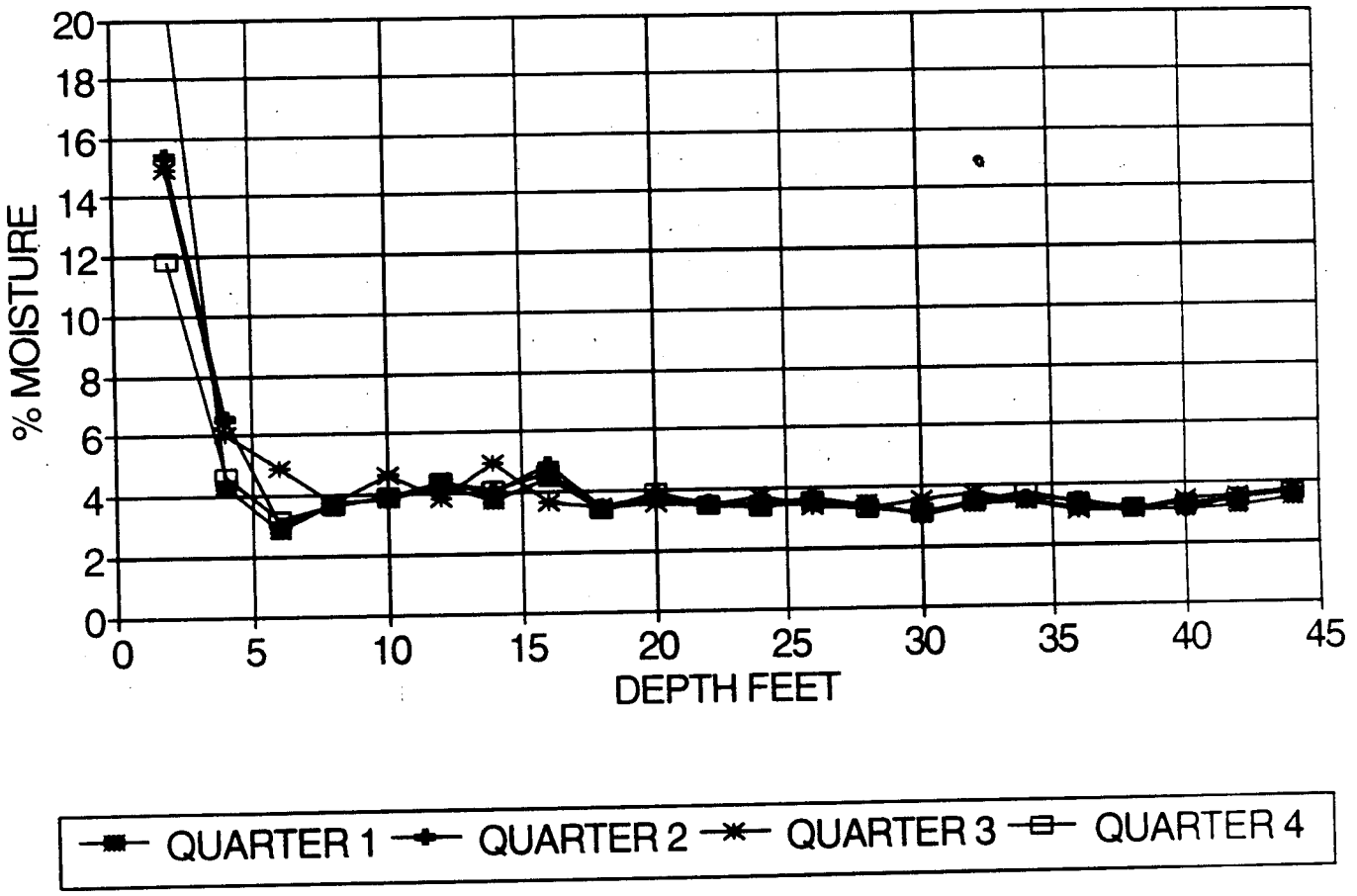
WELLS B-53 1993

4 QUARTERS



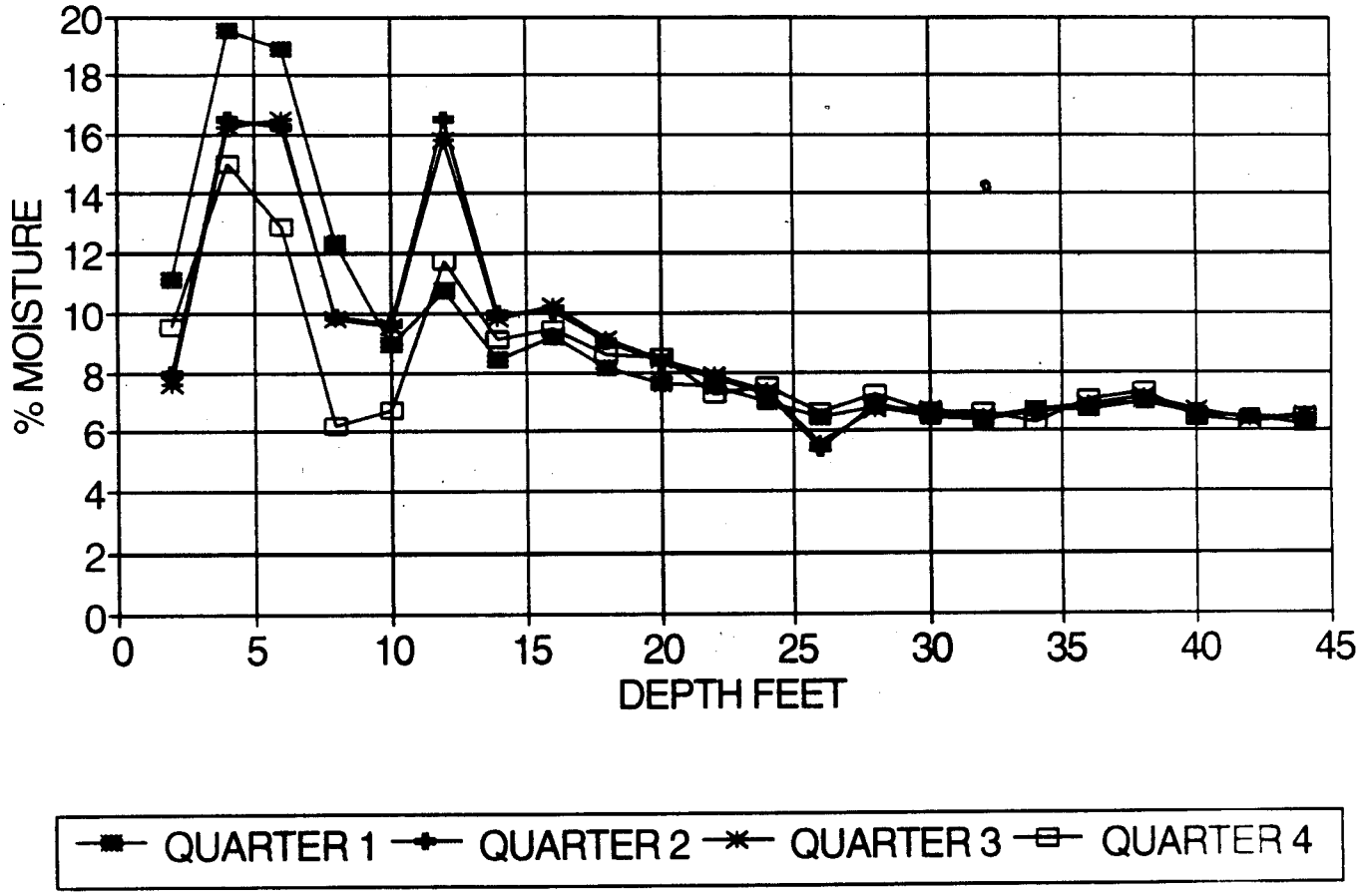
WELLS 1-53 1993

4 QUARTERS



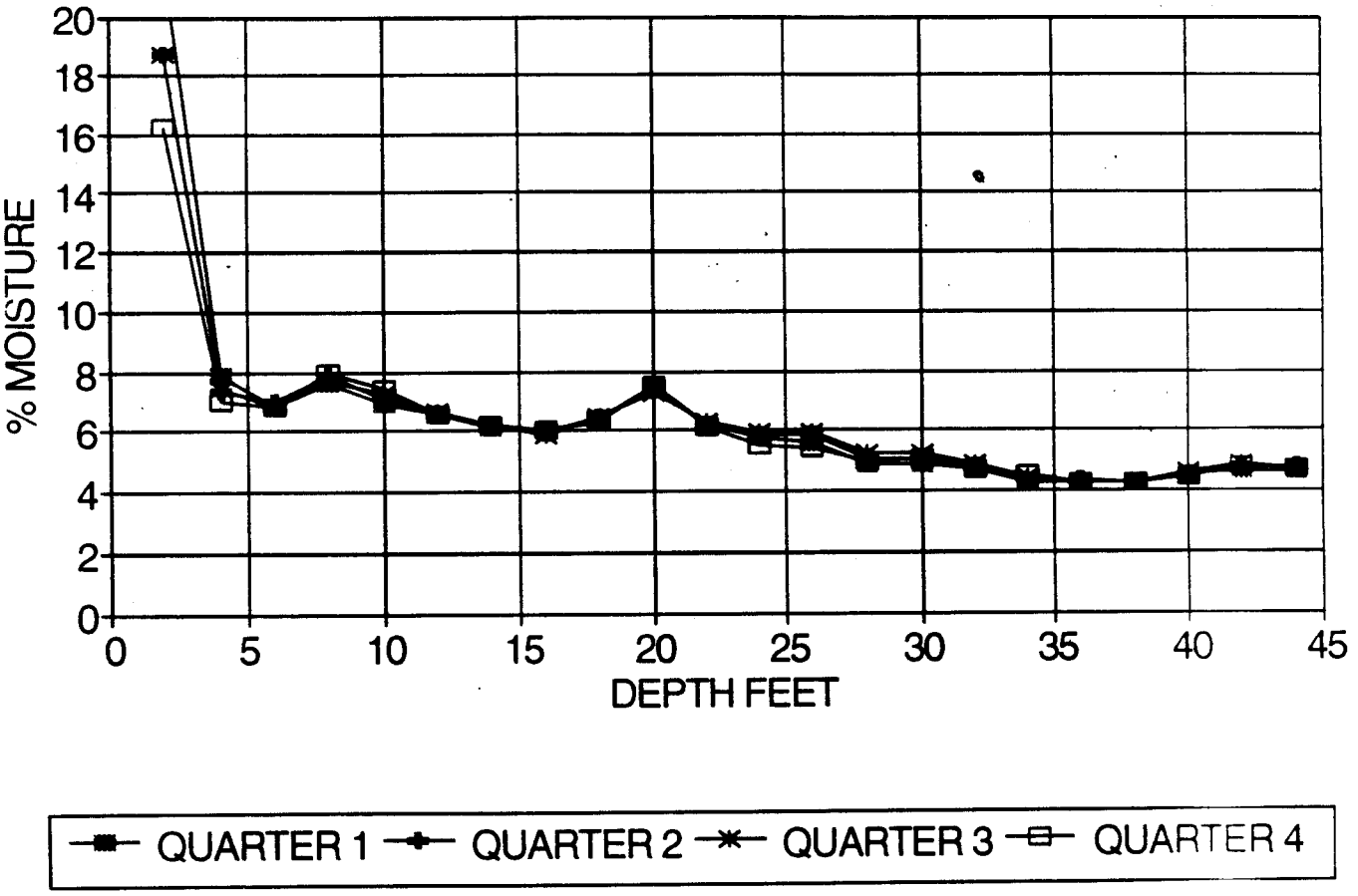
WELLS 2-53 1993

4 QUARTERS



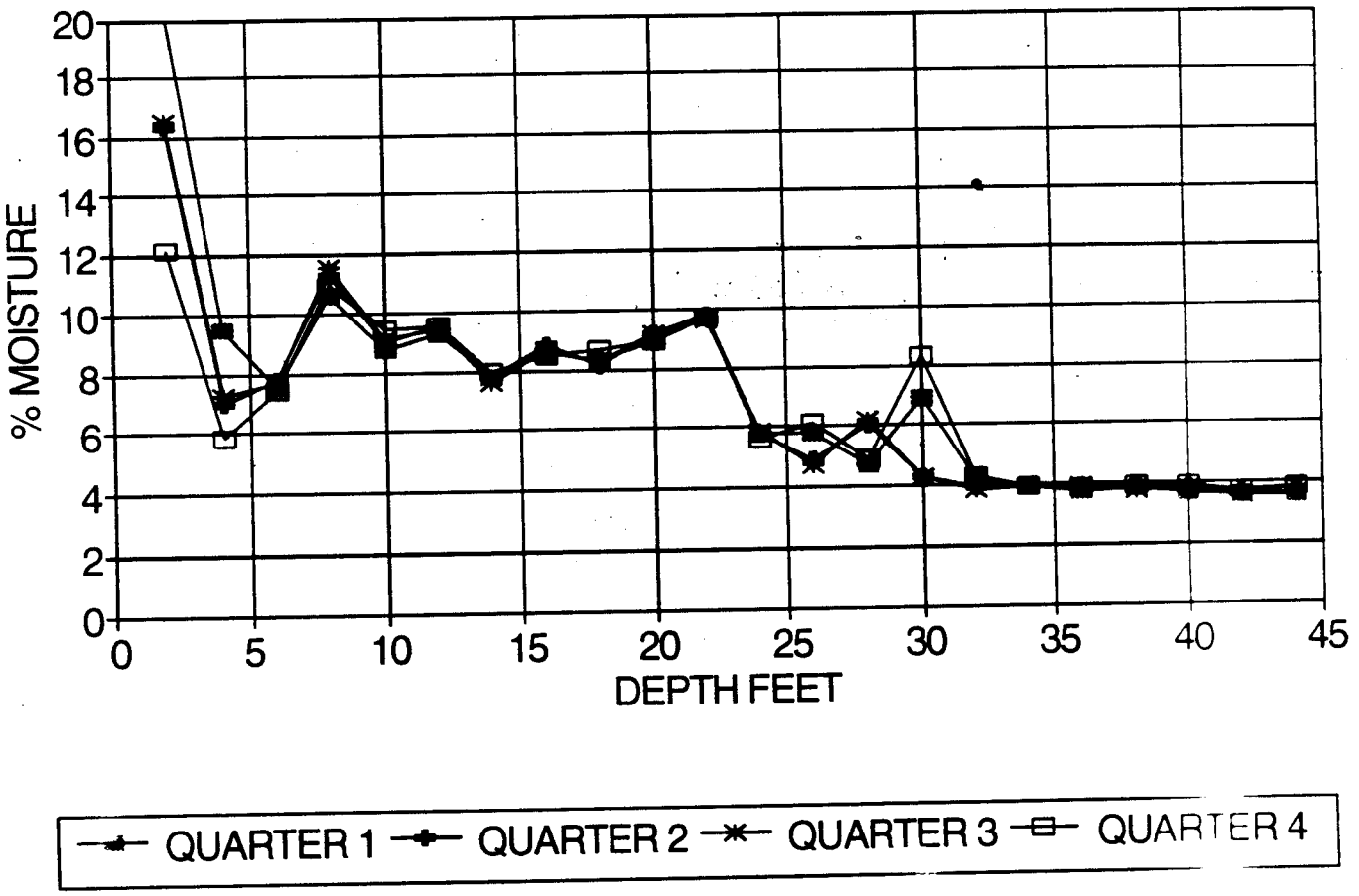
WELLS 3-53 93

4 QUARTERS



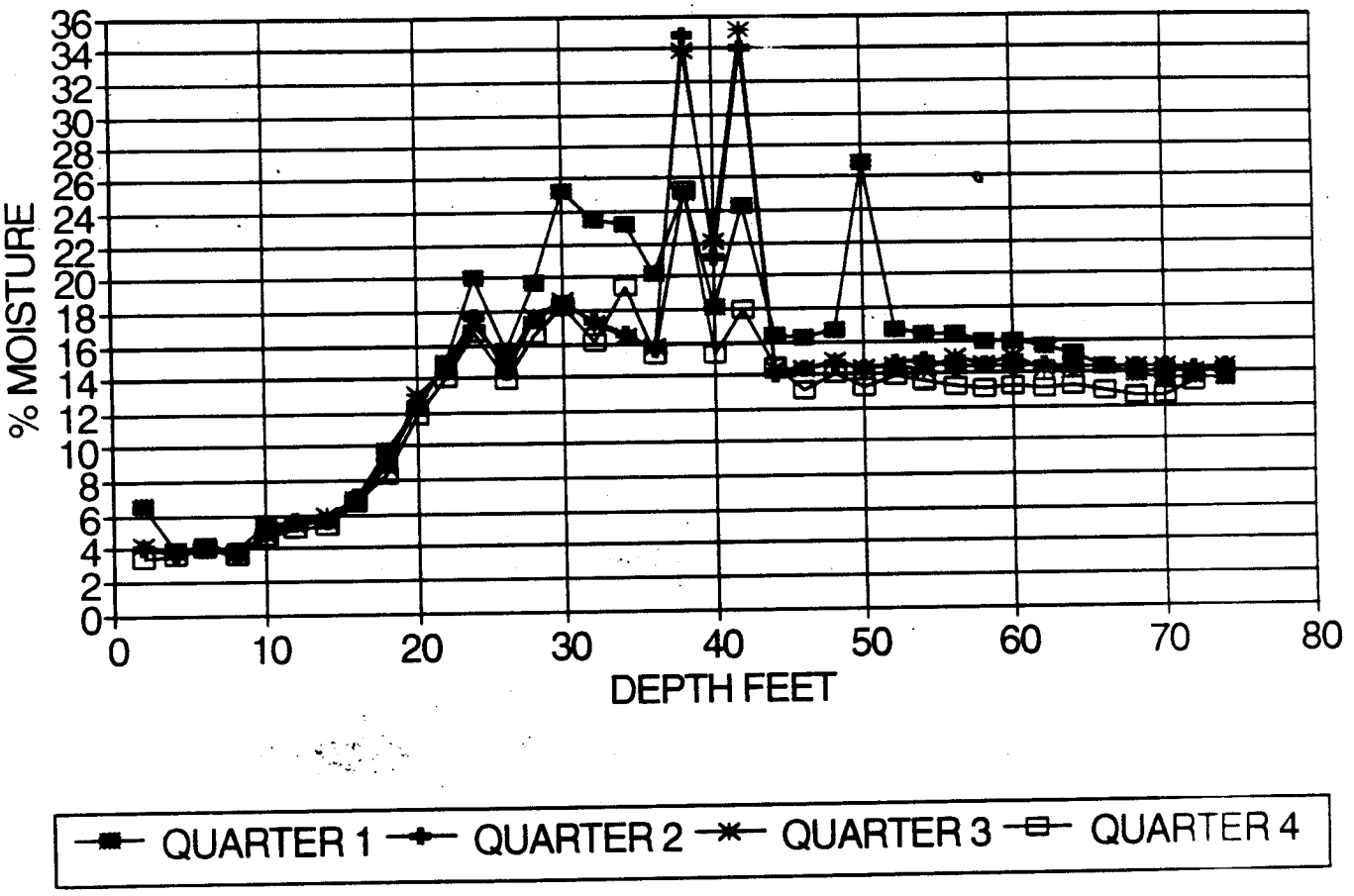
WELLS 4-53 93

4 QUARTERS



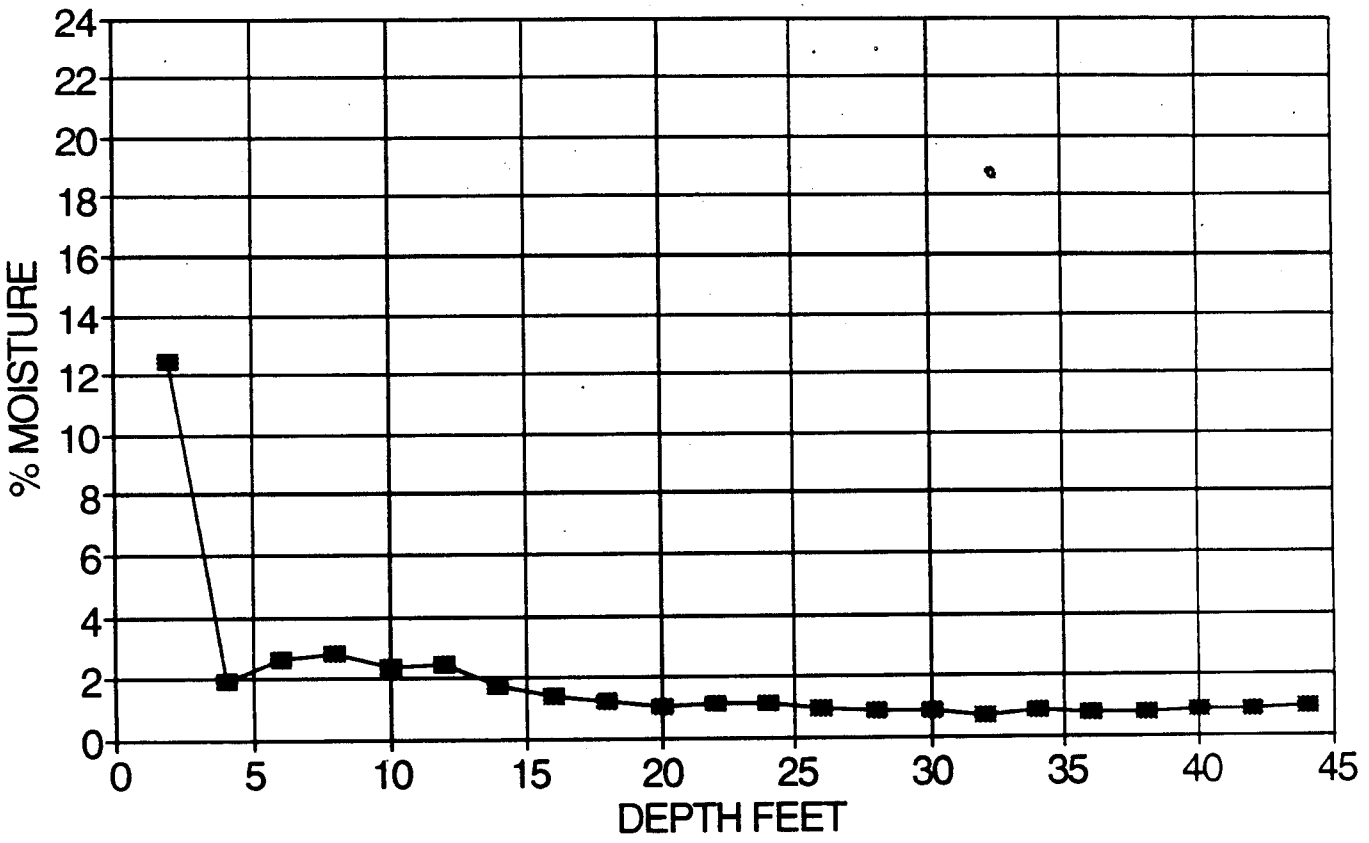
WELLS 7-53 93

4 QUARTERS



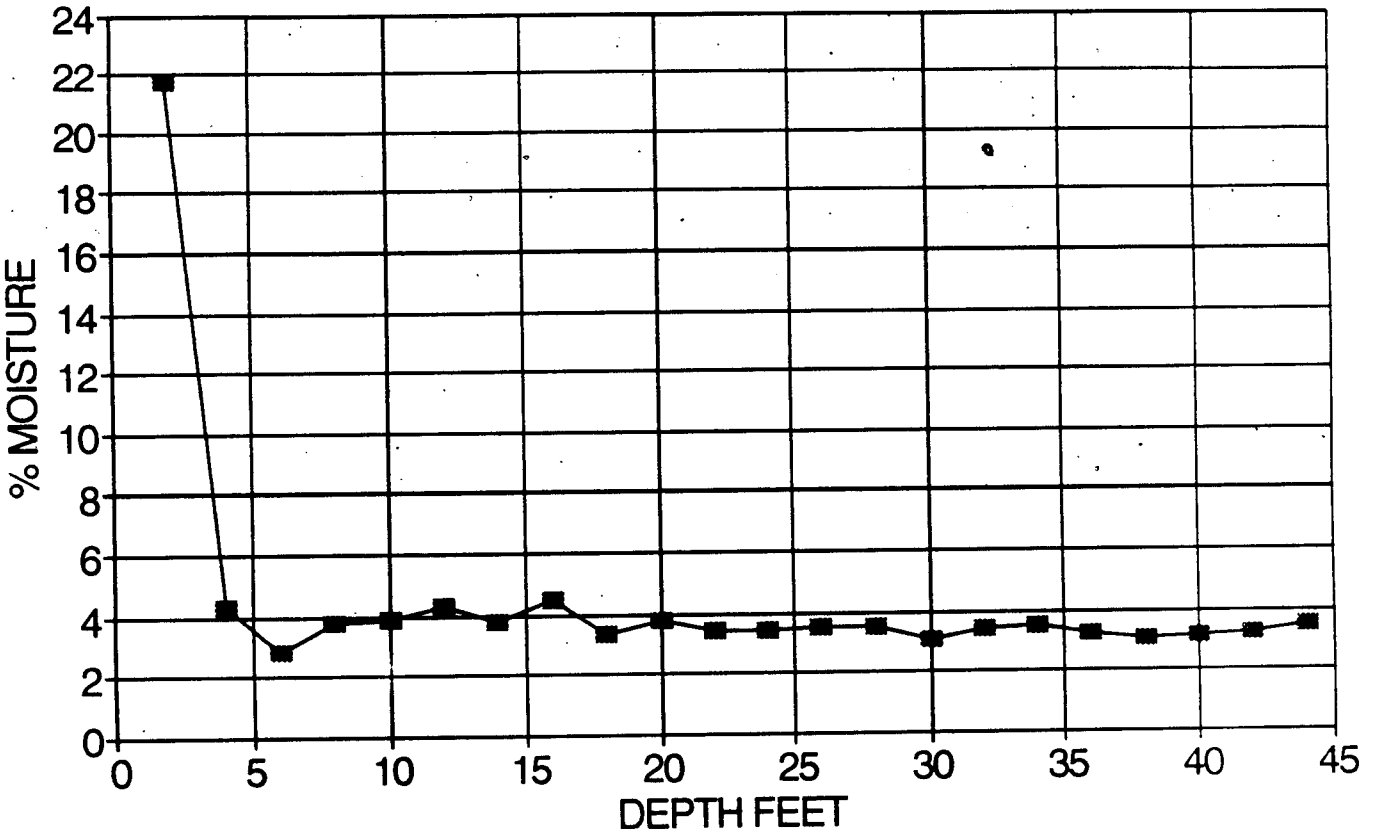
WELL B-53 TA-53

3-4-93



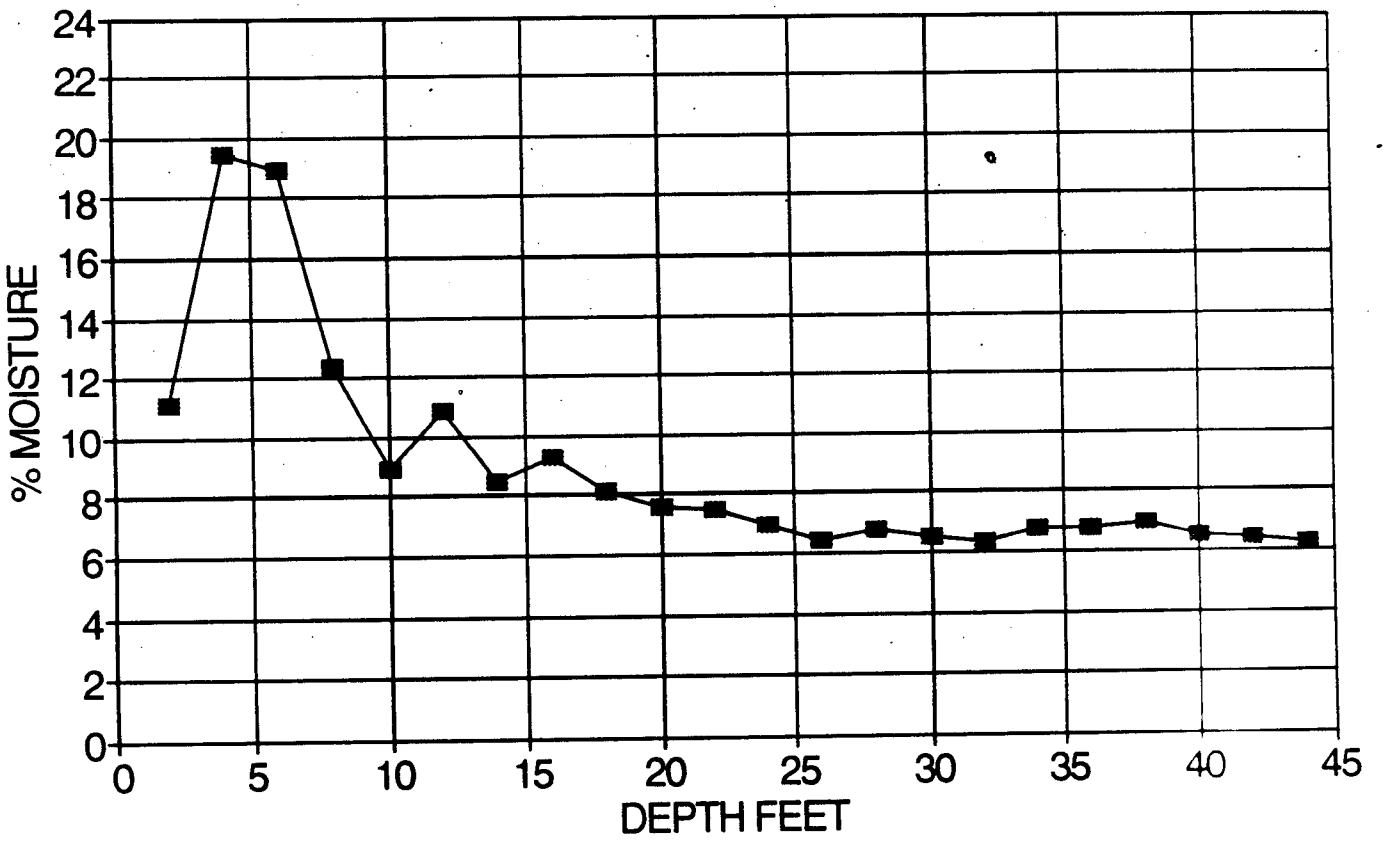
WELL 1-53 TA-53

3-4-93



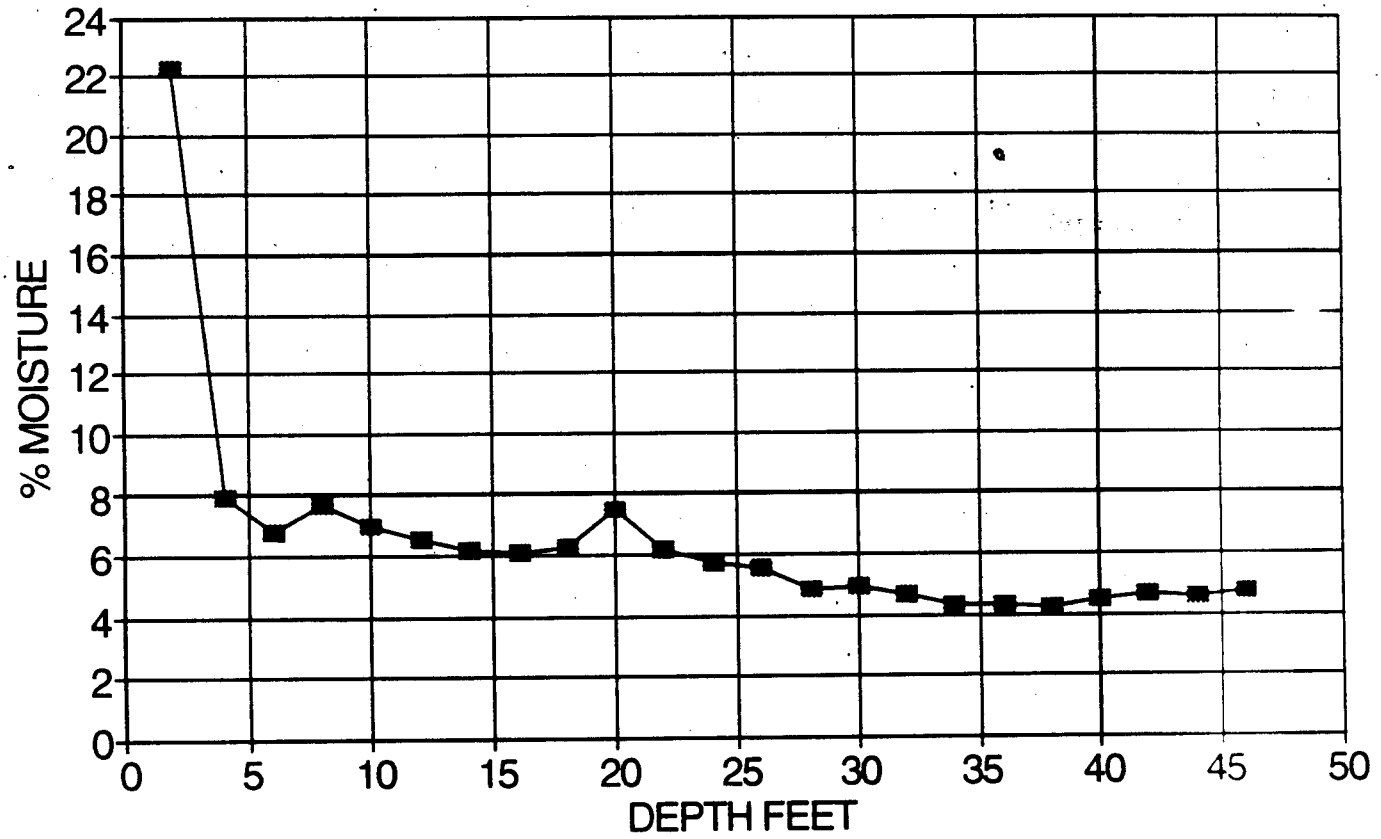
WELL 2-53 TA-53

3-4-93



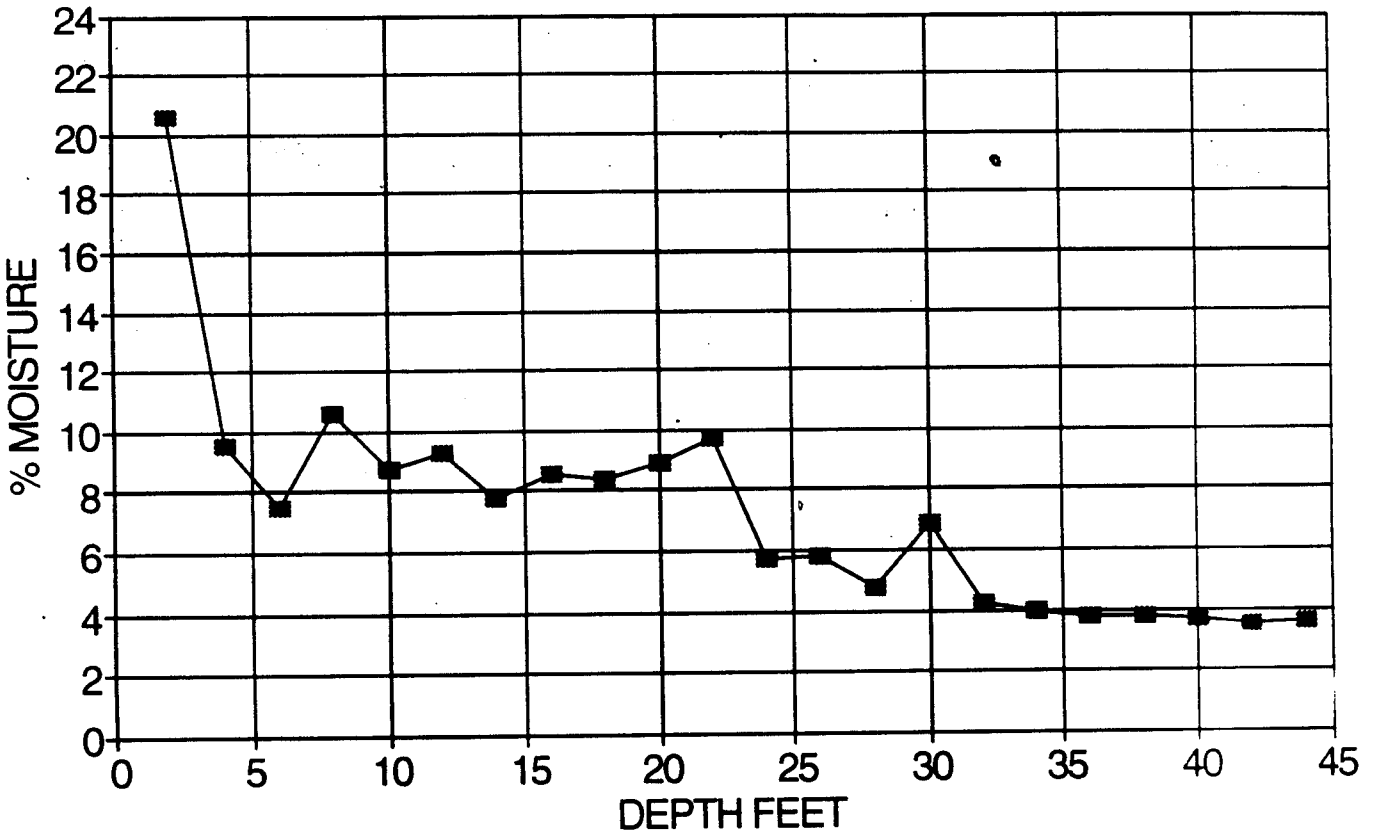
WELL 3-53 TA-53

3-4-93



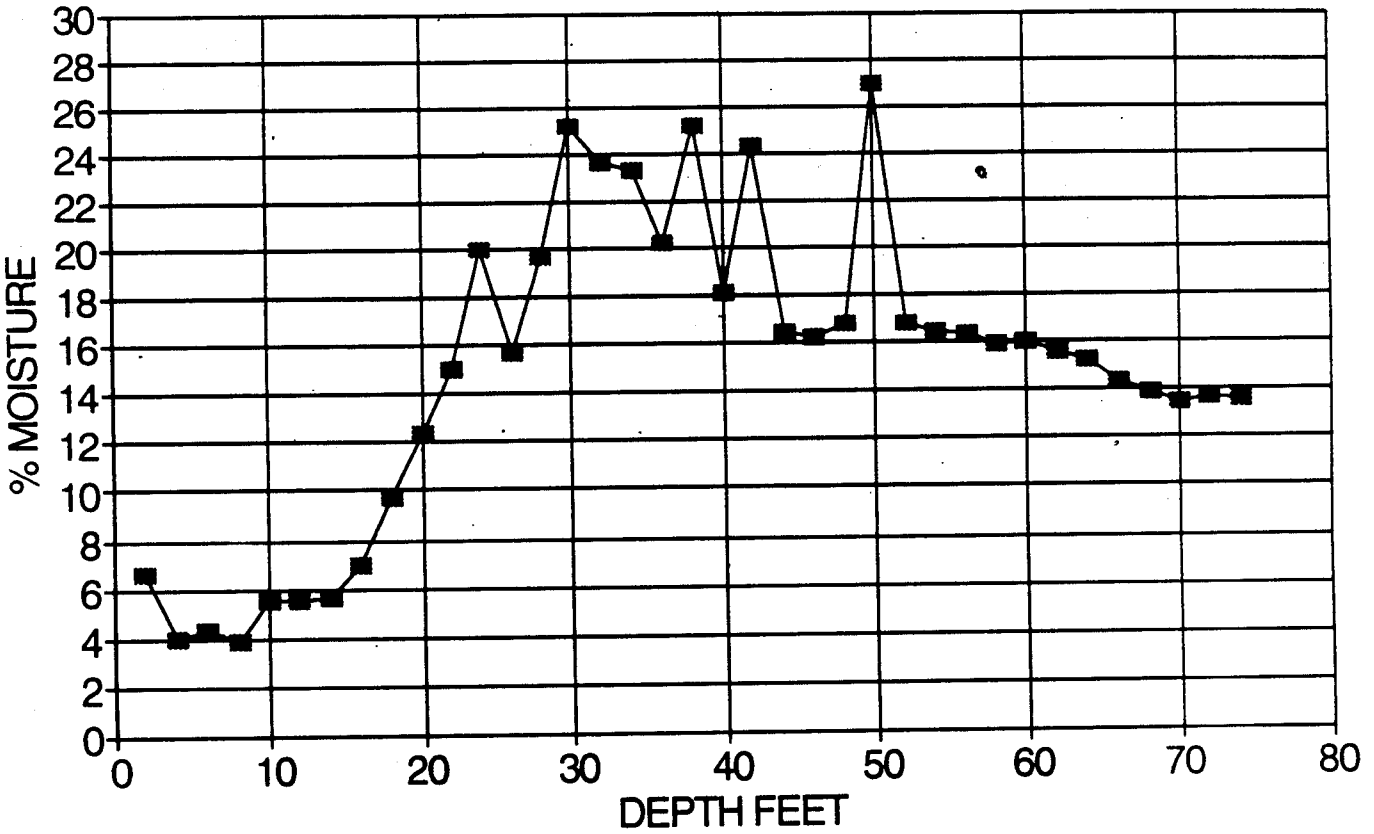
WELL 4-53 TA-53

3-17-93



WELL 7-53 TA-72

3-17-93



TA-53 WELL B-53 3-4-93

DEPTH	%VOLUM
2	12.47
4	1.95
6	2.62
8	2.78
10	2.37
12	2.43
14	1.75
16	1.37
18	1.17
20	1.03
22	1.09
24	1.08
26	0.93
28	0.81
30	0.82
32	0.7
34	0.81
36	0.74
38	0.73
40	0.84
42	0.83
44	0.92

TA-53 WELL 1-53 3-4-93

DEPTH	%VOLUM
2	21.8
4	4.32
6	2.84
8	3.75
10	3.83
12	4.32
14	3.74
16	4.47
18	3.34
20	3.71
22	3.45
24	3.44
26	3.47
28	3.48
30	3.04
32	3.37
34	3.5
36	3.21
38	3.1
40	3.16
42	3.23
44	3.48

TA-53 WELL 2-53 3-4-93

DEPTH	%VOLUM
2	11.12
4	19.49
6	18.94
8	12.36
10	8.95
12	10.84
14	8.42
16	9.22
18	8.13
20	7.59
22	7.47
24	6.98
26	6.43
28	6.77
30	6.51
32	6.38
34	6.76
36	6.76
38	7
40	6.52
42	6.43
44	6.26

TA-53 WELL 3-53 3-4-93

DEPTH	%VOLUM
2	22.25
4	7.91
6	6.8
8	7.63
10	6.93
12	6.53
14	6.16
16	6.02
18	6.28
20	7.55
22	6.19
24	5.74
26	5.57
28	4.84
30	4.87
32	4.69
34	4.31
36	4.27
38	4.25
40	4.48
42	4.62
44	4.58
46	4.72

TA-53 WELL 4-53 3-4-93

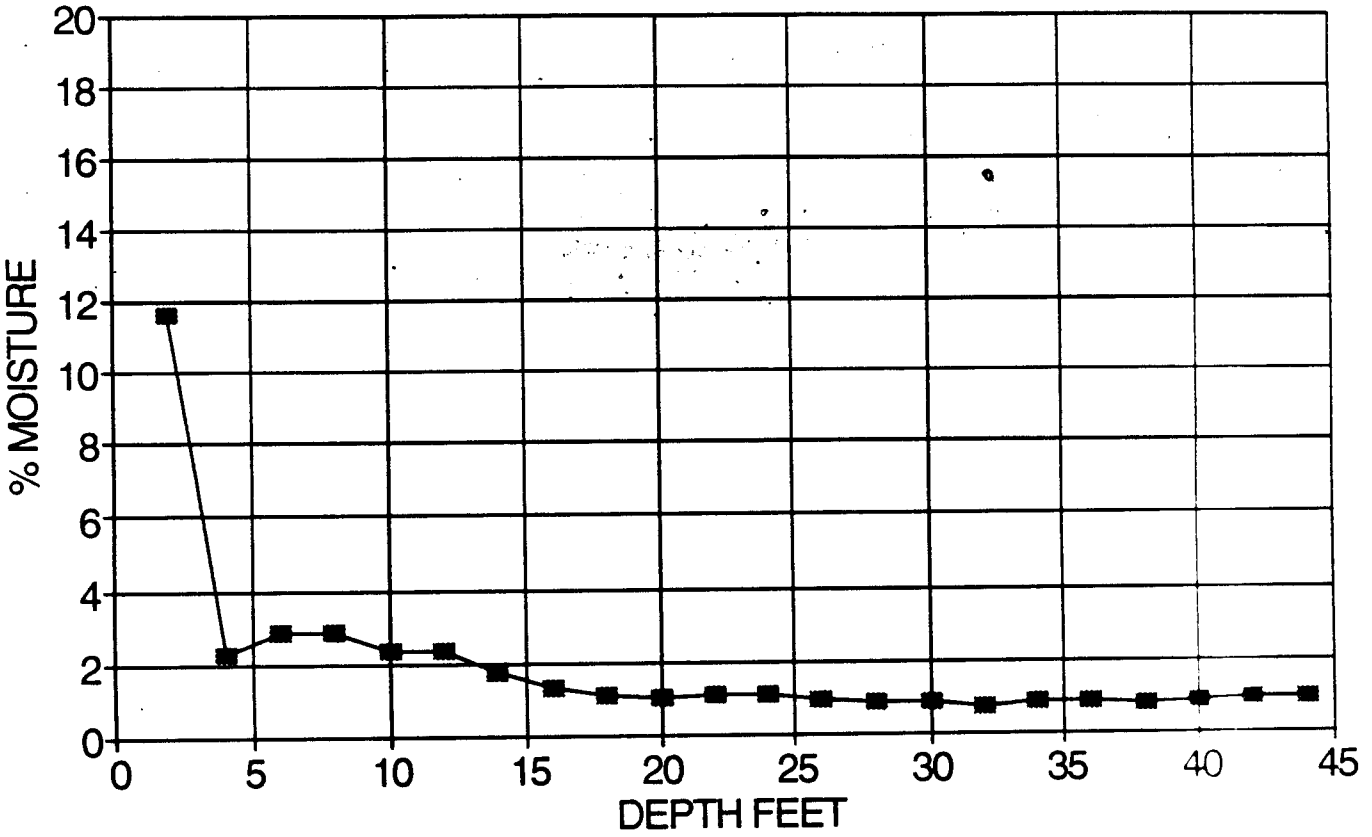
DEPTH	%VOLUM
2	20.59
4	9.47
6	7.49
8	10.63
10	8.73
12	9.27
14	7.78
16	8.57
18	8.31
20	8.94
22	9.73
24	5.74
26	5.79
28	4.74
30	6.9
32	4.18
34	3.93
36	3.73
38	3.79
40	3.66
42	3.55
44	3.59

TA-72 WELL 7-53 3-17-93

DEPTH	%VOLUM
2	6.6
4	3.89
6	4.26
8	3.85
10	5.51
12	5.44
14	5.62
16	6.97
18	9.71
20	12.34
22	15
24	20.06
26	15.66
28	19.65
30	25.25
32	23.57
34	23.27
36	20.25
38	25.16
40	18.09
42	24.28
44	16.4
46	16.21
48	16.79
50	26.95
52	16.69
54	16.4
56	16.34
58	15.93
60	15.97
62	15.62
64	15.19
66	14.28
68	13.91
70	13.46
72	13.68
74	13.58

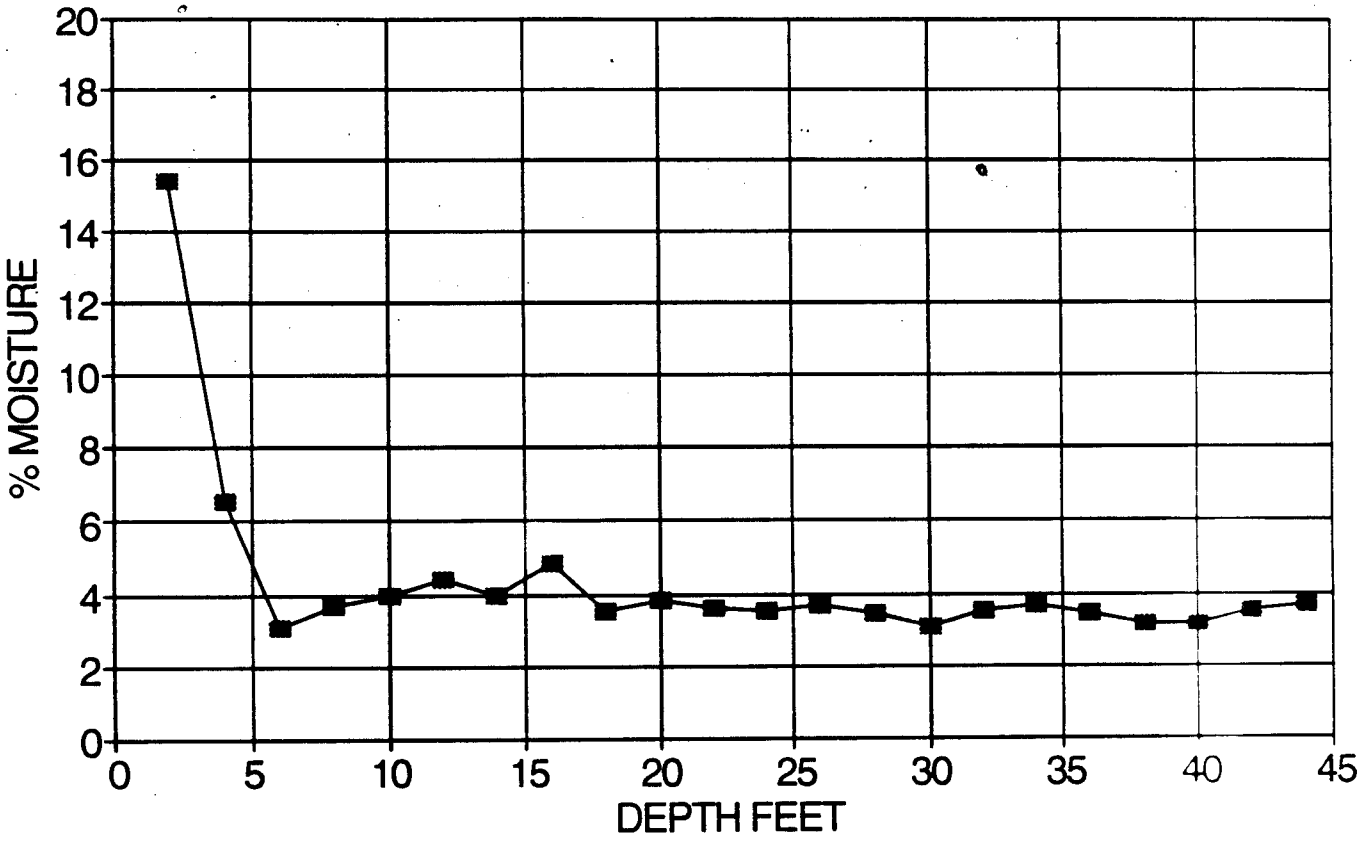
WELL B-53 TA-53

6-23-93



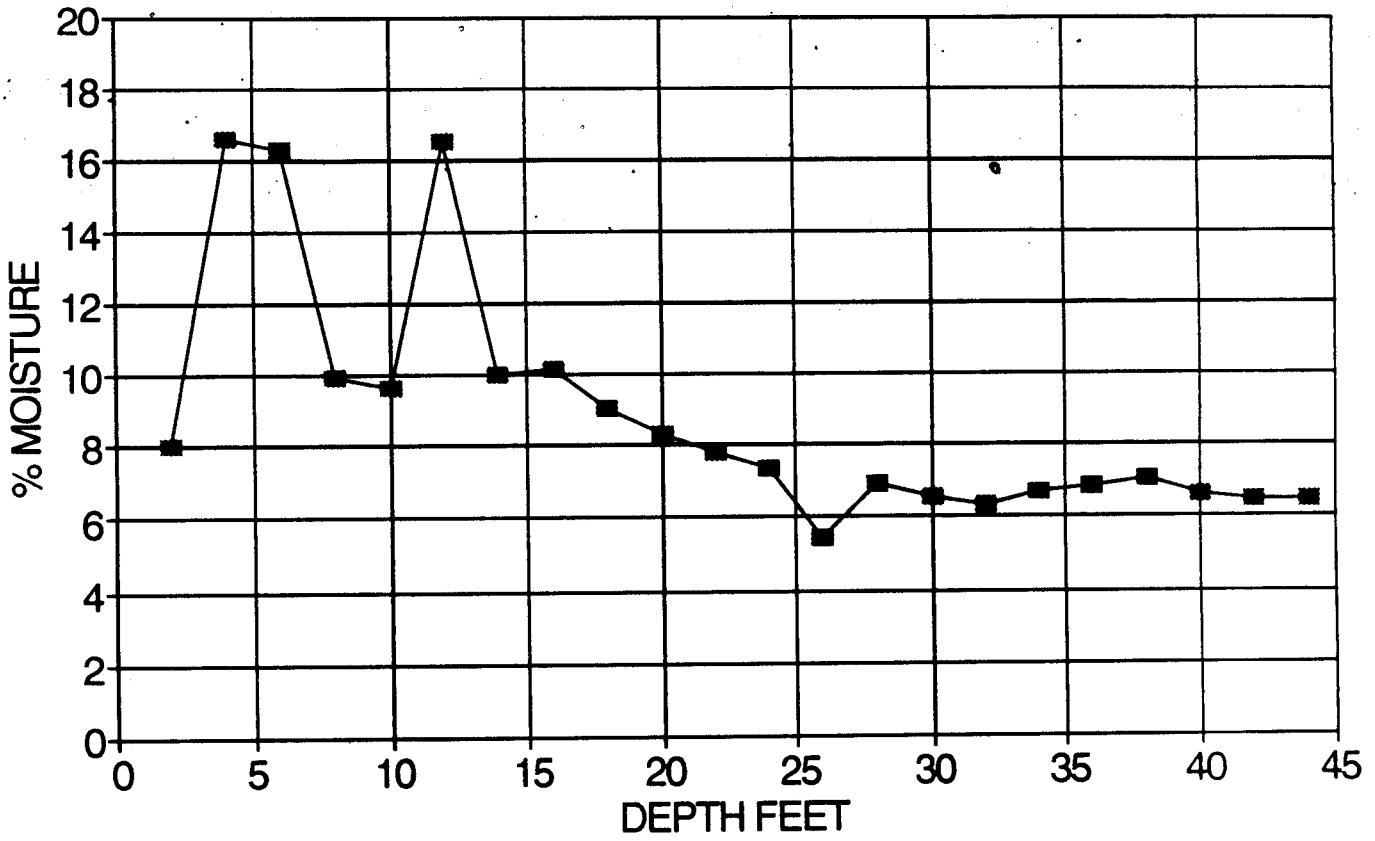
WELL 1-53 TA-53

6-23-93



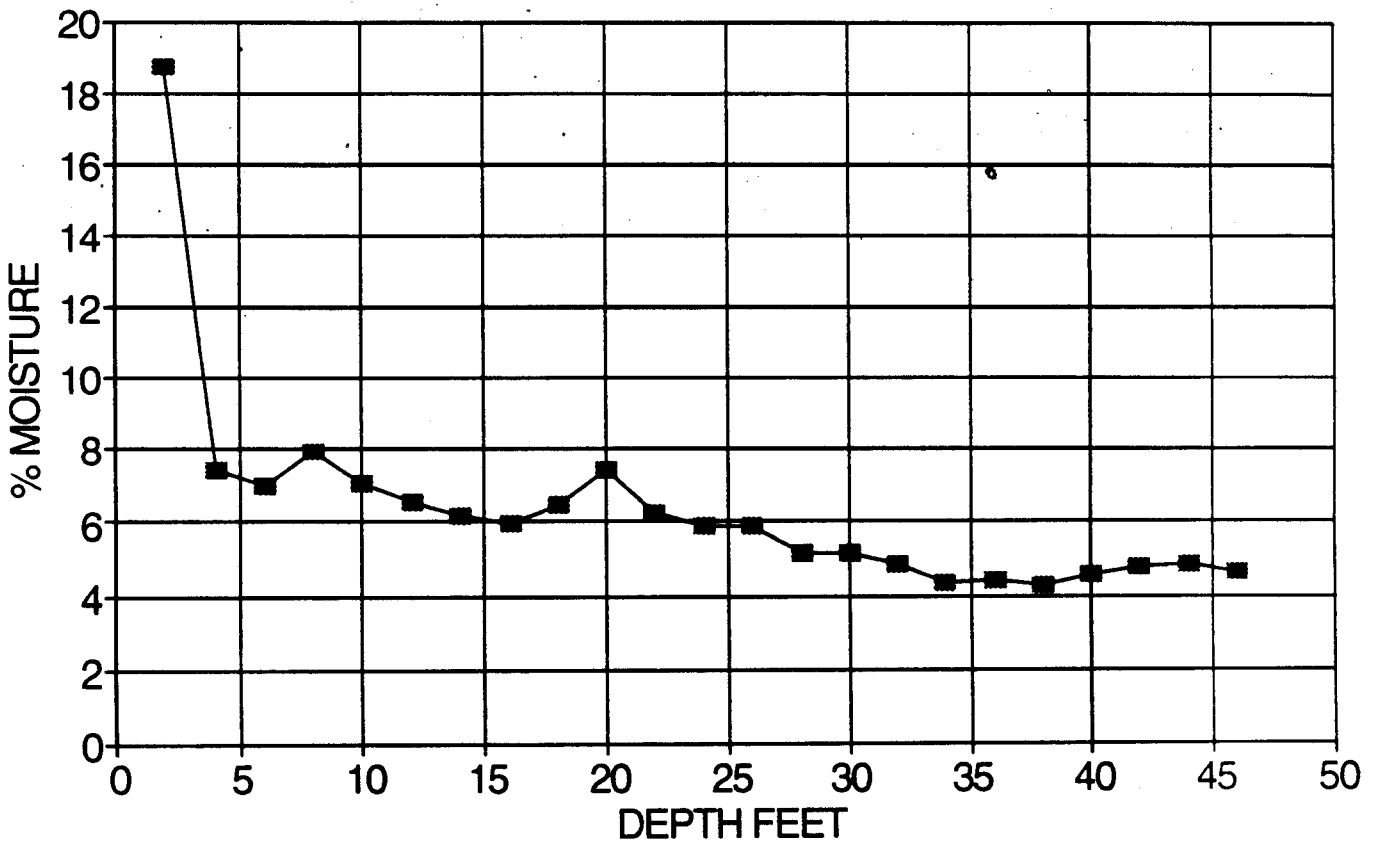
WELL 2-53 TA-53

6-23-93



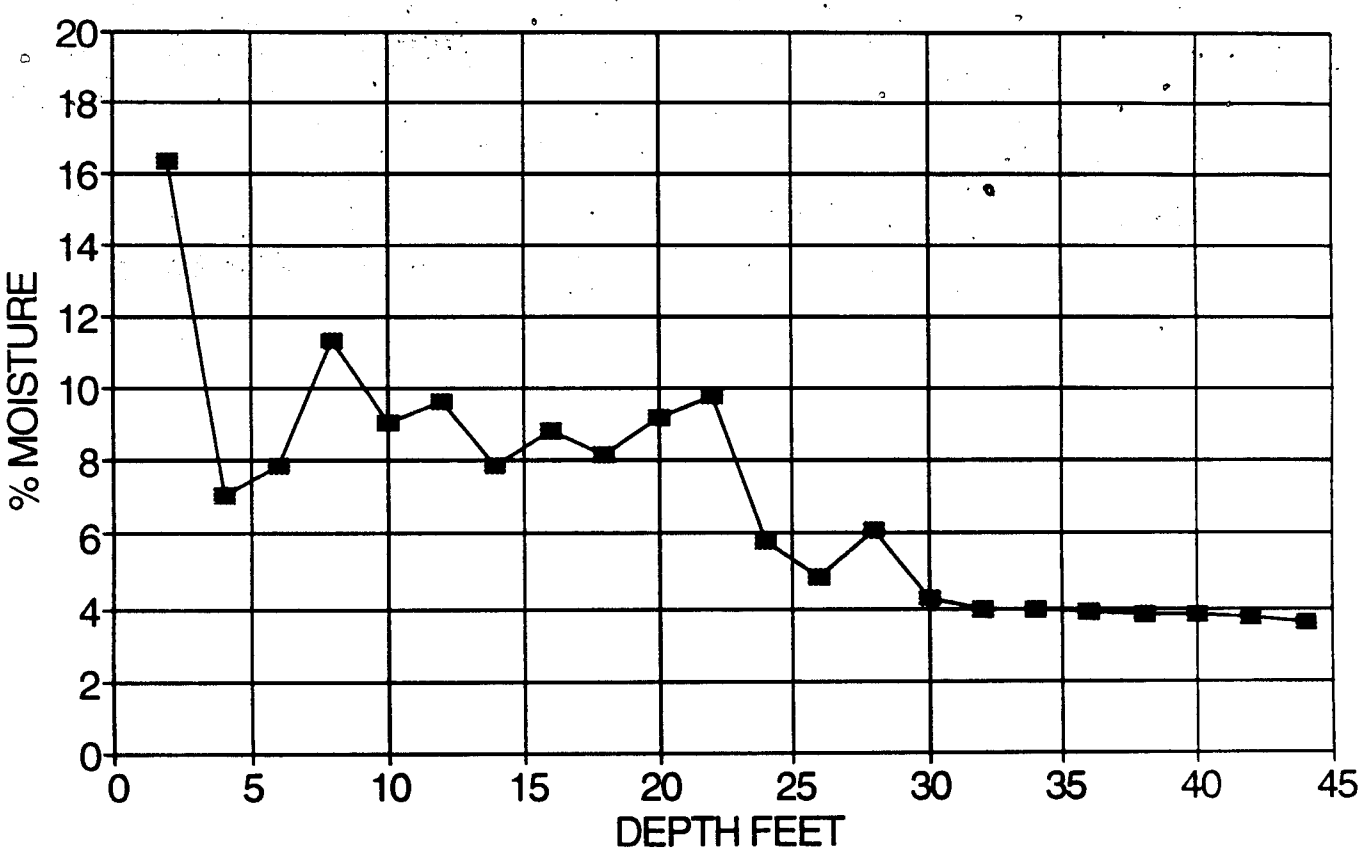
WELL 3-53 TA-53

6-23-93



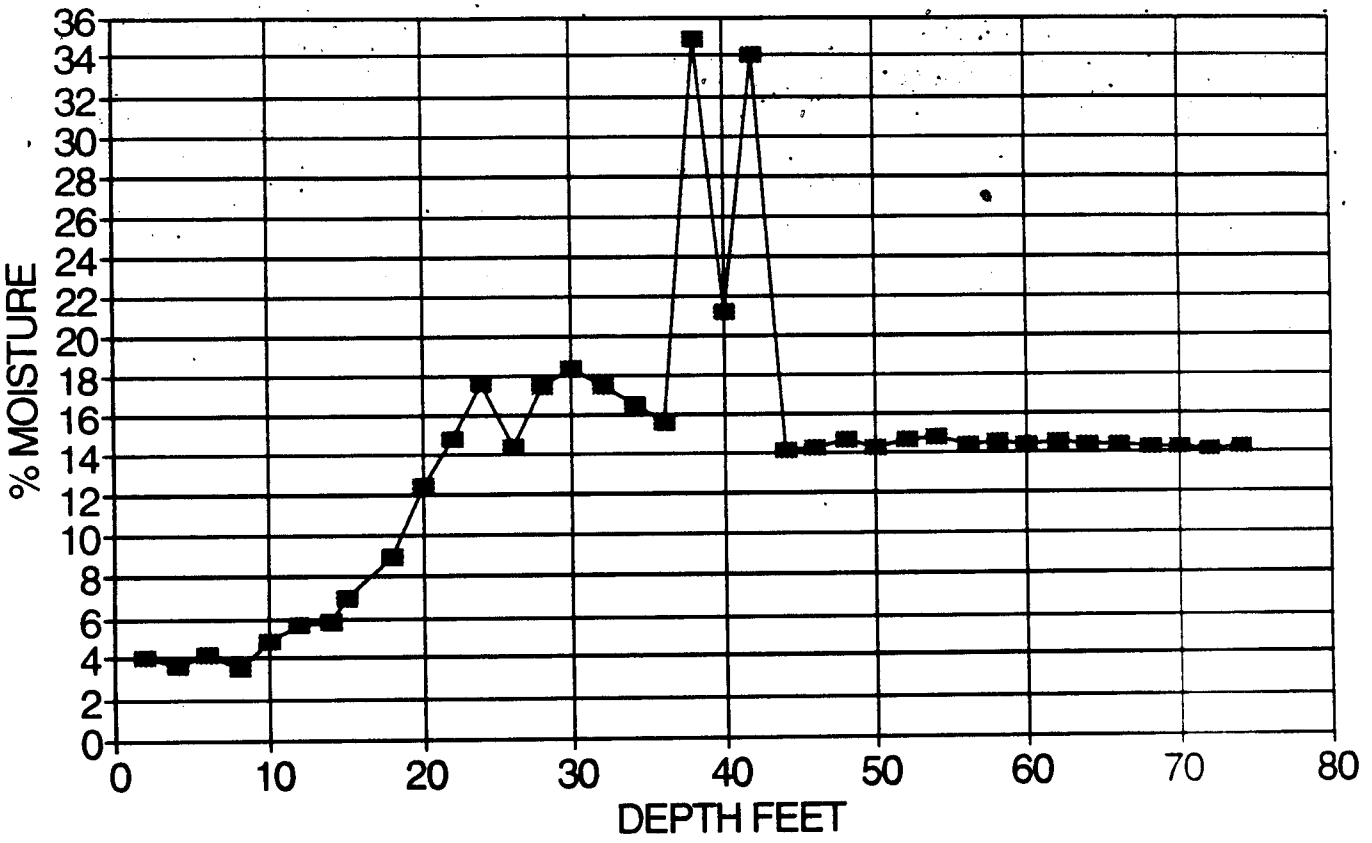
WELL 4-53 TA-53

6-23-93



WELL 7-53 TA-72

6-24-93



TA=53 WELL B-53 6-23-93

DEPTH	%VOLUM
2	11.61
4	2.28
6	2.83
8	2.86
10	2.36
12	2.3
14	1.72
16	1.33
18	1.1
20	1.02
22	1.1
24	1.08
26	0.93
28	0.83
30	0.8
32	0.74
34	0.81
36	0.8
38	0.77
40	0.82
42	0.93
44	0.9

TA-53 WELL 1-53 6-23-93

DEPTH	%VOLUM
2	15.36
4	6.54
6	3.08
8	3.65
10	3.92
12	4.36
14	3.99
16	4.85
18	3.52
20	3.81
22	3.58
24	3.53
26	3.68
28	3.43
30	3.08
32	3.53
34	3.63
36	3.44
38	3.12
40	3.13
42	3.46
44	3.68

TA-53 WELL 2-53 6-23-93

DEPTH	%VOLUM
2	7.98
4	16.56
6	16.28
8	9.95
10	9.64
12	16.47
14	9.96
16	10.14
18	9.05
20	8.29
22	7.79
24	7.3
26	5.44
28	6.89
30	6.58
32	6.33
34	6.67
36	6.85
38	7.01
40	6.62
42	6.46
44	6.43

TA-53 WELL 3-53 6-23-93

DEPTH	%VOLUM
2	18.7
4	7.38
6	6.99
8	7.89
10	7.08
12	6.52
14	6.16
16	5.95
18	6.43
20	7.4
22	6.25
24	5.84
26	5.84
28	5.09
30	5.09
32	4.8
34	4.32
36	4.36
38	4.23
40	4.57
42	4.76
44	4.8
46	4.65

TA-53 WELL 4-53 6-23-93

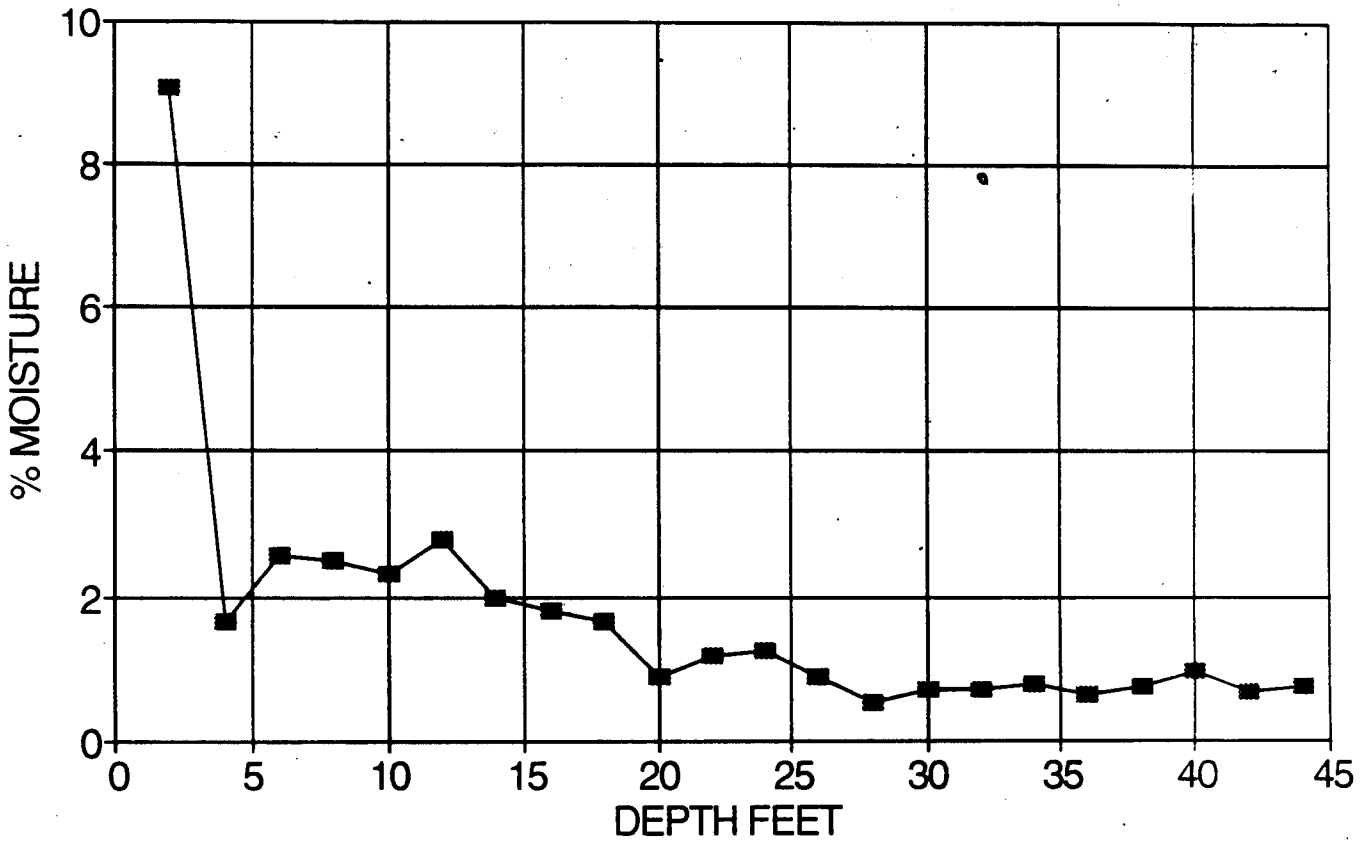
DEPTH	%VOLUM
2	16.32
4	7.01
6	7.84
8	11.32
10	9.05
12	9.59
14	7.86
16	8.87
18	8.15
20	9.19
22	9.78
24	5.77
26	4.84
28	6.06
30	4.26
32	3.98
34	3.96
36	3.9
38	3.81
40	3.82
42	3.71
44	3.62

TA-72 WELL 7-53 6-24-93

DEPTH	%VOLUM
2	4.05
4	3.72
6	4.19
8	3.58
10	4.95
12	5.61
14	5.72
15	6.99
18	8.93
20	12.44
22	14.84
24	17.56
26	14.35
28	17.54
30	18.39
32	17.41
34	16.57
36	15.65
38	34.82
40	21.22
42	34.06
44	14.14
46	14.3
48	14.71
50	14.28
52	14.69
54	14.84
56	14.41
58	14.59
60	14.35
62	14.59
64	14.35
66	14.34
68	14.28
70	14.25
72	14.16
74	14.3

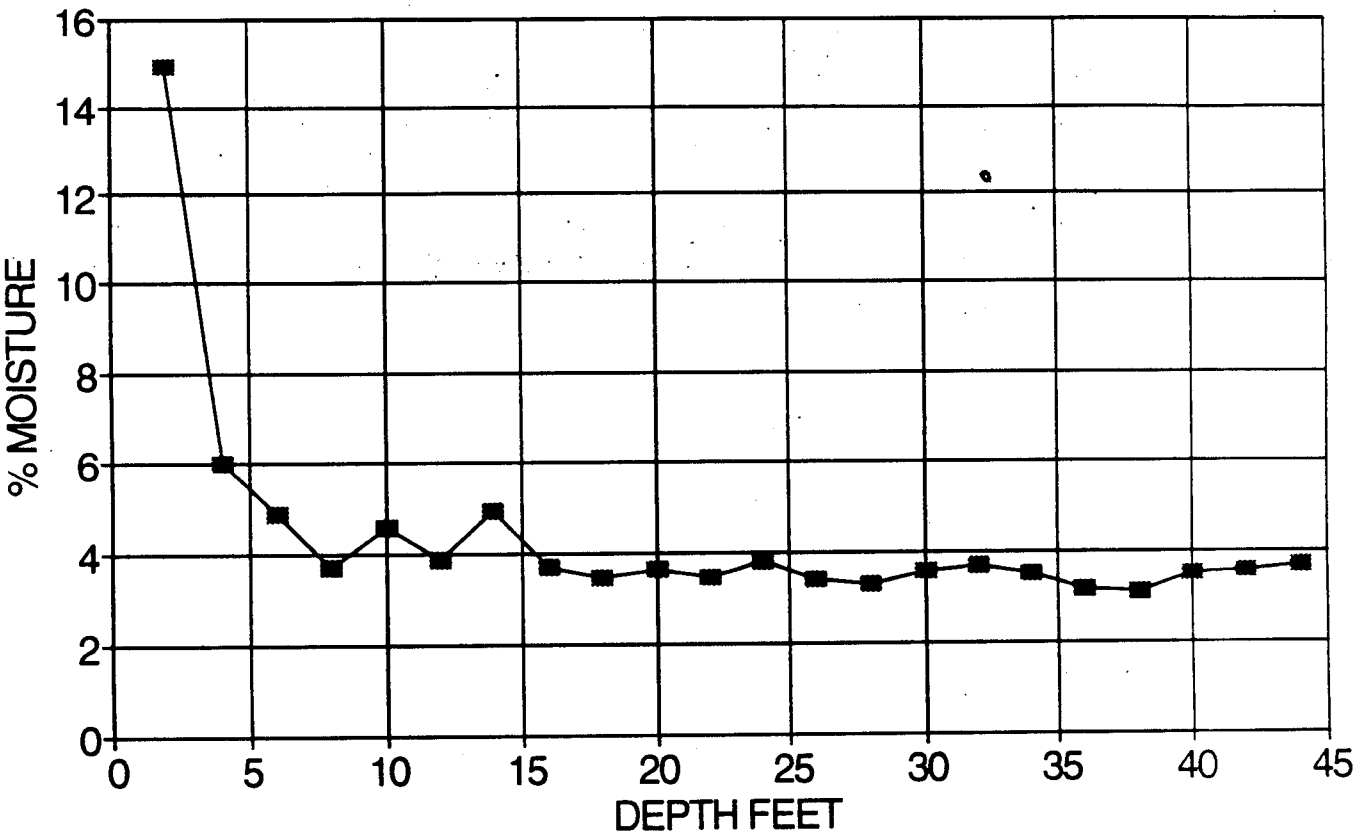
WELL B-53 TA-53

10-20-93



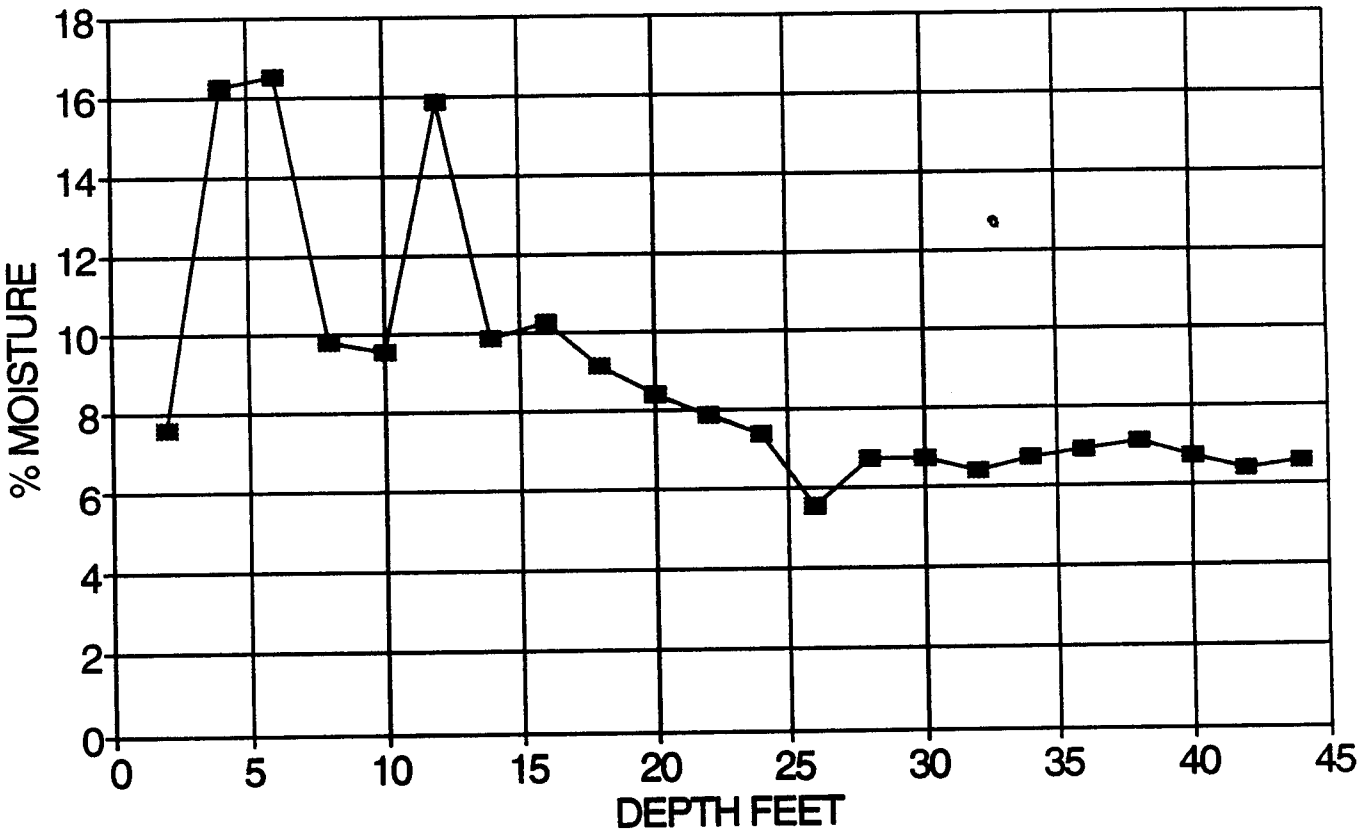
WELL 1-53 TA53

10-20-93



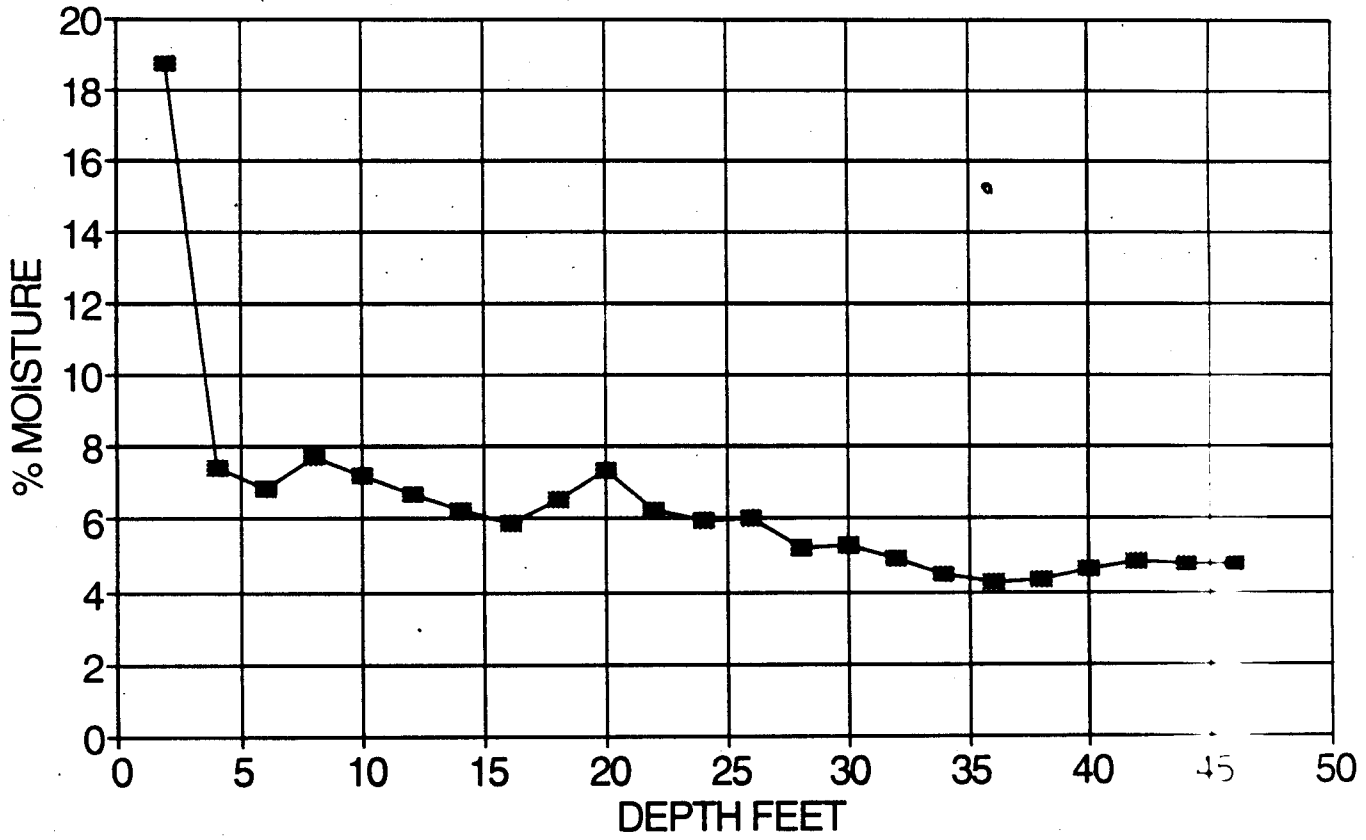
WELL 2-53 TA-53

10-20-93



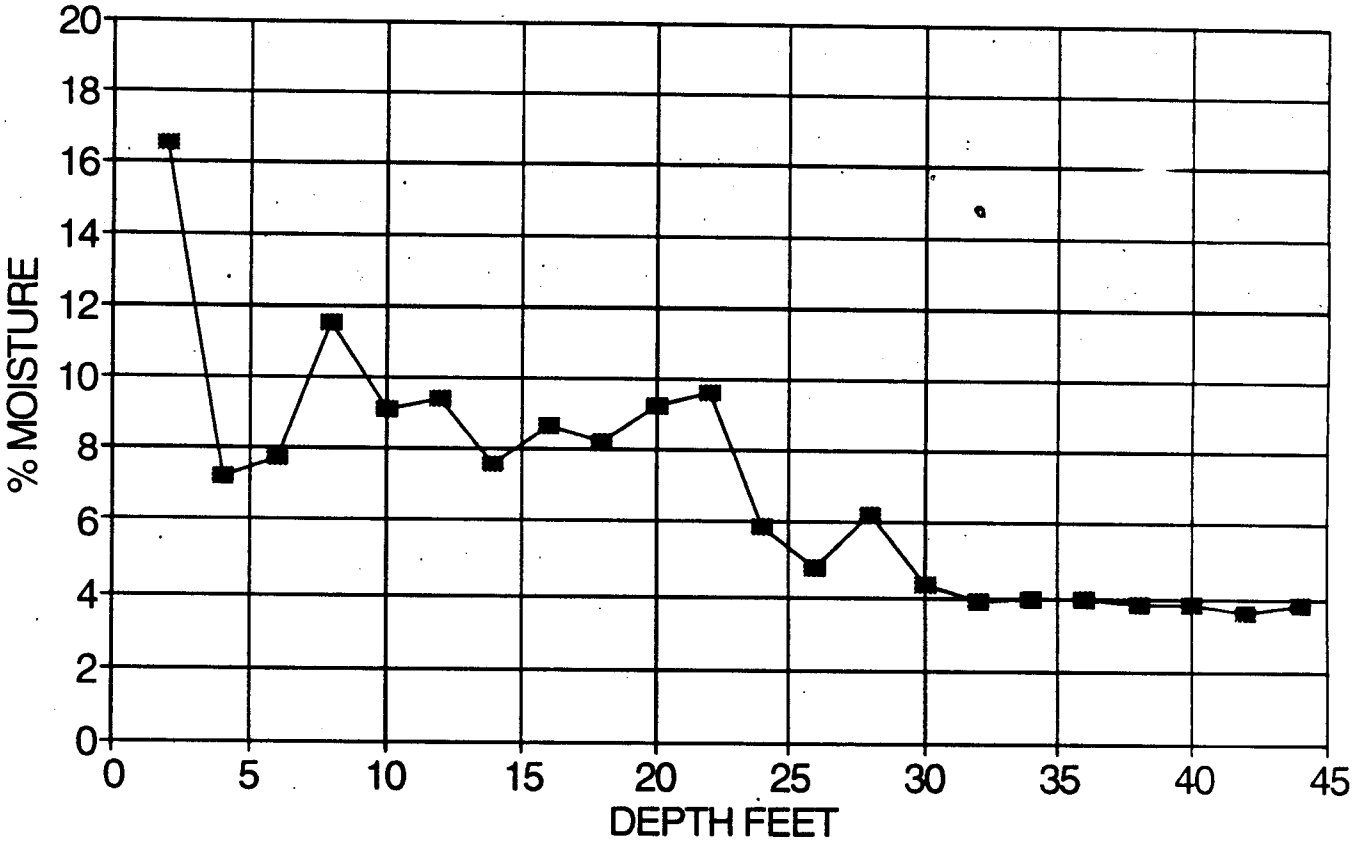
WELL 3-53 TA-53

10-20-93



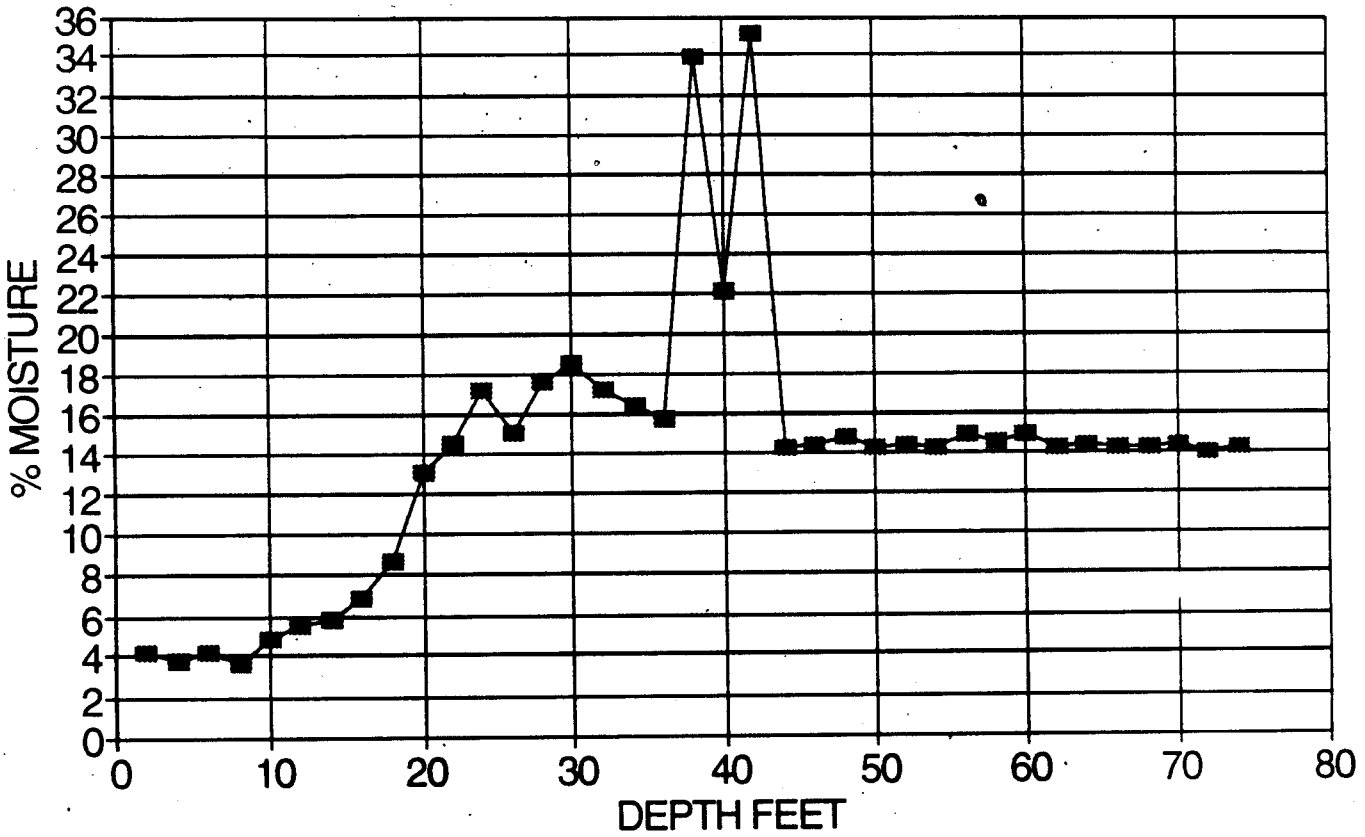
WELL 4-53 TA-53

10-20-93



WELL 7-53 TA-72

10-21-93



TA-53 WELLB-53 10-20-93

DEPTH	%VOLUM
2	9.08
4	1.63
6	2.55
8	2.49
10	2.32
12	2.78
14	1.97
16	1.8
18	1.65
20	0.88
22	1.16
24	1.23
26	0.86
28	0.5
30	0.69
32	0.69
34	0.75
36	0.62
38	0.72
40	0.93
42	0.65
44	0.72

TA-53 WELL 1-53 10-20-93

DEPTH	%VOLUM
2	14.93
4	6.02
6	4.85
8	3.72
10	4.58
12	3.87
14	4.96
16	3.68
18	3.45
20	3.62
22	3.45
24	3.78
26	3.43
28	3.24
30	3.56
32	3.72
34	3.53
36	3.18
38	3.09
40	3.52
42	3.56
44	3.72

TA-53 WELL 2-53 10-20-93

DEPTH	%VOLUM
2	7.62
4	16.24
6	16.53
8	9.8
10	9.52
12	15.85
14	9.83
16	10.24
18	9.15
20	8.43
22	7.91
24	7.4
26	5.55
28	6.72
30	6.75
32	6.43
34	6.72
36	6.94
38	7.12
40	6.72
42	6.38
44	6.57

TA-53 WELL 3-53 10-20-93

DEPTH	%VOLUM
2	18.69
4	7.45
6	6.83
8	7.75
10	7.23
12	6.67
14	6.24
16	5.89
18	6.51
20	7.3
22	6.27
24	5.93
26	5.97
28	5.24
30	5.27
32	4.9
34	4.43
36	4.27
38	4.31
40	4.61
42	4.83
44	4.72
46	4.71

TA-53 WELL 4-53 10-20-93

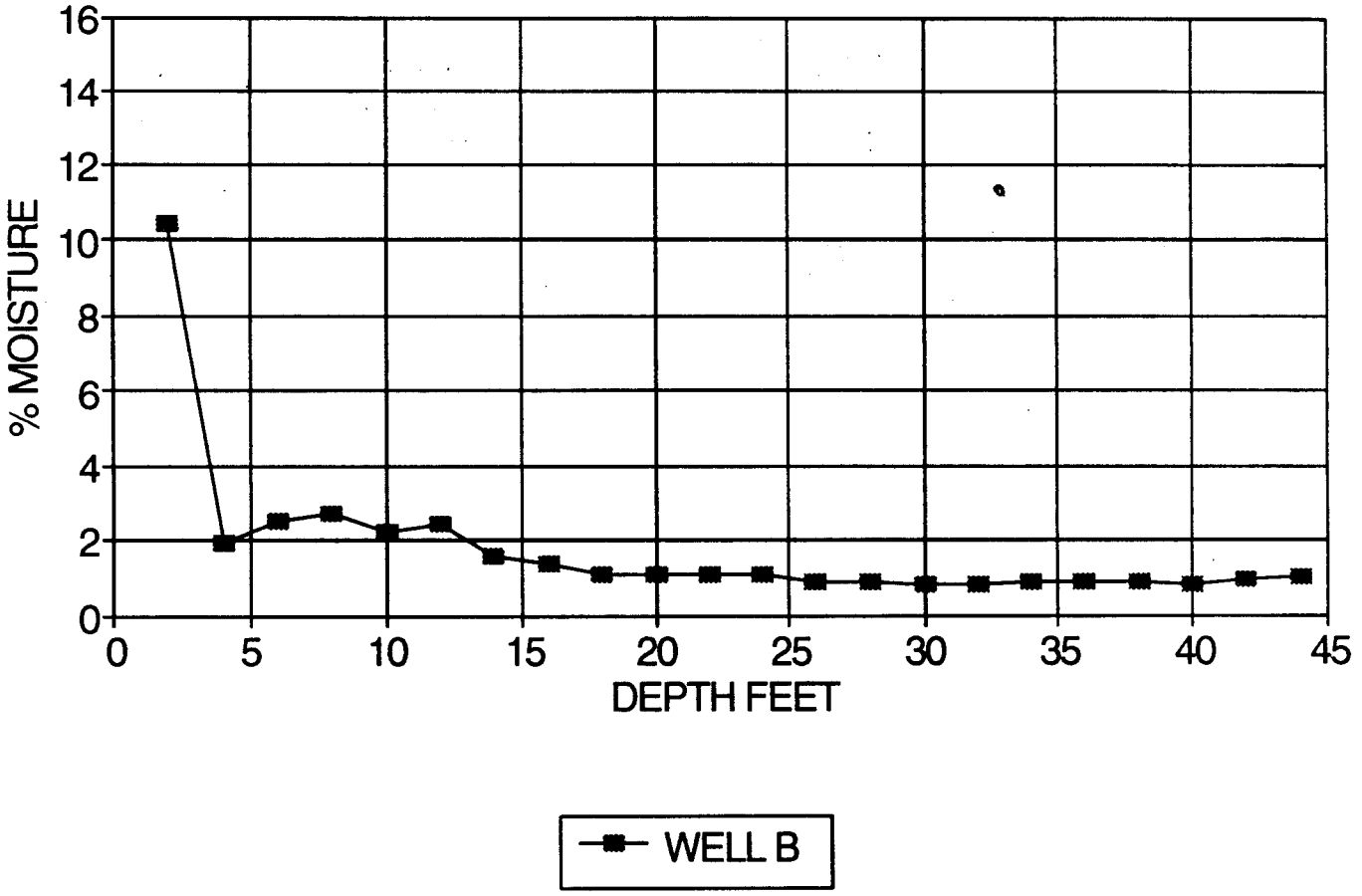
DEPTH	%VOLUM
2	16.54
4	7.23
6	7.68
8	11.57
10	9.15
12	9.43
14	7.57
16	8.63
18	8.21
20	9.23
22	9.64
24	5.89
26	4.72
28	6.24
30	4.32
32	3.87
34	3.94
36	3.95
38	3.77
40	3.79
42	3.62
44	3.79

TA-72 WELL 7-53 10-21-93

DEPTH	%VOLUM
2	4.23
4	3.79
6	4.24
8	3.73
10	4.87
12	5.54
14	5.83
16	6.89
18	8.7
20	13.12
22	14.56
24	17.21
26	15.01
28	17.69
30	18.57
32	17.21
34	16.45
36	15.72
38	33.93
40	22.15
42	35.14
44	14.29
46	14.4
48	14.81
50	14.27
52	14.47
54	14.23
56	14.94
58	14.54
60	14.93
62	14.23
64	14.38
66	14.25
68	14.25
70	14.36
72	14.01
74	14.3

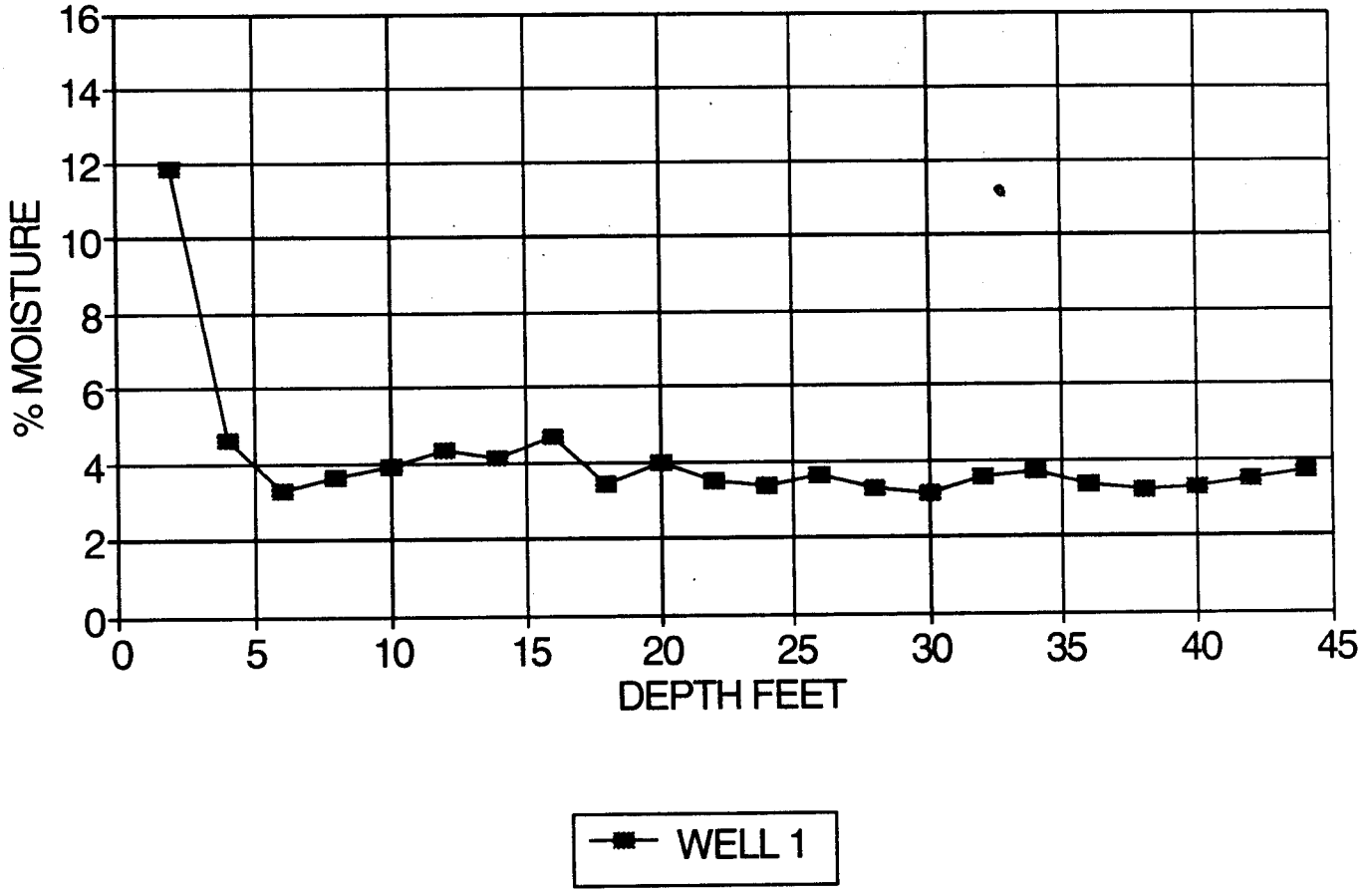
WELL B-53 TA-53

12-8-93



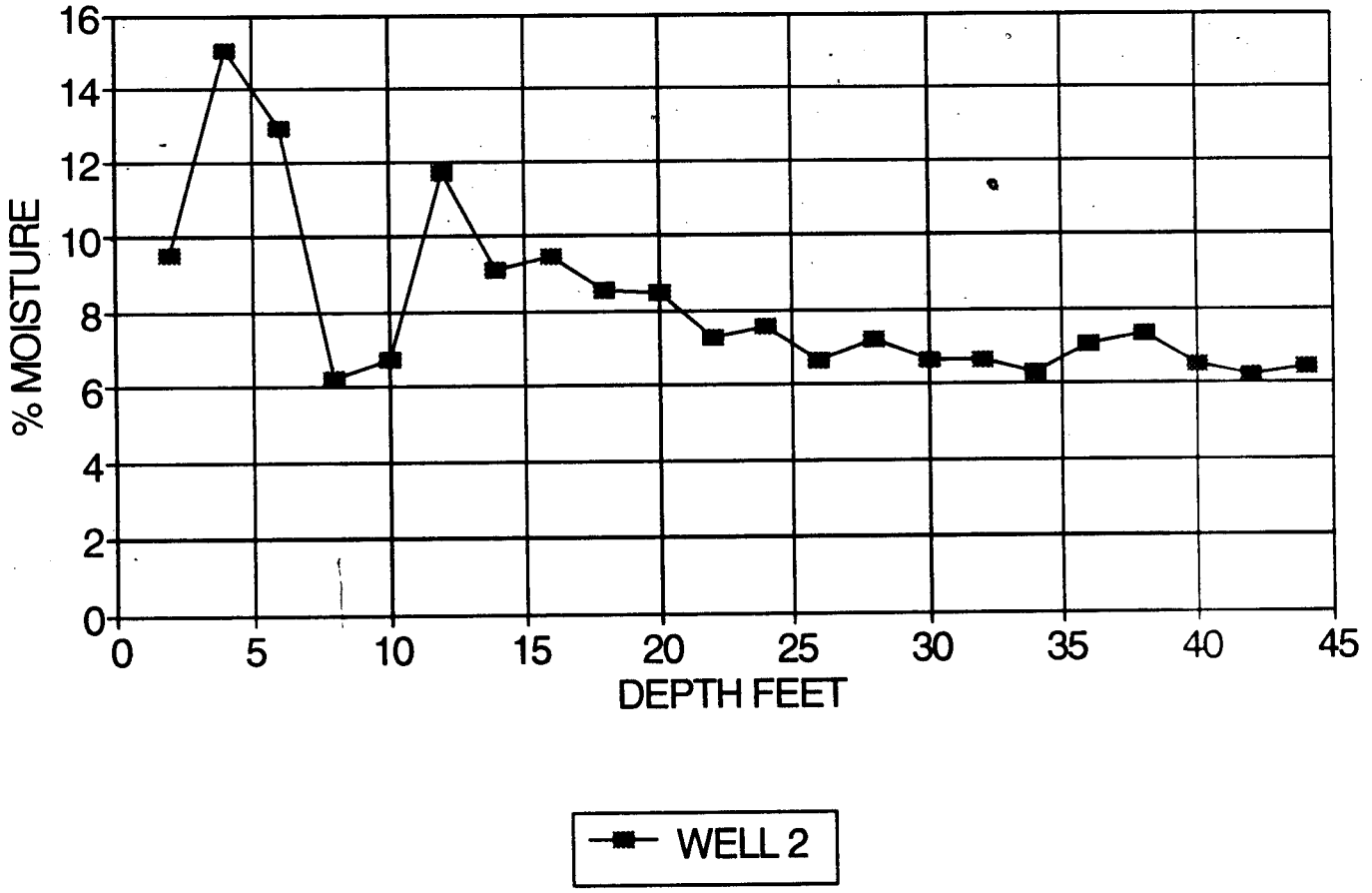
WELL 1-53 TA-53

12-8-93



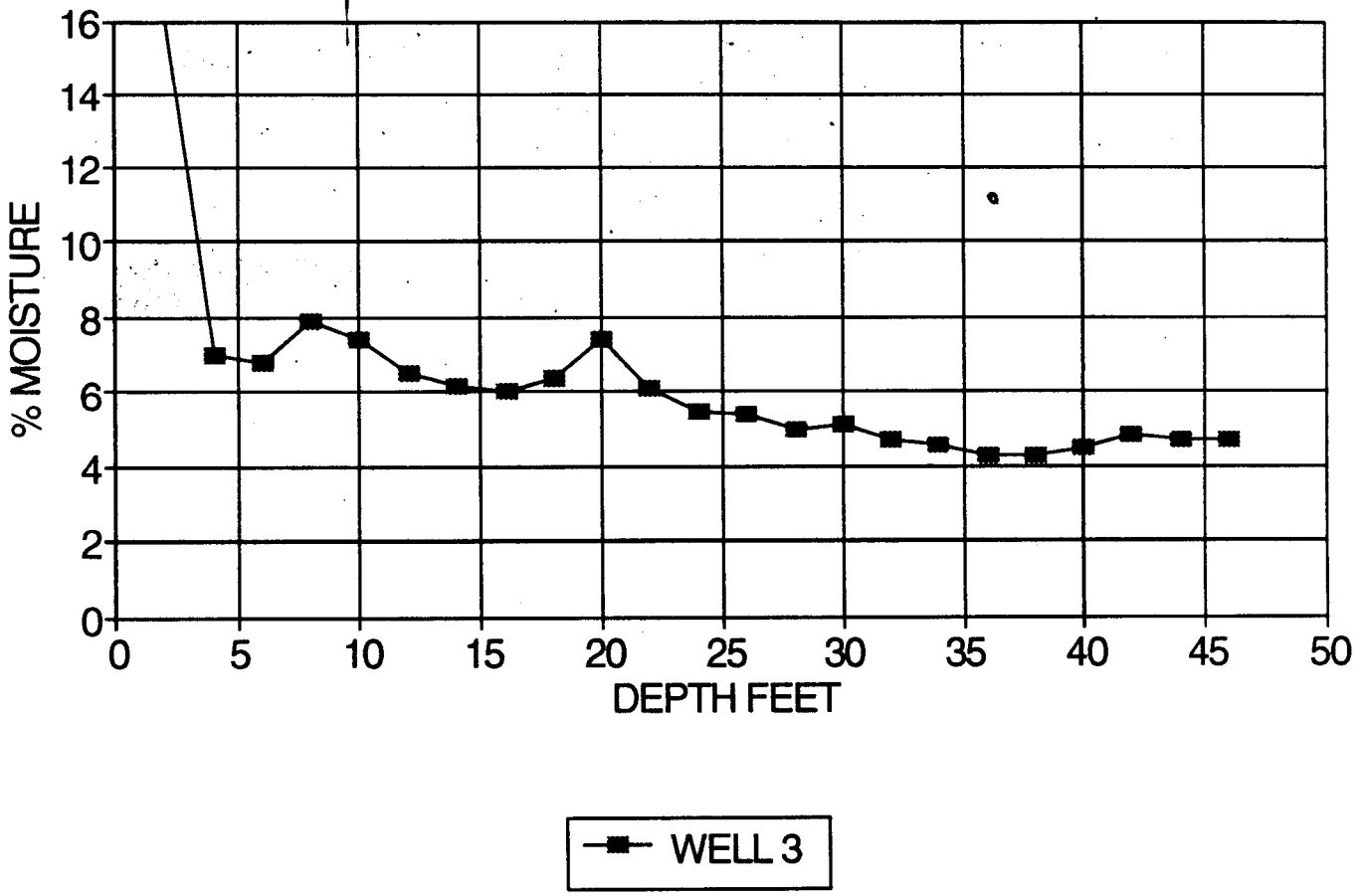
WELL 2-53 TA-53

12-8-93



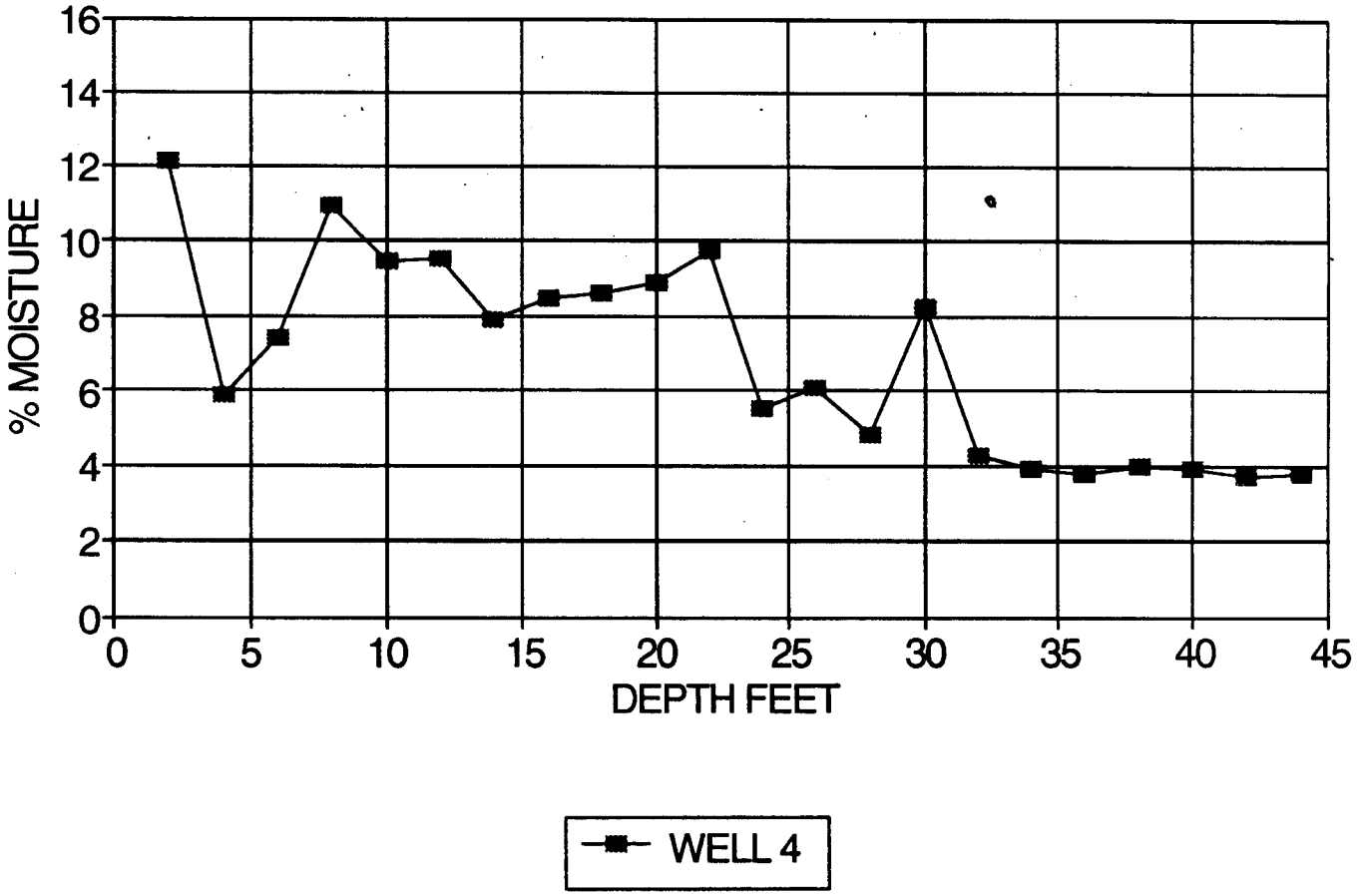
WELL 3-53 TA-53

12-8-93



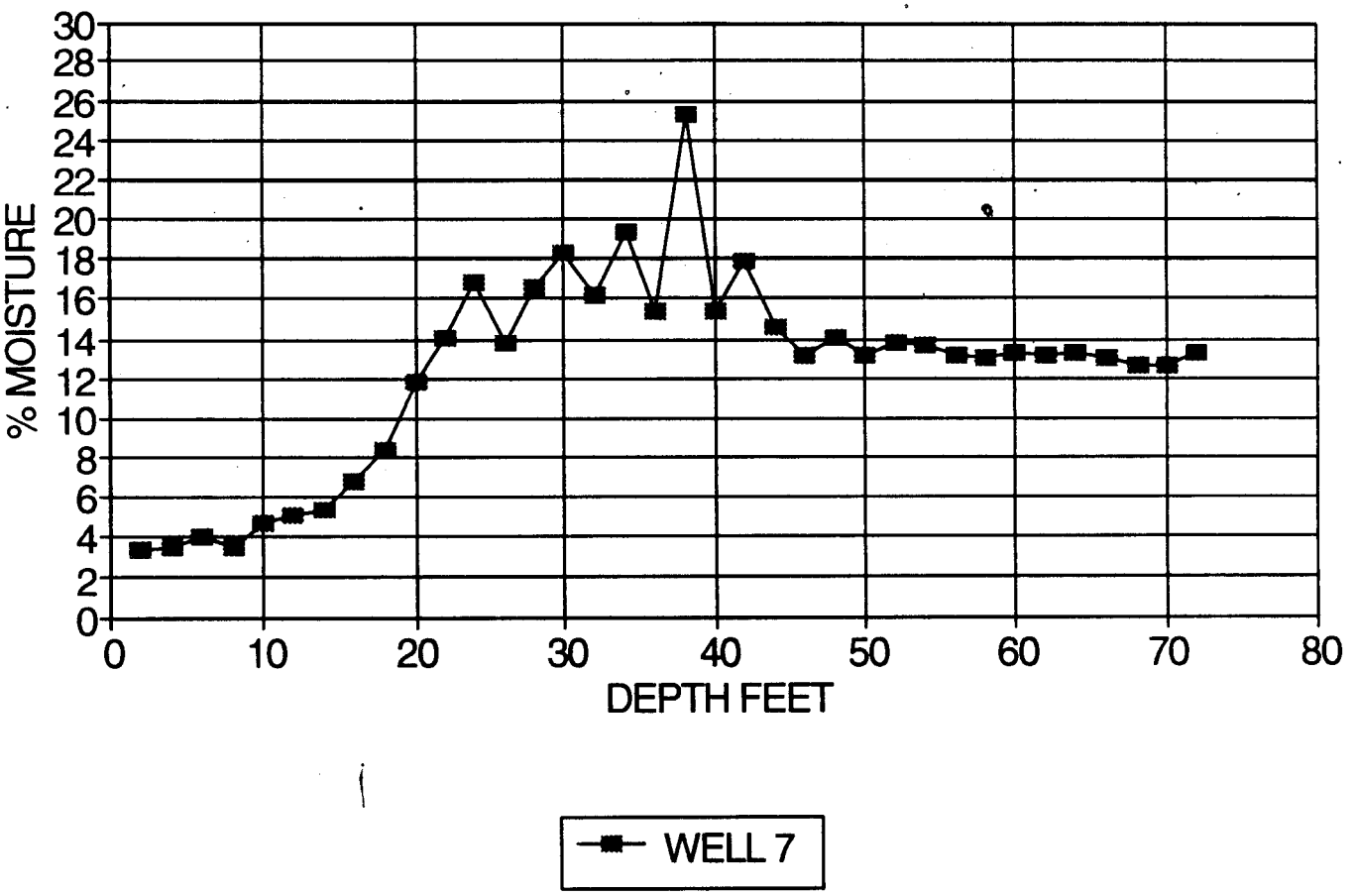
WELL 4-53 TA-53

12-8-93



WELL 7-53 TA-72

12-9-93



TA-53 WELL B-53 12-8-93

DEPTH	%VOLUM
2	10.46
4	1.93
6	2.53
8	2.73
10	2.26
12	2.39
14	1.6
16	1.39
18	1.06
20	1.06
22	1.05
24	1.11
26	0.87
28	0.91
30	0.8
32	0.76
34	0.84
36	0.87
38	0.88
40	0.83
42	0.96
44	1.03

TA-53 WELL 1-53 12-8-93

DEPTH	%VOLUM
2	11.83
4	4.62
6	3.23
8	3.64
10	3.94
12	4.37
14	4.1
16	4.66
18	3.43
20	3.97
22	3.47
24	3.37
26	3.61
28	3.24
30	3.17
32	3.52
34	3.72
36	3.38
38	3.2
40	3.28
42	3.5
44	3.67

TA-53 WELL 2-53 12-8-93

DEPTH	%VOLUM
2	9.56
4	15.02
6	12.91
8	6.26
10	6.76
12	11.71
14	9.11
16	9.47
18	8.58
20	8.47
22	7.28
24	7.53
26	6.65
28	7.24
30	6.62
32	6.65
34	6.31
36	7.08
38	7.4
40	6.5
42	6.27
44	6.43

TA-53 WELL 3-53 12-8-93

DEPTH	%VOLUM
2	16.31
4	6.99
6	6.78
8	7.94
10	7.42
12	6.55
14	6.17
16	5.99
18	6.4
20	7.48
22	6.09
24	5.48
26	5.38
28	5
30	5.1
32	4.7
34	4.57
36	4.26
38	4.26
40	4.45
42	4.79
44	4.72
46	4.67

TA-53 WELL 4-53 12-8-93

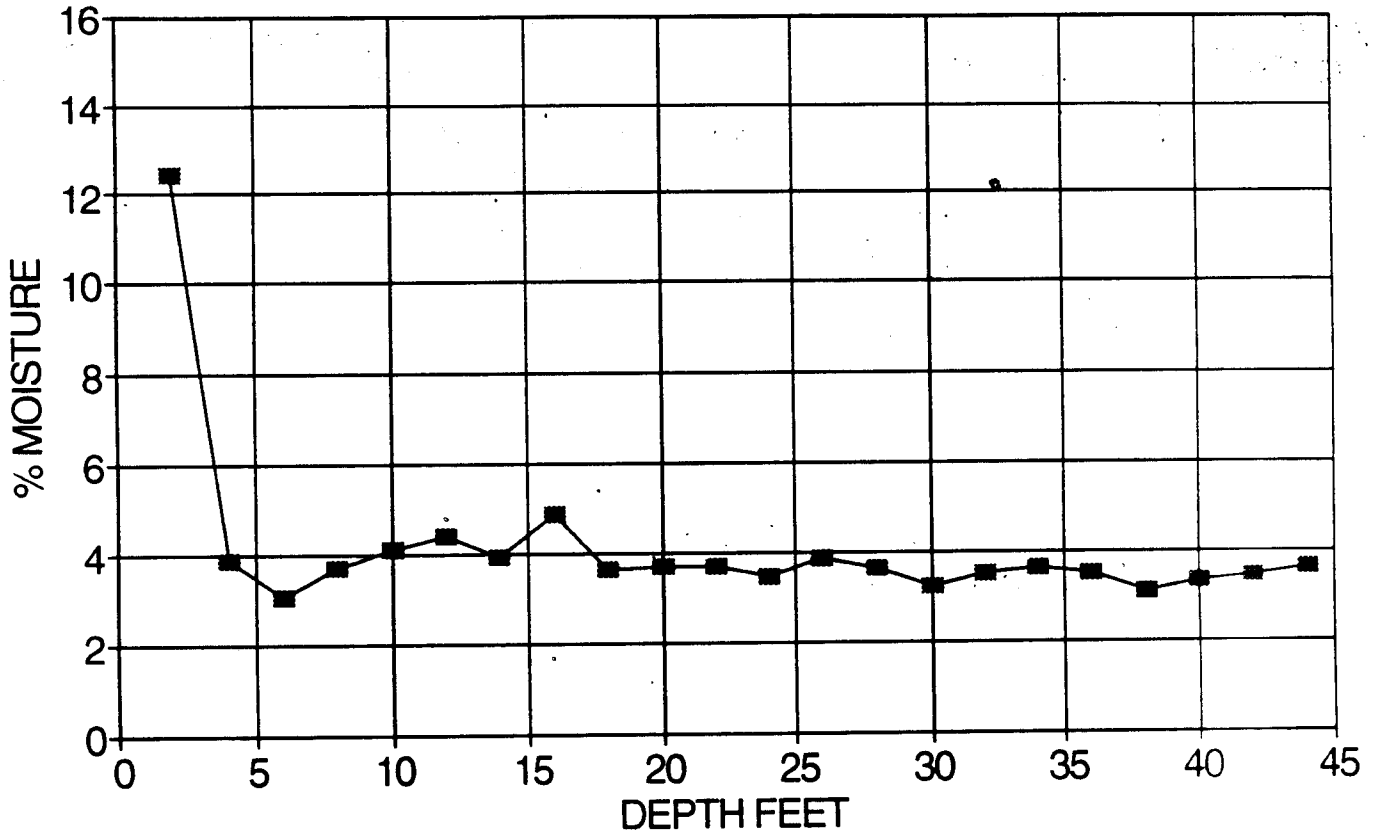
DEPTH	%VOLUM
2	12.14
4	5.88
6	7.43
8	10.97
10	9.47
12	9.58
14	7.93
16	8.51
18	8.66
20	8.94
22	9.73
24	5.54
26	6.11
28	4.84
30	8.29
32	4.26
34	3.9
36	3.79
38	3.96
40	3.94
42	3.69
44	3.81

TA=72 WELL 7-53 12-9-93

DEPTH	%VOLUM
2	3.43
4	3.53
6	4.02
8	3.51
10	4.7
12	5.11
14	5.3
16	6.78
18	8.34
20	11.83
22	14.1
24	16.8
26	13.88
28	16.56
30	18.32
32	16.12
34	19.35
36	15.38
38	25.27
40	15.35
42	17.97
44	14.59
46	13.12
48	14.05
50	13.19
52	13.82
54	13.61
56	13.17
58	13.03
60	13.26
62	13.07
64	13.32
66	12.92
68	12.65
70	12.58
72	13.35
74	

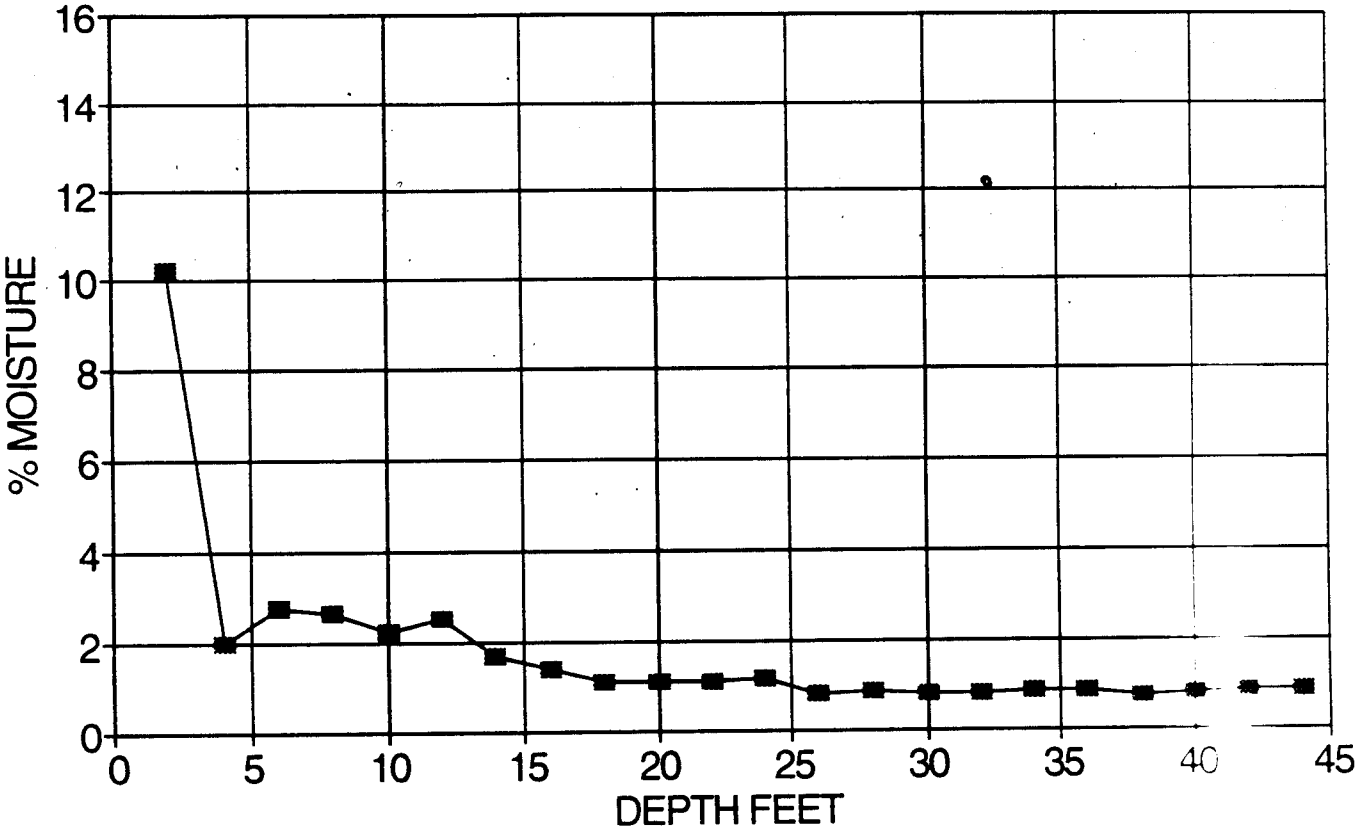
WELL 1-53 TA-53

3-15-94



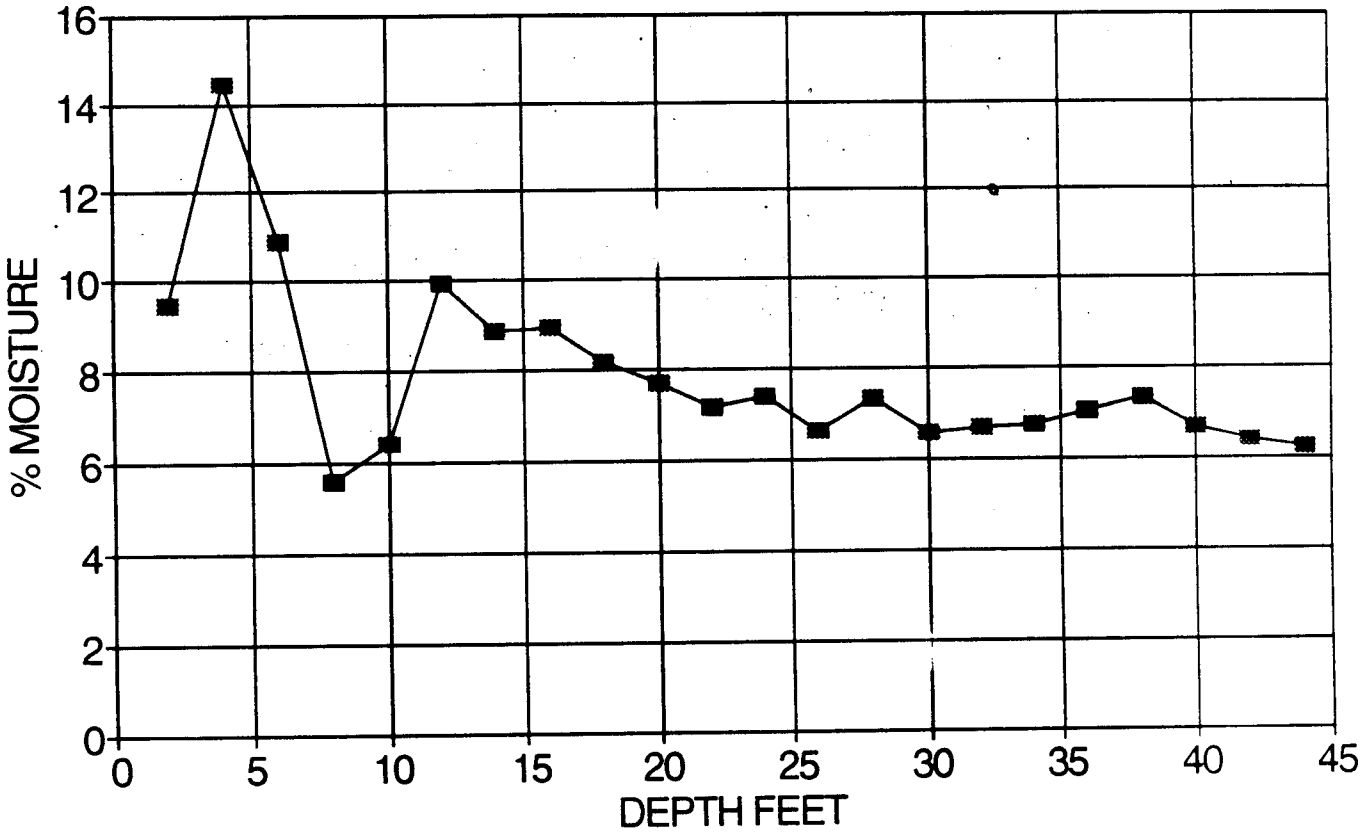
WELL B-53 TA-53

3-15-94



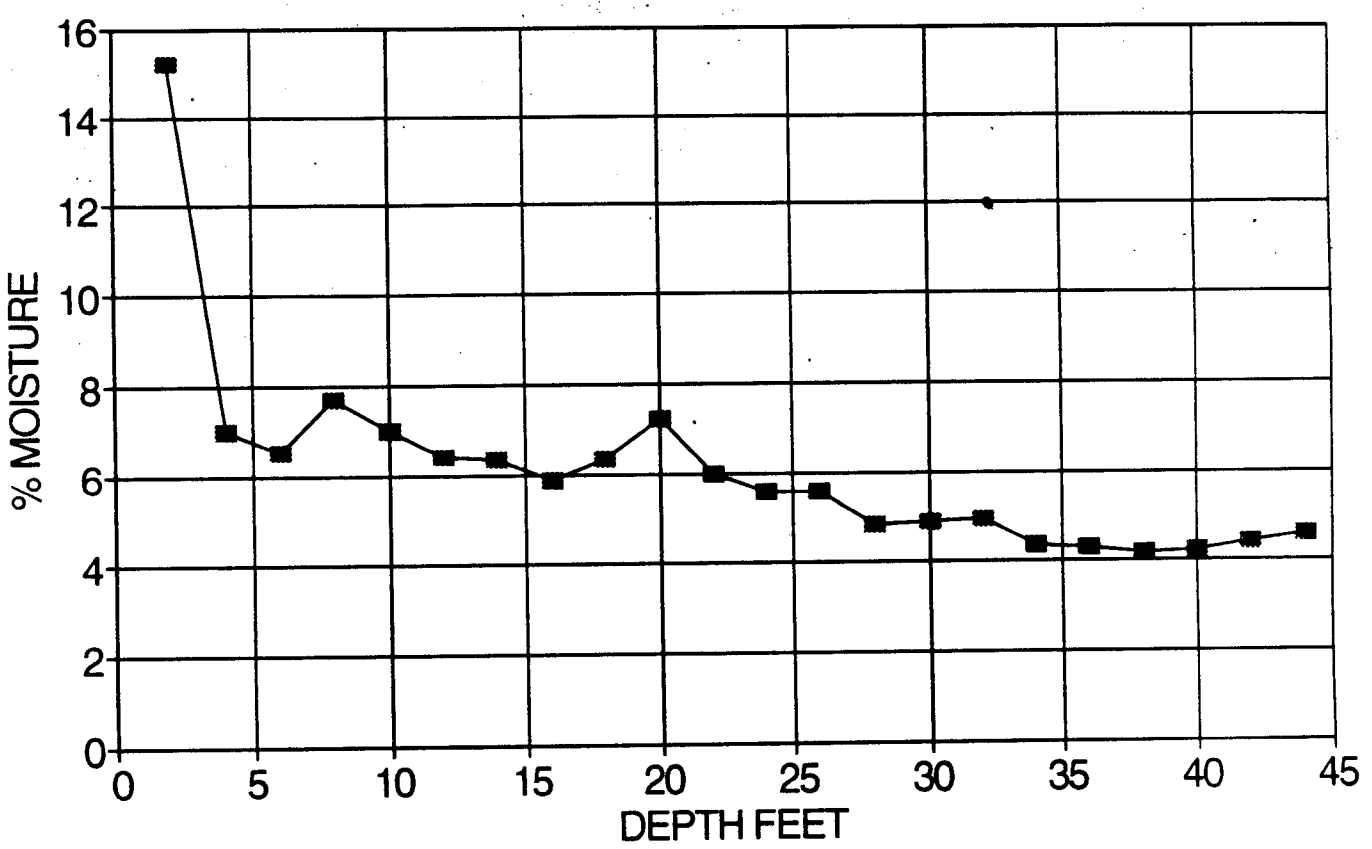
WELL 2-53 TA-53

3-15-94



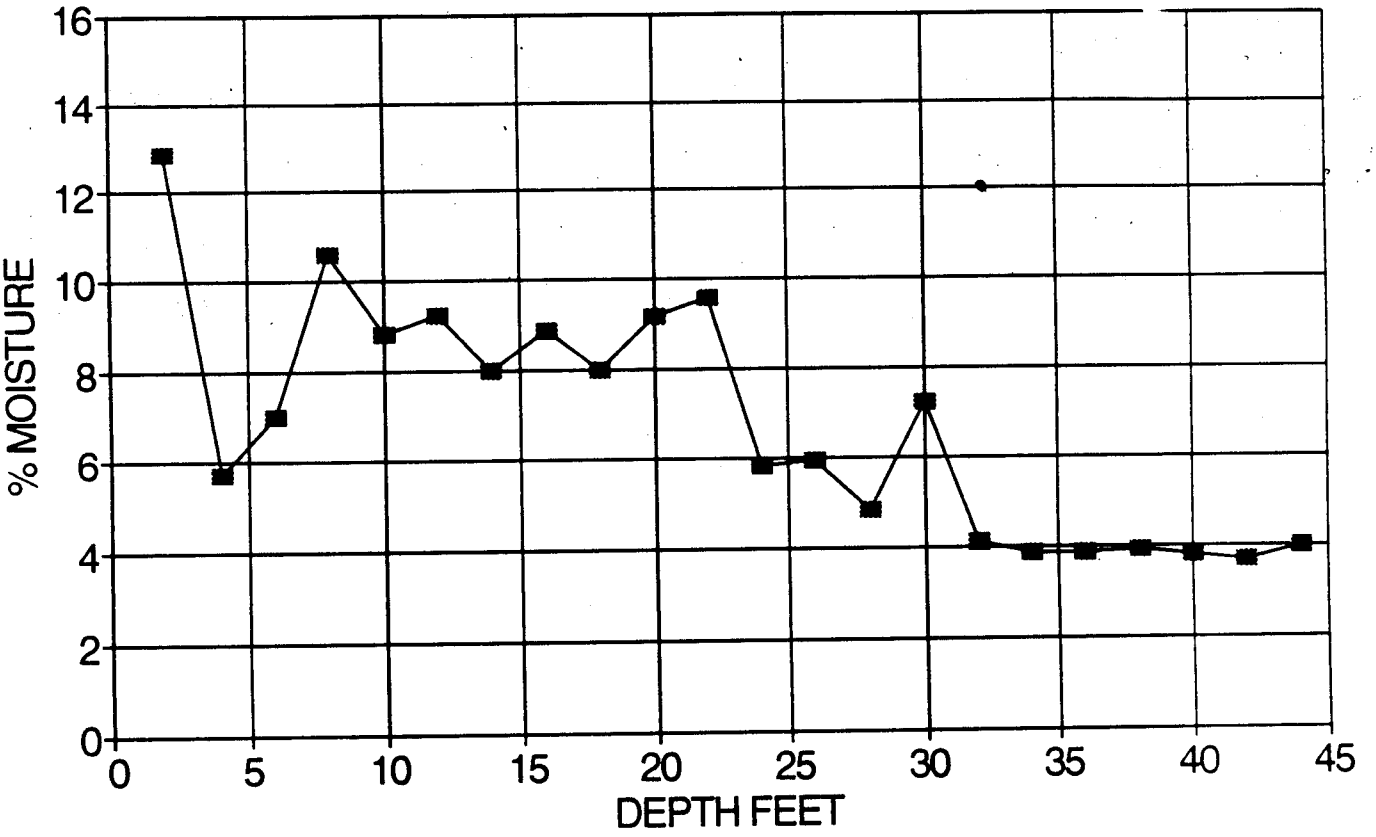
WELL 3-53 TA-53

3-15-94



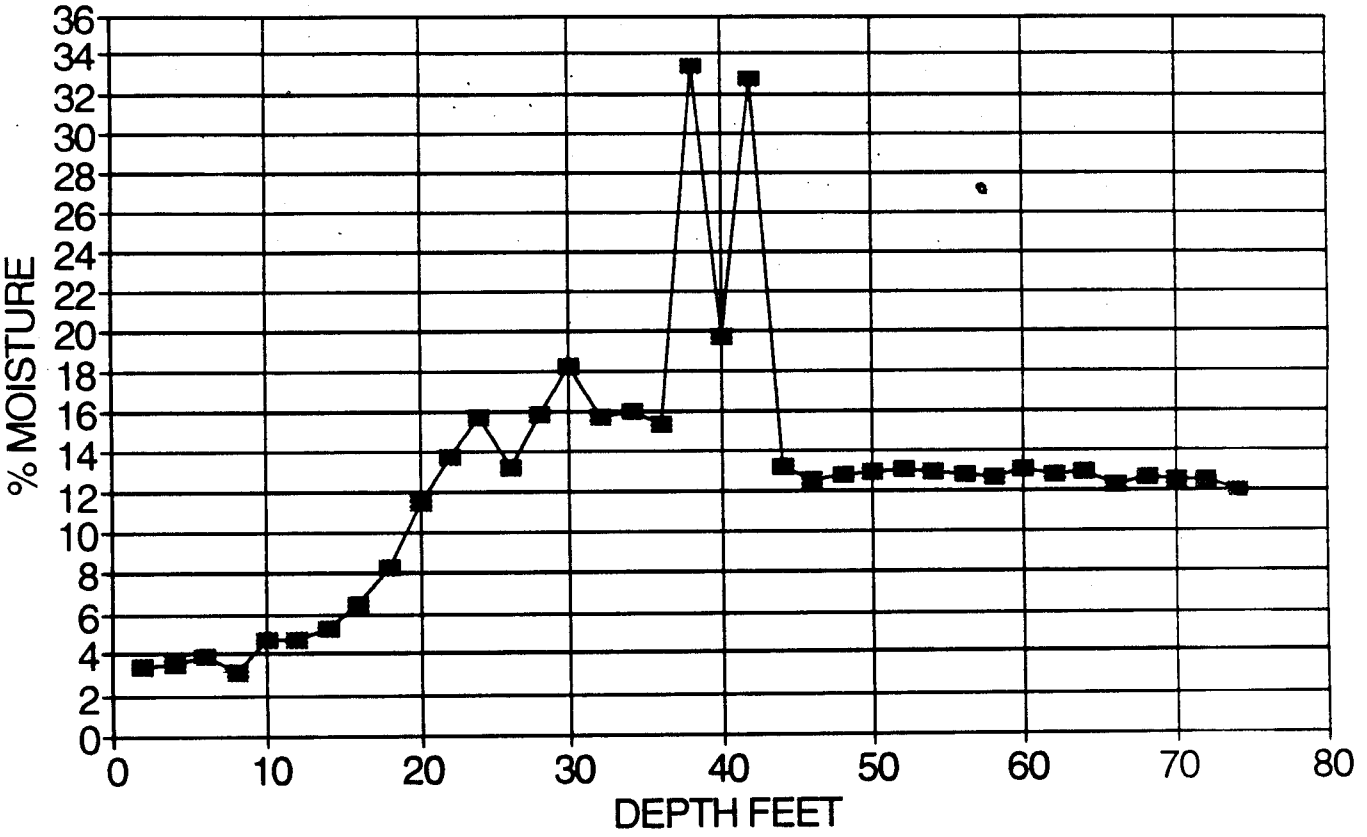
WELL 4-53 TA-53

3-16-94



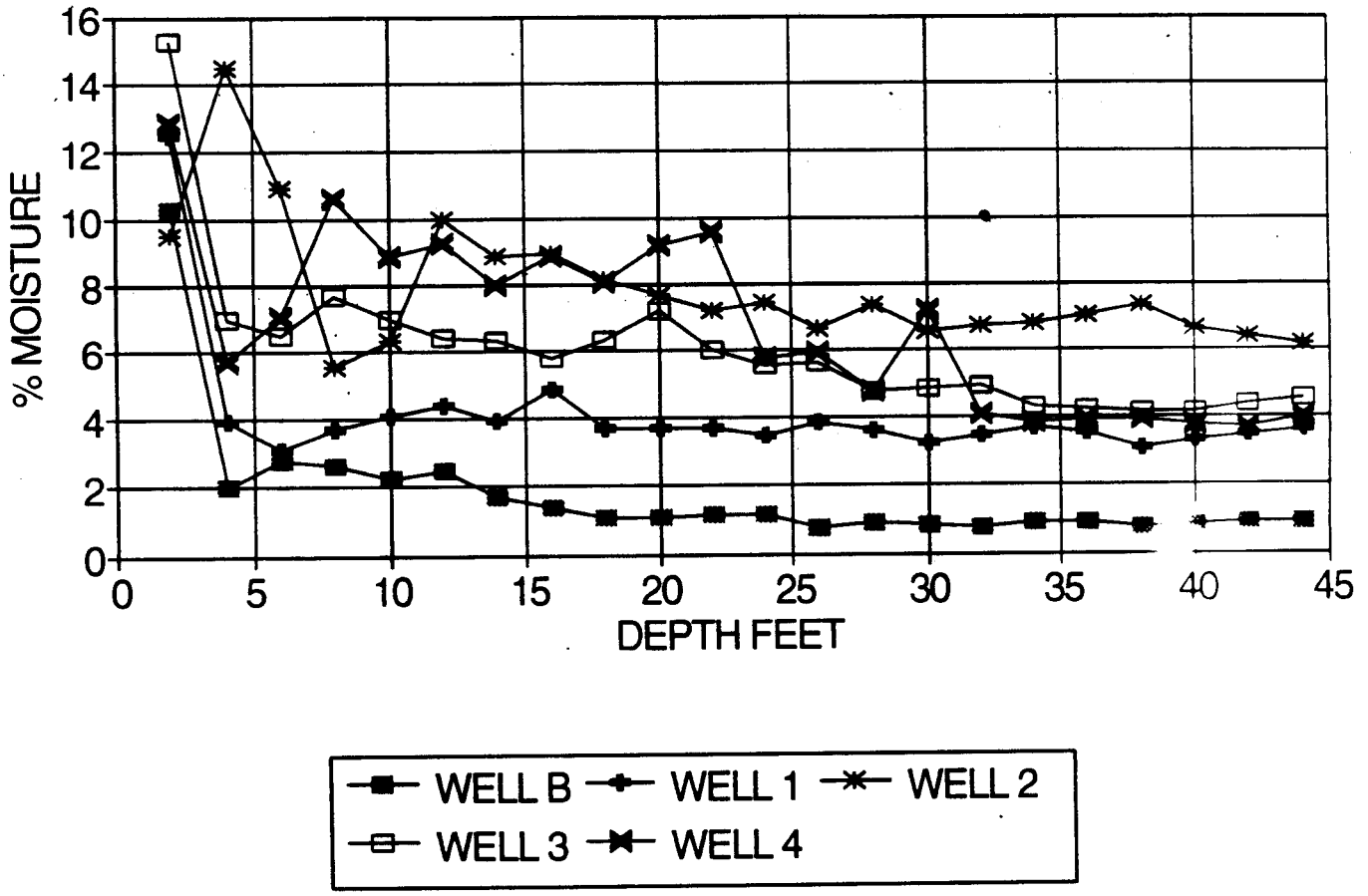
WELL 7-53 TA-72

3-16-94



WELLS B1234

3-16-94



TA-53 WELL B-53 3-15-94

DEPTH	%VOLUM
2	10.26
4	1.97
6	2.75
8	2.64
10	2.21
12	2.49
14	1.68
16	1.37
18	1.1
20	1.07
22	1.11
24	1.14
26	0.79
28	0.85
30	0.81
32	0.77
34	0.89
36	0.89
38	0.72
40	0.8
42	0.9
44	0.88

TA-53 WELL 1-53 3-15-94

DEPTH	% VOLU
2	12.44
4	3.89
6	3.06
8	3.67
10	4.11
12	4.38
14	3.96
16	4.86
18	3.66
20	3.72
22	3.72
24	3.46
26	3.85
28	3.61
30	3.22
32	3.48
34	3.66
36	3.53
38	3.12
40	3.31
42	3.44
44	3.64

TA-53 WELL 2-53 3-15-94

DEPTH	%VOLUM
2	9.49
4	14.45
6	10.93
8	5.59
10	6.37
12	9.95
14	8.89
16	8.92
18	8.16
20	7.71
22	7.19
24	7.41
26	6.63
28	7.34
30	6.6
32	6.73
34	6.8
36	7.08
38	7.34
40	6.67
42	6.41
44	6.22

TA-53 WELL 3-53 3-15-94

DEPTH	%VOLUM
2	15.23
4	6.97
6	6.51
8	7.69
10	6.98
12	6.43
14	6.35
16	5.84
18	6.31
20	7.21
22	6
24	5.56
26	5.6
28	4.81
30	4.87
32	4.95
34	4.36
36	4.27
38	4.18
40	4.23
42	4.38
44	4.58
46	4.51

TA-53 WELL 4-53 3-16-94

DEPTH	%VOLUM
2	12.84
4	5.7
6	7.03
8	10.61
10	8.83
12	9.25
14	8.02
16	8.88
18	8.03
20	9.16
22	9.59
24	5.82
26	5.95
28	4.83
30	7.22
32	4.1
34	3.87
36	3.9
38	3.96
40	3.82
42	3.72
44	3.99

TA-72 WELL 7-53 3-16-94

DEPTH	%VOLUM
2	3.33
4	3.52
6	3.97
8	3.21
10	4.73
12	4.73
14	5.3
16	6.51
18	8.35
20	11.49
22	13.72
24	15.73
26	13.13
28	15.97
30	18.24
32	15.73
34	15.98
36	15.35
38	33.41
40	19.78
42	32.77
44	13.17
46	12.57
48	12.81
50	13.01
52	13.11
54	12.98
56	12.79
58	12.73
60	13.09
62	12.8
64	13.05
66	12.32
68	12.69
70	12.55
72	12.56
74	12.01

— Stephanie
— Lee
— Barbara,

5/3/94

Per your request I reviewed the package from 1991 on the TA-53 Lagoons.

These were early times for the lagoons and LANL was trying to keep them operating and Ed Horst did a completeness determination on the Part B Application that LANL had submitted for the lagoons.

Then LANL reversed its decision for a permit and instead chose closure.

The analytical data package attached to this package are not familiar to me. My guess is that Ed Horst had them pigeon holed and they are either not relevant or are included in more updated information on closure.

Marc Sides

667-3768

11. HWMR-6, Pt. IX, § 270.14(b)(13) requires a copy of the closure plan, including, where applicable, the specific requirements in HWMR-6, Pt. V, § 264.228. These specific requirements include contingent closure and post-closure plans if the impoundment(s) does not comply with the liner requirements of § 264.221(a) or is not exempt from the requirements. Please address the liner requirements specifically or include the contingent plans if necessary.

-2A-2B-
Liq Ovq.

Please note that according to ~~the Hazardous and Solid Waste Amendments of 1984~~ of the Resource Conservation and Recovery Act, as amended, Section 3005(j)(6)(A), the surface impoundments must be retrofitted within 4 years after ~~the promulgation of regulations which make~~ the impoundment become subject to hazardous waste regulation. In New Mexico, ~~this~~ the date ~~is~~ is July 25, 1990. Any demonstration under section 3005(j)(5) that the surface impoundments are not required to be retrofitted must be made within 2 years of the promulgation of regulation. The retrofitting requirement is implemented by the Environmental Protection Agency. Related correspondence should be directed to that agency.

(3)

HWMR-6, Pt. IV, § 270.14 (b)(13) requires a copy of the closure plan, including, where applicable, the specific requirements in HWMR-6, Pt. V, § 264.228. These specific requirements include ~~complying~~ with the liner requirements of § 264.221(a) or is not exempt from the requirements. Please address ~~this~~ the a requirement for a contingent ~~post~~ closure and post-closure plan if the impoundment(s) does not comply liner requirements specifically or include the contingent closure plans if necessary.

Please note that according to the Resource Conservation and Recovery Act, Section 3005(j)(6)(A), the surface impoundments must be retrofitted within 4 years after the promulgation of ~~state~~ regulations which made the impoundment(s) subject to Hazardous waste regulations. In New Mexico, the date of Hazardous and Solid Waste amendment of 1984 to Any demonstration under section 3005(j)(5) that the surface impoundments are not required to be retrofitted must be made within 2 years of the promulgation of the regulations.

Promulgation is July

Receipt for Analytical Results of Sludge + Liquid - TA-53 Impoundments

- includes volatile + semi-volatile organics analysis
  metals analysis

12/13/91

Marc Sides 12/13/91
Hazardous and Radioactive Materials Bureau
NMED

cc to Alice B.

September 13, 1991

DELAY OF CLOSURE

Regulatory Requirements

Units that have become classified as hazardous waste management units as a result of regulatory interpretation (such as the mixed waste impoundments) may qualify for delay of closure by meeting the requirements of 40 CFR 265.113(d) and (e). Listed below are the major aspects of those requirements and some factors to consider in determining whether or not delay of closure is appropriate.

1. Submit a Part B permit application which demonstrates the following:

   A. The unit(s) has adequate existing capacity to continue to receive waste.

      Factors to Consider: (ie. Freeboard will be maintained while non-hazardous waste is being received, and that overtopping of the unit does not occur.) Unit may not be enlarged to accommodate receipt of non-hazardous waste.

   B. There is a reasonable likelihood that non-hazardous waste will be received in the unit within one year of the final receipt of hazardous waste.

      Factors to Consider: Unit or facility characteristics, including capacity and operating conditions; demand for the facility; the owners/operators business plans; requirements that the owner/operator continue to comply with interim status or permit standards will ensure that units remaining open following the final receipt of hazardous waste are protective of human health and the environment.

   C. Non-hazardous waste received will be compatible with any other wastes remaining in the unit.

      Factors to Consider: Unit is designed specifically to handle both hazardous and non-hazardous waste.

   D. Closure of the unit is incompatible with continued operation of the facility.

      Factors to Consider: Information showing the role of the unit in the facility's overall waste management scheme.

   E. The facility will continue to operate in compliance

with all applicable interim status or permitted requirements.

Factors to Consider: Units wishing to delay closure are currently subject to Subtitle C requirements and remain regulated as long as hazardous constituents regulated by Subtitle C remain in the units unless delisting or clean closure requirements are satisfied.

Note: The owner/operator should make the above demonstrations in the Part B application within 60 days of receipt of the final volume of hazardous waste.

Factors to Consider: The owner/operator may establish the date of final hazardous waste receipt.

2. The Part B Application must also include the following technical requirements:

A. Amended Waste Analysis Plan

Factors to Consider: Changes in the Waste Analysis Plan to reflect substantial changes in the types of waste handled in the unit (switch from hazardous to non-hazardous waste receipt). eg. demonstration that listed wastes are prevented from entering the units. Also Waste Analysis Plan should support the waste compatibility demonstration.

B. Groundwater monitoring and response plan.

The Part B application must include all applicable Part 264 corrective action requirements including a contingent corrective measures plan for units that do not meet the minimum technology requirements and leachate collection system requirements.

Factors to Consider: Plans for implementing corrective measures if a release over background levels or above a groundwater protection standard is detected. Corrective action must be able to be implemented within one year of the detection of the release. Units may continue to receive non-hazardous waste after the detection of a release only if a demonstration is made that continued receipt of non-hazardous waste will not impede corrective measures.

C. Human Exposure Assessment

Factors to Consider: Update as necessary and appropriate to account for receipt of non-hazardous waste following receipt of final receipt of hazardous waste.

D. Closure and Post-Closure Plans

Factors to Consider: Updated plans to reflect revised closure date and schedule of closure activities and to meet all 265 Subpart G requirements.

E. Cost Estimates - Not Applicable

F. Hazardous Sludge and Liquid Removal

For impoundments that do not meet the Minimum Technology Requirements for liners and leachate clooection systems a plan is to be submitted for removing all hazardous sludge and hazardous waste liquids from the unit to the "extent practicable" without impairing the integrity of the liner.

Factors to Consider: Removal is to be completed within 90 days after receiving the final volume of hazardous waste unless an extension to the timeframe is approved by NMED.

Administrative Processing of Delay of Closure

The requirements listed above can be processed and approved through the Closure Plan Approval Process.

A permit will still need to be issued for the units delaying closure, to prevent them from remaining in interim status for an indefinite "delay of closure" period. Regulations appear to give the regulatory agency flexibility in the timing for processing the permit for a delay of closure unit, so the application review may be able to be put on hold for a while if the closure plan approval for delay of closure is proving to be protective of the environment and human health.

A Post-Closure permit will eventually be required for a delay of closure unit unless the wastes are delisted or clean closure requirements are satisfied.

Summary

Requesting delay of closure effectively circumvents the regulatory requirement that the facility submit the surface impoundment closure plan to NMED for approval at least 150 days prior to the date that the unit receives the known final volume of hazardous waste. Under typical closure circumstances, NMED is supposed to approve the closure within 90 days of our receipt and the facility is to start implementing closure within 90 days of State approval. The effect of requesting a delay of closure and getting it approved is to temporarily suspend these closure timeframe requirements.

[Date]

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

RE: NOTICE OF DEFICIENCY
[EPA I.D. No.]

Mr. Jerry L. Bellows
Area Manager
Department of Energy
Albuquerque Operations
Los Alamos Area Office
Los Alamos, New Mexico 87544

Dear Mr. Bellows:

The New Mexico Environment Department has ~~reviewed~~ conducted an administrative review of the ~~Los Alamos~~ Department of Energy's ~~National Laboratory's~~ application for the operating permit required under the Resource Conservation and Recovery Act (RCRA) for Los Alamos National Laboratories, Los Alamos, New Mexico. The application is for Surface Impoundments Technical Area 53. The document~~s~~ reviewed ~~were~~ was the RCRA Part B Permit Application, dated July, 1991.

Based on this review pursuant to the New Mexico Hazardous Waste Management Regulations (HWMR-6, as amended 1990), EID has found the application to be deficient. The remainder of this letter is a list of the deficiencies noted and the actions required to correct them.

HWMR-6, Pt. IV, §

1. ~~40 CFR~~ 270.10(j)(1)(i) requires that an exposure assessment accompany the permit application. Please submit the required information
2. 40 CFR 270.1~~0(j)(1)(ii)~~
3. 40 CFR 270.1~~0(j)(1)(iii)~~
4. 40 CFR 270.14(b)(2)
5. 40 CFR 270.14(b)(6)
6. 40 CFR 270.14(b)(7) * requires a contingency plan. ~~[illegible]~~ The document should stand alone and should not reference an issued permit
7. 40 CFR 270.14(b)(8)(iii) *
8. 40 CFR 270.14(b)(11)(iii)
9. 40 CFR 270.14(b)(12) *
10. 40 CFR 270.14(b)(19)(ii)

~~NOTE: THOSE ITEMS MARKED WITH "*" ARE DEFICIENT BECAUSE THEY REFER TO A PERMIT THAT WAS ISSUED IN 1989 FOR A HWS UNIT AND NOT A MIXED WASTE UNIT. STAND ALONE DOCUMENT IS REQUIRED, UNLESS OTHERWISE PROVIDED.~~

Finally, we do insist that the revised Part B which includes the additional information required above be an easily usable

document. We do not categorically require a completely new version of the application, but in most cases this will be the easiest way to ensure comprehensibility. We do require an accurate table of contents.

Please submit the above requested information in one package within 30 days from the receipt of this letter. You may request a meeting to discuss the deficiencies and the required information. Such a meeting must be held within the thirty day period and will not suspend the thirty day deadline for compliance with this Notice. The information you provide will be subject to review by EID. If you fail to provide the information within the 30 days, you will receive a Notice of Violation and may be subject to loss of interim status pursuant to Pt. IX, § 270.10(e)(5).

Compliance with the requirements of this Notice does not relieve the Department of Energy of its obligation to comply with the New Mexico Hazardous Waste Management Regulations in other activities, nor does it relieve the Department of Energy of its obligation to comply with any other applicable laws and regulations.

Upon submission of a complete application, you will be notified of the determination and a technical review of the application will commence.

If you have any questions regarding this Notice, please contact Edward L. Horst at (505) 827-2928 or at the address given above. Please address the information you provide in response to this Notice to his attention.

Yours truly,

Benito J. Garcia
Bureau Chief
Hazardous and Radioactive Materials Bureau

cc: Lynn Prince, US EPA Region 6

REPORT NUMBER: 10810

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: MAB on 10-Jul-1991

ANALYSIS: HG REQUEST NUMBER: 11674 MATRIX: WW ANALYST: Malti Bhatia PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

ANALYTICAL TECHNIQUE: CVAA ANALYTICAL PROCEDURE : 7470

CUSTOMER NUM	SAMPLE NUM	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT
AB-53-NW-1W	91.05740	< 0.2		UG/L	7/10/91	
AB-53-NW-2W	91.05741	< 0.2		UG/L	7/10/91	
AB-53-NW-3W	91.05742	< 0.2		UG/L	7/10/91	
AB-53-NW-1S	91.05743	< 0.2		UG/L	7/10/91	
AB-53-NW-2S	91.05744	< 0.2		UG/L	7/10/91	
AB-53-NW-3S	91.05745	< 0.2		UG/L	7/10/91	
AB-53-NW-4SQ	91.05746	< 0.2		UG/L	7/10/91	
AB-53-NE-1W	91.05747	< 0.2		UG/L	7/10/91	
AB-53-NE-2W	91.05748	< 0.2		UG/L	7/10/91	
AB-53-NE-3W	91.05749	< 0.2		UG/L	7/10/91	
AB-53-NE-4WQ	91.05750	< 0.2		UG/L	7/10/91	
AB-53-NE-1S	91.05751	< 0.2		UG/L	7/10/91	
AB-53-NE-2S	91.05752	< 0.2		UG/L	7/10/91	
AB-53-NE-3S	91.05753	< 0.2		UG/L	7/10/91	
AB-53-SO-1W	91.05754	< 0.2		UG/L	7/10/91	
AB-53-SO-2W	91.05755	< 0.2		UG/L	7/10/91	
AB-53-SO-3W	91.05756	< 0.2		UG/L	7/10/91	
AB-53-SO-1S	91.05757	< 0.2		UG/L	7/10/91	
AB-53-SO-2S	91.05758	< 0.2		UG/L	7/10/91	
AB-53-SO-3S	91.05759	< 0.2		UG/L	7/10/91	

****

REPORT NUMBER: 10770

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: EAJ on 9-Jul-1991

ANALYSIS: [redacted] REQUEST NUMBER: 11674 MATRIX: WW ANALYST: Michael Bell PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

ANALYTICAL TECHNIQUE: FAA ANALYTICAL PROCEDURE: 272.1

CUSTOMER SAMPLES:

CUSTOMER NUM	SAMPLE NUM	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT
AB-53-NW-1W	91.05740	23.	10.	UG/L	7/09/91	
AB-53-NW-2W	91.05741	< 10.		UG/L	7/09/91	
AB-53-NW-3W	91.05742	< 10.		UG/L	7/09/91	
AB-53-NW-1S	91.05743	18.	10.	UG/L	7/09/91	
AB-53-NW-2S	91.05744	< 10.		UG/L	7/09/91	
AB-53-NW-3S	91.05745	< 10.		UG/L	7/09/91	
AB-53-NW-4SQ	91.05746	< 10.		UG/L	7/09/91	
AB-53-NE-1W	91.05747	< 10.		UG/L	7/09/91	
AB-53-NE-2W	91.05748	< 10.		UG/L	7/09/91	
AB-53-NE-3W	91.05749	< 10.		UG/L	7/09/91	
AB-53-NE-4WQ	91.05750	< 10.		UG/L	7/09/91	
AB-53-NE-1S	91.05751	< 10.		UG/L	7/09/91	
AB-53-NE-2S	91.05752	15.	10.	UG/L	7/09/91	
AB-53-NE-3S	91.05753	11.	10.	UG/L	7/09/91	
AB-53-SO-1W	91.05754	< 10.		UG/L	7/09/91	
AB-53-SO-2W	91.05755	< 10.		UG/L	7/09/91	
AB-53-SO-3W	91.05756	< 10.		UG/L	7/09/91	
AB-53-SO-1S	91.05757	14.	10.	UG/L	7/09/91	
AB-53-SO-2S	91.05758	10.	10.	UG/L	7/09/91	
AB-53-SO-3S	91.05759	< 10.		UG/L	7/09/91	

CUSTOMER SAMPLE DUPLICATES:

CUSTOMER NUM	SAMPLE NUM	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT
AB-53-NW-1W	91.05740	15.	10.	UG/L	7/09/91	
AB-53-NE-4WQ	91.05750	< 10.		UG/L	7/09/91	

MATRIX SPIKES:

CUSTOMER NUM	SAMPLE NUM	AMOUNT SPIKED	AMOUNT RECOVERED	UNITS	COMPLETION DATE	COMMENT
AB-53-NW-1W	91.05740	100.	105.	UG/L	7/09/91	

AB-53-NW-2W	91.05741	100.	107.	UG/L	7/09/91
AB-53-NW-3W	91.05742	100.	118.	UG/L	7/09/91
AB-53-NW-1S	91.05743	100.	97.	UG/L	7/09/91
AB-53-NW-2S	91.05744	100.	104.	UG/L	7/09/91
AB-53-NW-3S	91.05745	100.	103.	UG/L	7/09/91
AB-53-NW-4SQ	91.05746	100.	105.	UG/L	7/09/91
AB-53-NE-1W	91.05747	100.	114.	UG/L	7/09/91
AB-53-NE-2W	91.05748	100.	110.	UG/L	7/09/91
AB-53-NE-3W	91.05749	100.	111.	UG/L	7/09/91
AB-53-NE-4WQ	91.05750	100.	108.	UG/L	7/09/91
AB-53-NE-1S	91.05751	100.	105.	UG/L	7/09/91
AB-53-NE-2S	91.05752	100.	101.	UG/L	7/09/91
AB-53-NE-3S	91.05753	100.	104.	UG/L	7/09/91
AB-53-SO-1W	91.05754	100.	107.	UG/L	7/09/91
AB-53-SO-2W	91.05755	100.	102.	UG/L	7/09/91
AB-53-SO-3W	91.05756	100.	109.	UG/L	7/09/91
AB-53-SO-1S	91.05757	100.	110.	UG/L	7/09/91
AB-53-SO-2S	91.05758	100.	106.	UG/L	7/09/91

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REPORT NUMBER: 10866

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: EAJ on 12-Jul-1991

REQUEST NUMBER: 11674 MATRIX: WW ANALYST: Janet Montoya PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT
AB-53-NW-1W	91.05740	AS	< 0.02		MG/L	7/11/91	
AB-53-NW-1W	91.05740	BA	0.06	0.006	MG/L	7/11/91	
AB-53-NW-1W	91.05740	CD	< 0.01		MG/L	7/11/91	
AB-53-NW-1W	91.05740	CR	< 0.01		MG/L	7/11/91	
AB-53-NW-1W	91.05740	PB	< 0.05		MG/L	7/11/91	
AB-53-NW-1W	91.05740	SE	< 0.02		MG/L	7/11/91	
AB-53-NW-2W	91.05741	AS	< 0.02		MG/L	7/11/91	
AB-53-NW-2W	91.05741	BA	0.07	0.007	MG/L	7/11/91	
AB-53-NW-2W	91.05741	CD	< 0.01		MG/L	7/11/91	
AB-53-NW-2W	91.05741	CR	< 0.01		MG/L	7/11/91	
AB-53-NW-2W	91.05741	PB	< 0.05		MG/L	7/11/91	
AB-53-NW-2W	91.05741	SE	< 0.02		MG/L	7/11/91	
AB-53-NW-3W	91.05742	AS	< 0.02		MG/L	7/11/91	
AB-53-NW-3W	91.05742	BA	0.07	0.007	MG/L	7/11/91	
AB-53-NW-3W	91.05742	CD	< 0.01		MG/L	7/11/91	
AB-53-NW-3W	91.05742	CR	< 0.01		MG/L	7/11/91	
AB-53-NW-3W	91.05742	PB	< 0.05		MG/L	7/11/91	
AB-53-NW-3W	91.05742	SE	< 0.02		MG/L	7/11/91	
AB-53-NW-1S	91.05743	AS	0.02	0.02	MG/L	7/11/91	
AB-53-NW-1S	91.05743	BA	0.5	0.05	MG/L	7/11/91	
AB-53-NW-1S	91.05743	CD	< 0.01		MG/L	7/11/91	
AB-53-NW-1S	91.05743	CR	< 0.01		MG/L	7/11/91	
AB-53-NW-1S	91.05743	PB	< 0.05		MG/L	7/11/91	
AB-53-NW-1S	91.05743	SE	< 0.02		MG/L	7/11/91	
AB-53-NW-2S	91.05744	AS	0.03	0.003	MG/L	7/11/91	
AB-53-NW-2S	91.05744	BA	0.57	0.057	MG/L	7/11/91	
AB-53-NW-2S	91.05744	CD	< 0.01		MG/L	7/11/91	
AB-53-NW-2S	91.05744	CR	< 0.01		MG/L	7/11/91	
AB-53-NW-2S	91.05744	PB	< 0.05		MG/L	7/11/91	
AB-53-NW-2S	91.05744	SE	< 0.02		MG/L	7/11/91	
AB-53-NW-3S	91.05745	AS	0.03	0.02	MG/L	7/11/91	
AB-53-NW-3S	91.05745	BA	0.56	0.056	MG/L	7/11/91	
AB-53-NW-3S	91.05745	CD	< 0.01		MG/L	7/11/91	
AB-53-NW-3S	91.05745	CR	0.01	0.01	MG/L	7/11/91	
AB-53-NW-3S	91.05745	PB	< 0.05		MG/L	7/11/91	
AB-53-NW-3S	91.05745	SE	< 0.02		MG/L	7/11/91	
AB-53-NW-4SQ	91.05746	AS	0.03	0.02	MG/L	7/11/91	
AB-53-NW-4SQ	91.05746	BA	0.63	0.063	MG/L	7/11/91	
AB-53-NW-4SQ	91.05746	CD	< 0.01		MG/L	7/11/91	
AB-53-NW-4SQ	91.05746	CR	< 0.01		MG/L	7/11/91	

NW water

NW sludge

NW sludge blank

AB-53-NW-4SQ	91.05746	PB	< 0.05		MG/L	7/11/91
AB-53-NW-4SQ	91.05746	SE	0.03	0.02	MG/L	7/11/91
AB-53-NE-1W	91.05747	AS	< 0.02		MG/L	7/11/91
AB-53-NE-1W	91.05747	BA	0.08	0.008	MG/L	7/11/91
AB-53-NE-1W	91.05747	CD	< 0.01		MG/L	7/11/91
AB-53-NE-1W	91.05747	CR	< 0.01		MG/L	7/11/91
AB-53-NE-1W	91.05747	PB	< 0.05		MG/L	7/11/91
AB-53-NE-1W	91.05747	SE	< 0.02		MG/L	7/11/91
AB-53-NE-2W	91.05748	AS	< 0.02		MG/L	7/11/91
AB-53-NE-2W	91.05748	BA	0.08	0.008	MG/L	7/11/91
AB-53-NE-2W	91.05748	CD	< 0.01		MG/L	7/11/91
AB-53-NE-2W	91.05748	CR	< 0.01		MG/L	7/11/91
AB-53-NE-2W	91.05748	PB	< 0.05		MG/L	7/11/91
AB-53-NE-2W	91.05748	SE	< 0.02		MG/L	7/11/91
AB-53-NE-3W	91.05749	AS	< 0.02		MG/L	7/11/91
AB-53-NE-3W	91.05749	BA	0.08	0.008	MG/L	7/11/91
AB-53-NE-3W	91.05749	CD	< 0.01		MG/L	7/11/91
AB-53-NE-3W	91.05749	CR	< 0.01		MG/L	7/11/91
AB-53-NE-3W	91.05749	PB	< 0.05		MG/L	7/11/91
AB-53-NE-3W	91.05749	SE	< 0.02		MG/L	7/11/91

NE water

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REPORT NUMBER: 10770

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: EAJ on 9-Jul-1991

ANALYSIS: AG REQUEST NUMBER: 11674 MATRIX: WW ANALYST: Michael Bell PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

ANALYTICAL TECHNIQUE: FAA ANALYTICAL PROCEDURE: 272.1

CUSTOMER SAMPLES:

CUSTOMER NUM	SAMPLE NUM	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT
AB-53-NW-1W	91.05740	23.	10.	UG/L	7/09/91	
AB-53-NW-2W	91.05741	< 10.		UG/L	7/09/91	
AB-53-NW-3W	91.05742	< 10.		UG/L	7/09/91	
AB-53-NW-1S	91.05743	18.	10.	UG/L	7/09/91	
AB-53-NW-2S	91.05744	< 10.		UG/L	7/09/91	
AB-53-NW-3S	91.05745	< 10.		UG/L	7/09/91	
AB-53-NW-4SQ	91.05746	< 10.		UG/L	7/09/91	
AB-53-NE-1W	91.05747	< 10.		UG/L	7/09/91	
AB-53-NE-2W	91.05748	< 10.		UG/L	7/09/91	
AB-53-NE-3W	91.05749	< 10.		UG/L	7/09/91	
AB-53-NE-4WQ	91.05750	< 10.		UG/L	7/09/91	
AB-53-NE-1S	91.05751	< 10.		UG/L	7/09/91	
AB-53-NE-2S	91.05752	15.	10.	UG/L	7/09/91	
AB-53-NE-3S	91.05753	11.	10.	UG/L	7/09/91	
AB-53-SO-1W	91.05754	< 10.		UG/L	7/09/91	
AB-53-SO-2W	91.05755	< 10.		UG/L	7/09/91	
AB-53-SO-3W	91.05756	< 10.		UG/L	7/09/91	
AB-53-SO-1S	91.05757	14.	10.	UG/L	7/09/91	
AB-53-SO-2S	91.05758	10.	10.	UG/L	7/09/91	
AB-53-SO-3S	91.05759	< 10.		UG/L	7/09/91	

CUSTOMER SAMPLE DUPLICATES:

CUSTOMER NUM	SAMPLE NUM	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT
AB-53-NW-1W	91.05740	15.	10.	UG/L	7/09/91	
AB-53-NE-4WQ	91.05750	< 10.		UG/L	7/09/91	

MATRIX SPIKES:

CUSTOMER NUM	SAMPLE NUM	AMOUNT SPIKED	AMOUNT RECOVERED	UNITS	COMPLETION DATE	COMMENT
AB-53-NW-1W	91.05740	100.	105.	UG/L	7/09/91	

AB-53-NW-2W	91.05741	100.	107.	UG/L	7/09/91
AB-53-NW-3W	91.05742	100.	118.	UG/L	7/09/91
AB-53-NW-1S	91.05743	100.	97.	UG/L	7/09/91
AB-53-NW-2S	91.05744	100.	104.	UG/L	7/09/91
AB-53-NW-3S	91.05745	100.	103.	UG/L	7/09/91
AB-53-NW-4SQ	91.05746	100.	105.	UG/L	7/09/91
AB-53-NE-1W	91.05747	100.	114.	UG/L	7/09/91
AB-53-NE-2W	91.05748	100.	110.	UG/L	7/09/91
AB-53-NE-3W	91.05749	100.	111.	UG/L	7/09/91
AB-53-NE-4WQ	91.05750	100.	108.	UG/L	7/09/91
AB-53-NE-1S	91.05751	100.	105.	UG/L	7/09/91
AB-53-NE-2S	91.05752	100.	101.	UG/L	7/09/91
AB-53-NE-3S	91.05753	100.	104.	UG/L	7/09/91
AB-53-SO-1W	91.05754	100.	107.	UG/L	7/09/91
AB-53-SO-2W	91.05755	100.	102.	UG/L	7/09/91
AB-53-SO-3W	91.05756	100.	109.	UG/L	7/09/91
AB-53-SO-1S	91.05757	100.	110.	UG/L	7/09/91
AB-53-SO-2S	91.05758	100.	106.	UG/L	7/09/91

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REPORT NUMBER: 10770 (continued)

********** HSE-9 QUALITY ASSURANCE REPORT *********

Prepared by: EAJ on 9-Jul-1991

REQUEST NUMBER: 11674 MATRIX: WW ANALYST: Michael Bell PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

SUMMARY OF CONTROL STATUS OF OPEN (NON-BLIND) QC SAMPLES RUN WITH THIS BATCH

CUSTOMER NUM	SAMPLE NUM	RESULT	UNCERTAINTY	UNITS	CERTIFIED VALUE	CERTIFIED VALUE UNCERTAINTY	COMPLETION DATE	COMMENT
00.01160	00.01160	32.	3.	UG/L	32.	2.45	7/09/91	UNDER CONTROL
00.01160	00.01160	29.	3.	UG/L	32.	2.45	7/09/91	UNDER CONTROL
00.01160	00.01160	31.	3.	UG/L	32.	2.45	7/09/91	UNDER CONTROL
00.01160	00.01160	31.	3.	UG/L	32.	2.45	7/09/91	UNDER CONTROL
00.98805	00.98805	0.495	0.05	MG/L	0.5	0.05	7/09/91	UNDER CONTROL
00.98805	00.98805	0.496	0.05	MG/L	0.5	0.05	7/09/91	UNDER CONTROL
00.98805	00.98805	0.499	0.05	MG/L	0.5	0.05	7/09/91	UNDER CONTROL
00.98805	00.98805	0.496	0.05	MG/L	0.5	0.05	7/09/91	UNDER CONTROL

SUMMARY OF CONTROL STATUS OF BLIND QC SAMPLES RUN WITH THIS BATCH

SAMPLE NUM	RESULT	UNCERTAINTY	UNITS	CERTIFIED VALUE	CERTIFIED VALUE UNCERTAINTY	COMPLETION DATE	COMMENT
91.05801	0.926	0.093	MG/L	1.	0.1	7/09/91	UNDER CONTROL
91.05801	0.927	0.093	MG/L	1.	0.1	7/09/91	UNDER CONTROL
91.05802	0.934	0.093	MG/L	1.	0.1	7/09/91	UNDER CONTROL
91.05802	0.932	0.093	MG/L	1.	0.1	7/09/91	UNDER CONTROL

REPORT NUMBER: 10770

BH for MHB
Analyst

Section Leader

QA Officer

7/10/91
Date

7/10/91
Date

7/10/91
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in

'Quality Assurance for Health and Environmental Chemistry: 1986,' LA-11114-MS, pp. 3-4.

****

To: Alice Barr
Thru: Chris Leibman
From: Laura Tsiagkouris

Enclosed is the final report for the sludge samples of request 11673. As Matthew Monagle has previously indicated, the samples submitted contained a number of Tentatively Identified Compounds (TIC's) at a significant level. Typically, TIC's are not reported on the final report unless specified by the client. If a detailed listing of the TIC's detected are required, please call me at 5-4993.

HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman SBM for CL
From: Matthew Monagle

Request Number: 11673
Matrix: Sludge
Summary Date: 08 July 1991

Sample ID	Target Compounds Found	Amount (ug/kg)	Level of Quantitation (ug/kg)	TIC's
Blank (03-Jul.-1991)	Di-n-butyl-phthalate	600	330	Yes
91.05743	Di-n-butyl-phthalate Benzidine Bis-2-ethyl-hexylphthalate	1400 3900 1200	640	Yes
91.05744	Benzidine Bis-2-ethyl-hexylphthalate	1900 1100	490	Yes
91.05745	Di-n-butyl-phthalate	1400	640	Yes
91.05746	NONE		650	Yes
91.05751	NONE		480	Yes
91.05752	NONE		630	Yes
91.05753	NONE		650	Yes
91.05757	Di-n-butyl-phthalate	1400	660	Yes
91.05758	NONE		660	Yes
91.05759	NONE		490	Yes

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VM

HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman SPM for CL
From: Matthew Monagle

Request Number: 11673
Matrix: Soil
Summary Date: 08 July 1991

Summary:

Ten sludge samples were received by Sandra Cisneros Flores (HSE-9) on 02 July 1991 at TA-50. After radioactivity screening, the samples, along with a quality control blind, matrix spikes and a method blank were extracted by continuous extraction methods on 03 July 1991. Surrogate compounds were added to the matrix to determine the efficiency of the extraction. Analysis was performed on 05, 06 and 07 July 1991 at TA-35 by capillary gas chromatography/mass spectrometry using methods consistent with EPA method SW-846.

The sludge samples were extremely wet; therefore, a reduced amount of sample was used in order to use more drying agent. This accounts for the higher reporting limits. In addition, due to the nature of the samples no percent moisture was performed on these samples and all the results are reported as wet weight.

Reportable quantities of three target compounds were found in the sludge samples submitted. Bis-(2-ethylhexyl) phthalate and di-n-octylphthalate are both common plasticizers frequently found in environmental samples. Di-n-octylphthalate was found in the blank at reportable levels. Therefore, it is possible that the di-n-octylphthalate in the sample is due to laboratory contamination.

Benzidine is a target compound that is difficult to chromatograph. Therefore, the presence of this target compound was verified through standard addition. A known amount of benzidine was added to one of the samples and the sample re-analyzed. This re-analysis confirmed the presence of benzidine. Additionally, the benzidine was quantitated using a one point calibration based on an 80 ppm standard due to decomposition of the benzidine in the 50 ppm standard.

In response to historical data I specifically looked for benzyl alcohol, 2-methylphenol, and 4-methylphenol. None of these compounds were found at reportable levels in any of the samples submitted.

Significant quantities of tentatively identified compounds including saturated hydrocarbons and polynuclear aromatic hydrocarbons were found in all the samples submitted. Two tentatively identified compounds were found in the blank.

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7/10/91

HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman SAM for CL
From: Matthew Monagle

Request Number: 11673
Matrix: Soil
Summary Date: 08 July 1991

Surrogate and Matrix Spike Recoveries:

All surrogate recoveries were within EPA guidelines. Matrix spike recoveries and relative percent deviations for some compounds were outside the EPA guidelines. This could be a problem with the extraction or matrices. This is not believed to affect the data in any way.

Problems encountered:

No other problems were encountered with the analysis of these samples.

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7/10/91

LOS ALAMOS NATIONAL LABORATORY
HEALTH, SAFETY AND ENVIRONMENT DIVISION
HSE-9
MATRIX SPIKE RECOVERIES FOR SEMI-VOLATILES

		DRY WT/VOL (G or L)		AMOUNT SPIKED IN UG/KG ACIDS	BASES	LCQ (UG/KG)
REQUEST #:	11673					
NUMBER OF SAMPLES:	14					
SPIKE ID: (STARTS M OR E)	M91.05751	SPIKE	20.69	4833	2417	480
SPIKE DUP ID: (STARTS D OR F)	D91.05751	SPIKE-DUP	20.32	4921	2461	490
RAW DATA WITH:	11673					
ANALYST:	MM					

	SPIKE REC.	SPIKE-DUP REC.	SPIKE % REC.	SPIKE-DUP % REC.	RPD	LOW. REC. LIM.	UPP. REC. LIM.	RPD LIM.
ENOL	2000	3600	41%	73%	55%*	26	90	35
2-CHLOROPHENOL	1600	3100	33%	63%	62%*	25	102	50
1,4-DICHLOROBENZENE	570	1600	24%*	65%	94%*	28	104	27
N-NITROSO-DI-N-PROPYLAMINE	1100	2100	46%	85%	61%*	41	126	38
1,2,4-TRICLOROBENZENE	910	2000	38%*	81%	73%*	38	107	23
4-CHLORO-3-METHYLPHENOL	2300	3400	48%	69%	37%*	26	103	33
ACENAPHTHENE	1300	1900	54%	77%	36%*	31	137	19
4-NITROPHENOL	2200	3100	46%	63%	32%	11	114	50
2,4-DINITROTOLUENE	1100	1500	46%	61%	29%	28	89	47
PENTACHLOROPHENOL	2800	3900	58%	79%	31%	17	109	47
PYRENE	1600	2300	66%	93%	34%	35	142	36

* If % Matrix Recovery is Followed by a "*", it is out of QC Limits.

Reviewed By: 7/11/91

LOS ALAMOS NATIONAL LABORATORY
HEALTH, SAFETY AND ENVIRONMENT DIVISION
HSE-8

SURROGATE RECOVERIES FOR SEMI-VOLATILES IN SOIL TYPE MATRICES

REQUEST #: 11673

NUMBER OF SAMPLES: 14
MATRIX C
ANALYST: MM
Date: 07/08/91

SURROGATE RECOVERIES

SURROGATE
RECOVERIES IN PERCENT (%)

	SAMPLE NUMBERS	TYPE	2-FLUORO-PHENOL	PHENOL (D6)	NITRO-BENZENE (D5)	2-FLUORO-BIPHENYL	2,4,6-TRIBROMO-PHENOL	TERPHENYL (D14)
1	B91.05774	BLANK	52	60	61	75	76	75
2	M91.05751	MATRIX SPIK	24	42	32	53	69	66
3	D91.05751	MATRIX SP-D	59	73	71	81	99	95
4	S91.05743	SAMPLE	49	55	52	68	84	83
5	S91.05744	SAMPLE	59	71	64	78	85	83
6	S91.05745	SAMPLE	58	71	61	76	89	75
7	S91.05746	SAMPLE	48	61	51	61	78	81
8	S91.05751	SAMPLE	28	50	38	64	80	79
9	S91.05752	SAMPLE	33	55	48	63	84	81
10	S91.05753	SAMPLE	27	46	38	55	90	79
11	S91.05757	SAMPLE	48	66	58	73	68	75
12	S91.05758	SAMPLE	28	47	40	61	66	81
13	S91.05759	SAMPLE	50	65	60	71	68	76
14	S91.05773	SAMPLE	64	75	67	74	80	77
15								
16								
17								
18								
19								
20								
21								
22								

Average % Surrogate Recovery...	44	58	52	67	84	80
Defined Lower QC Limits (%)....	23	24	23	30	19	18
Defined Upper QC Limits (%)....	121	113	120	115	122	137
Observed Lower QC Limits (%)...	24	42	32	53	69	66
Observed Upper QC Limits (%)...	59	73	71	81	99	95

"*" If % Surrogate Recovery is Followed by a "*", it is out of QC Limits.

Reviewed By: 7/11/91

REPORT NUMBER: 10818

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: C ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05743

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/03/91 Date Analyzed: 7/05/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-1S	91.05743	83329	< 640.		UG/KG	7/10/91		Acenaphthene
AB-53-NW-1S	91.05743	208968	< 640.		UG/KG	7/10/91		Acenaphthylene
AB-53-NW-1S	91.05743	62533	< 640.		UG/KG	7/10/91		Aniline
AB-53-NW-1S	91.05743	120127	< 640.		UG/KG	7/10/91		Anthracene
AB-53-NW-1S	91.05743	103333	< 640.		UG/KG	7/10/91		Azobenzene
AB-53-NW-1S	91.05743	92875	3900.	1170.	UG/KG	7/10/91		m-Benzidine
AB-53-NW-1S	91.05743	56553	< 640.		UG/KG	7/10/91		Benzo[a]anthracene
AB-53-NW-1S	91.05743	50328	< 640.		UG/KG	7/10/91		Benzo[a]pyrene
AB-53-NW-1S	91.05743	205992	< 640.		UG/KG	7/10/91		Benzo[b]fluoranthene
AB-53-NW-1S	91.05743	191242	< 640.		UG/KG	7/10/91		Benzo[g,h,i]perylene
AB-53-NW-1S	91.05743	207089	< 640.		UG/KG	7/10/91		Benzo[k]fluoranthene
AB-53-NW-1S	91.05743	65850	< 640.		UG/KG	7/10/91		Benzoic acid
AB-53-NW-1S	91.05743	100516	< 640.		UG/KG	7/10/91		Benzyl alcohol
AB-53-NW-1S	91.05743	111911	< 640.		UG/KG	7/10/91		Bis(2-chloroethoxy)methane
AB-53-NW-1S	91.05743	111444	< 640.		UG/KG	7/10/91		Bis(2-chloroethyl)ether
AB-53-NW-1S	91.05743	108601	< 640.		UG/KG	7/10/91		Bis(2-chloroisopropyl)ether
AB-53-NW-1S	91.05743	117817	1200.	360.	UG/KG	7/10/91		Bis(2-ethylhexyl)phthalate
AB-53-NW-1S	91.05743	101553	< 640.		UG/KG	7/10/91		4-Bromophenylphenyl ether
AB-53-NW-1S	91.05743	85687	< 640.		UG/KG	7/10/91		Butylbenzyl phthalate
AB-53-NW-1S	91.05743	59507	< 640.		UG/KG	7/10/91		4-Chloro-3-methylphenol
AB-53-NW-1S	91.05743	106478	< 640.		UG/KG	7/10/91		4-Chloroaniline

AB-53-NW-1S	91.05743	91587	< 640.		UG/KG	7/10/91	2-Chloronaphthalene
AB-53-NW-1S	91.05743	95578	< 640.		UG/KG	7/10/91	o-Chlorophenol
AB-53-NW-1S	91.05743	7005723	< 640.		UG/KG	7/10/91	4-Chlorophenylphenyl ether
AB-53-NW-1S	91.05743	218019	< 640.		UG/KG	7/10/91	Chrysene
AB-53-NW-1S	91.05743	84742	1400.	420.	UG/KG	7/10/91	Di-n-butyl phthalate
AB-53-NW-1S	91.05743	117840	< 640.		UG/KG	7/10/91	Di-n-octyl phthalate
AB-53-NW-1S	91.05743	53703	< 640.		UG/KG	7/10/91	Dibenzo[a,h]anthracene
AB-53-NW-1S	91.05743	132649	< 640.		UG/KG	7/10/91	Dibenzofuran
AB-53-NW-1S	91.05743	95501	< 640.		UG/KG	7/10/91	o-Dichlorobenzene (1,2)
AB-53-NW-1S	91.05743	541731	< 640.		UG/KG	7/10/91	m-Dichlorobenzene (1,3)
AB-53-NW-1S	91.05743	106467	< 640.		UG/KG	7/10/91	p-Dichlorobenzene (1,4)
AB-53-NW-1S	91.05743	91941	< 640.		UG/KG	7/10/91	3,3'-Dichlorobenzidine
AB-53-NW-1S	91.05743	120832	< 640.		UG/KG	7/10/91	2,4-Dichlorophenol
AB-53-NW-1S	91.05743	84662	< 640.		UG/KG	7/10/91	Diethyl phthalate
AB-53-NW-1S	91.05743	131113	< 640.		UG/KG	7/10/91	Dimethyl phthalate
AB-53-NW-1S	91.05743	105679	< 640.		UG/KG	7/10/91	2,4-Dimethylphenol
AB-53-NW-1S	91.05743	51285	< 640.		UG/KG	7/10/91	2,4-Dinitrophenol
AB-53-NW-1S	91.05743	121142	< 640.		UG/KG	7/10/91	2,4-Dinitrotoluene
AB-53-NW-1S	91.05743	606202	< 640.		UG/KG	7/10/91	2,6-Dinitrotoluene
AB-53-NW-1S	91.05743	206440	< 640.		UG/KG	7/10/91	Fluoranthene
AB-53-NW-1S	91.05743	86737	< 640.		UG/KG	7/10/91	Fluorene
AB-53-NW-1S	91.05743	118741	< 640.		UG/KG	7/10/91	Hexachlorobenzene
AB-53-NW-1S	91.05743	87683	< 640.		UG/KG	7/10/91	Hexachlorobutadiene
AB-53-NW-1S	91.05743	77474	< 640.		UG/KG	7/10/91	Hexachlorocyclopentadiene
AB-53-NW-1S	91.05743	67721	< 640.		UG/KG	7/10/91	Hexachloroethane
AB-53-NW-1S	91.05743	193395	< 640.		UG/KG	7/10/91	Indeno[1,2,3-cd]pyrene
AB-53-NW-1S	91.05743	78591	< 640.		UG/KG	7/10/91	Isophorone
AB-53-NW-1S	91.05743	534521	< 640.		UG/KG	7/10/91	2-Methyl-4,6-dinitrophenol
AB-53-NW-1S	91.05743	91576	< 640.		UG/KG	7/10/91	2-Methylnaphthalene
AB-53-NW-1S	91.05743	95487	< 640.		UG/KG	7/10/91	2-Methylphenol
AB-53-NW-1S	91.05743	106445	< 640.		UG/KG	7/10/91	4-Methylphenol
AB-53-NW-1S	91.05743	91203	< 640.		UG/KG	7/10/91	Naphthalene
AB-53-NW-1S	91.05743	88744	< 640.		UG/KG	7/10/91	2-Nitroaniline
AB-53-NW-1S	91.05743	99092	< 640.		UG/KG	7/10/91	3-Nitroaniline
AB-53-NW-1S	91.05743	100016	< 640.		UG/KG	7/10/91	4-Nitroaniline
AB-53-NW-1S	91.05743	98953	< 640.		UG/KG	7/10/91	Nitrobenzene
AB-53-NW-1S	91.05743	88755	< 640.		UG/KG	7/10/91	2-Nitrophenol
AB-53-NW-1S	91.05743	100027	< 640.		UG/KG	7/10/91	4-Nitrophenol
AB-53-NW-1S	91.05743	621647	< 640.		UG/KG	7/10/91	N-Nitrosodi-n-propylamine
AB-53-NW-1S	91.05743	62759	< 640.		UG/KG	7/10/91	N-Nitrosodimethylamine
AB-53-NW-1S	91.05743	86306	< 640.		UG/KG	7/10/91	N-Nitrosodiphenylamine
AB-53-NW-1S	91.05743	87865	< 640.		UG/KG	7/10/91	Pentachlorophenol
AB-53-NW-1S	91.05743	85018	< 640.		UG/KG	7/10/91	Phenanthrene
AB-53-NW-1S	91.05743	108952	< 640.		UG/KG	7/10/91	Phenol
AB-53-NW-1S	91.05743	129000	< 640.		UG/KG	7/10/91	Pyrene

AB-53-NW-1S	91.05743	120821	< 640.	UG/KG	7/10/91	1,2,4-Trichlorobenzene
AB-53-NW-1S	91.05743	95954	< 640.	UG/KG	7/10/91	2,4,5-Trichlorophenol
AB-53-NW-1S	91.05743	88062	< 640.	UG/KG	7/10/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05743

none

Customer Sample Duplicate Results for Sample # 91.05743

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05743

none

REPORT NUMBER: 10818

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: C ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05744

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/03/91 Date Analyzed: 7/05/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-2S	91.05744	83329	< 490.		UG/KG	7/10/91		Acenaphthene
AB-53-NW-2S	91.05744	208968	< 490.		UG/KG	7/10/91		Acenaphthylene
AB-53-NW-2S	91.05744	62533	< 490.		UG/KG	7/10/91		Aniline
AB-53-NW-2S	91.05744	120127	< 490.		UG/KG	7/10/91		Anthracene
AB-53-NW-2S	91.05744	103333	< 490.		UG/KG	7/10/91		Azobenzene
AB-53-NW-2S	91.05744	92875	1900.	570.	UG/KG	7/10/91		m-Benzidine
AB-53-NW-2S	91.05744	56553	< 490.		UG/KG	7/10/91		Benzo[a]anthracene
AB-53-NW-2S	91.05744	50328	< 490.		UG/KG	7/10/91		Benzo[a]pyrene
AB-53-NW-2S	91.05744	205992	< 490.		UG/KG	7/10/91		Benzo[b]fluoranthene
AB-53-NW-2S	91.05744	191242	< 490.		UG/KG	7/10/91		Benzo[g,h,i]perylene
AB-53-NW-2S	91.05744	207089	< 490.		UG/KG	7/10/91		Benzo[k]fluoranthene
AB-53-NW-2S	91.05744	65850	< 490.		UG/KG	7/10/91		Benzoic acid
AB-53-NW-2S	91.05744	100516	< 490.		UG/KG	7/10/91		Benzyl alcohol
AB-53-NW-2S	91.05744	111911	< 490.		UG/KG	7/10/91		Bis(2-chloroethoxy)methane
AB-53-NW-2S	91.05744	111444	< 490.		UG/KG	7/10/91		Bis(2-chloroethyl)ether
AB-53-NW-2S	91.05744	108601	< 490.		UG/KG	7/10/91		Bis(2-chloroisopropyl)ether
AB-53-NW-2S	91.05744	117817	1100.	330.	UG/KG	7/10/91		Bis(2-ethylhexyl)phthalate
AB-53-NW-2S	91.05744	101553	< 490.		UG/KG	7/10/91		4-Bromophenylphenyl ether
AB-53-NW-2S	91.05744	85687	< 490.		UG/KG	7/10/91		Butylbenzyl phthalate
AB-53-NW-2S	91.05744	59507	< 490.		UG/KG	7/10/91		4-Chloro-3-methylphenol
AB-53-NW-2S	91.05744	106478	< 490.		UG/KG	7/10/91		4-Chloroaniline

AB-53-NW-2S	91.05744	91587	< 490.	UG/KG	7/10/91	2-Chloronaphthalene
AB-53-NW-2S	91.05744	95578	< 490.	UG/KG	7/10/91	o-Chlorophenol
AB-53-NW-2S	91.05744	7005723	< 490.	UG/KG	7/10/91	4-Chlorophenylphenyl ether
AB-53-NW-2S	91.05744	218019	< 490.	UG/KG	7/10/91	Chrysene
AB-53-NW-2S	91.05744	84742	< 490.	UG/KG	7/10/91	Di-n-butyl phthalate
AB-53-NW-2S	91.05744	117840	< 490.	UG/KG	7/10/91	Di-n-octyl phthalate
AB-53-NW-2S	91.05744	53703	< 490.	UG/KG	7/10/91	Dibenzo[a,h]anthracene
AB-53-NW-2S	91.05744	132649	< 490.	UG/KG	7/10/91	Dibenzofuran
AB-53-NW-2S	91.05744	95501	< 490.	UG/KG	7/10/91	o-Dichlorobenzene (1,2)
AB-53-NW-2S	91.05744	541731	< 490.	UG/KG	7/10/91	m-Dichlorobenzene (1,3)
AB-53-NW-2S	91.05744	106467	< 490.	UG/KG	7/10/91	p-Dichlorobenzene (1,4)
AB-53-NW-2S	91.05744	91941	< 490.	UG/KG	7/10/91	3,3'-Dichlorobenzidine
AB-53-NW-2S	91.05744	120832	< 490.	UG/KG	7/10/91	2,4-Dichlorophenol
AB-53-NW-2S	91.05744	84662	< 490.	UG/KG	7/10/91	Diethyl phthalate
AB-53-NW-2S	91.05744	131113	< 490.	UG/KG	7/10/91	Dimethyl phthalate
AB-53-NW-2S	91.05744	105679	< 490.	UG/KG	7/10/91	2,4-Dimethylphenol
AB-53-NW-2S	91.05744	51285	< 490.	UG/KG	7/10/91	2,4-Dinitrophenol
AB-53-NW-2S	91.05744	121142	< 490.	UG/KG	7/10/91	2,4-Dinitrotoluene
AB-53-NW-2S	91.05744	606202	< 490.	UG/KG	7/10/91	2,6-Dinitrotoluene
AB-53-NW-2S	91.05744	206440	< 490.	UG/KG	7/10/91	Fluoranthene
AB-53-NW-2S	91.05744	86737	< 490.	UG/KG	7/10/91	Fluorene
AB-53-NW-2S	91.05744	118741	< 490.	UG/KG	7/10/91	Hexachlorobenzene
AB-53-NW-2S	91.05744	87683	< 490.	UG/KG	7/10/91	Hexachlorobutadiene
AB-53-NW-2S	91.05744	77474	< 490.	UG/KG	7/10/91	Hexachlorocyclopentadiene
AB-53-NW-2S	91.05744	67721	< 490.	UG/KG	7/10/91	Hexachloroethane
AB-53-NW-2S	91.05744	193395	< 490.	UG/KG	7/10/91	Indeno[1,2,3-cd]pyrene
AB-53-NW-2S	91.05744	78591	< 490.	UG/KG	7/10/91	Isophorone
AB-53-NW-2S	91.05744	534521	< 490.	UG/KG	7/10/91	2-Methyl-4,6-dinitrophenol
AB-53-NW-2S	91.05744	91576	< 490.	UG/KG	7/10/91	2-Methylnaphthalene
AB-53-NW-2S	91.05744	95487	< 490.	UG/KG	7/10/91	2-Methylphenol
AB-53-NW-2S	91.05744	106445	< 490.	UG/KG	7/10/91	4-Methylphenol
AB-53-NW-2S	91.05744	91203	< 490.	UG/KG	7/10/91	Naphthalene
AB-53-NW-2S	91.05744	88744	< 490.	UG/KG	7/10/91	2-Nitroaniline
AB-53-NW-2S	91.05744	99092	< 490.	UG/KG	7/10/91	3-Nitroaniline
AB-53-NW-2S	91.05744	100016	< 490.	UG/KG	7/10/91	4-Nitroaniline
AB-53-NW-2S	91.05744	98953	< 490.	UG/KG	7/10/91	Nitrobenzene
AB-53-NW-2S	91.05744	88755	< 490.	UG/KG	7/10/91	2-Nitrophenol
AB-53-NW-2S	91.05744	100027	< 490.	UG/KG	7/10/91	4-Nitrophenol
AB-53-NW-2S	91.05744	621647	< 490.	UG/KG	7/10/91	N-Nitrosodi-n-propylamine
AB-53-NW-2S	91.05744	62759	< 490.	UG/KG	7/10/91	N-Nitrosodimethylamine
AB-53-NW-2S	91.05744	86306	< 490.	UG/KG	7/10/91	N-Nitrosodiphenylamine
AB-53-NW-2S	91.05744	87865	< 490.	UG/KG	7/10/91	Pentachlorophenol
AB-53-NW-2S	91.05744	85018	< 490.	UG/KG	7/10/91	Phenanthrene
AB-53-NW-2S	91.05744	108952	< 490.	UG/KG	7/10/91	Phenol
AB-53-NW-2S	91.05744	129000	< 490.	UG/KG	7/10/91	Pyrene

AB-53-NW-2S	91.05744	120821	< 490.	UG/KG	7/10/91	1,2,4-Trichlorobenzene
AB-53-NW-2S	91.05744	95954	< 490.	UG/KG	7/10/91	2,4,5-Trichlorophenol
AB-53-NW-2S	91.05744	88062	< 490.	UG/KG	7/10/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05744

none

Customer Sample Duplicate Results for Sample # 91.05744

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05744

none

REPORT NUMBER: 10818

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: C ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05745

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/03/91 Date Analyzed: 7/05/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-3S	91.05745	83329	< 490.		UG/KG	7/10/91		Acenaphthene
AB-53-NW-3S	91.05745	208968	< 490.		UG/KG	7/10/91		Acenaphthylene
AB-53-NW-3S	91.05745	62533	< 490.		UG/KG	7/10/91		Aniline
AB-53-NW-3S	91.05745	120127	< 490.		UG/KG	7/10/91		Anthracene
AB-53-NW-3S	91.05745	103333	< 490.		UG/KG	7/10/91		Azobenzene
AB-53-NW-3S	91.05745	92875	< 490.		UG/KG	7/10/91		m-Benzidine
AB-53-NW-3S	91.05745	56553	< 490.		UG/KG	7/10/91		Benzo[a]anthracene
AB-53-NW-3S	91.05745	50328	< 490.		UG/KG	7/10/91		Benzo[a]pyrene
AB-53-NW-3S	91.05745	205992	< 490.		UG/KG	7/10/91		Benzo[b]fluoranthene
AB-53-NW-3S	91.05745	191242	< 490.		UG/KG	7/10/91		Benzo[g,h,i]perylene
AB-53-NW-3S	91.05745	207089	< 490.		UG/KG	7/10/91		Benzo[k]fluoranthene
AB-53-NW-3S	91.05745	65850	< 490.		UG/KG	7/10/91		Benzoic acid
AB-53-NW-3S	91.05745	100516	< 490.		UG/KG	7/10/91		Benzyl alcohol
AB-53-NW-3S	91.05745	111911	< 490.		UG/KG	7/10/91		Bis(2-chloroethoxy)methane
AB-53-NW-3S	91.05745	111444	< 490.		UG/KG	7/10/91		Bis(2-chloroethyl)ether
AB-53-NW-3S	91.05745	108601	< 490.		UG/KG	7/10/91		Bis(2-chloroisopropyl)ether
AB-53-NW-3S	91.05745	117817	< 490.		UG/KG	7/10/91		Bis(2-ethylhexyl)phthalate
AB-53-NW-3S	91.05745	101553	< 490.		UG/KG	7/10/91		4-Bromophenylphenyl ether
AB-53-NW-3S	91.05745	85687	< 490.		UG/KG	7/10/91		Butylbenzyl phthalate
AB-53-NW-3S	91.05745	59507	< 490.		UG/KG	7/10/91		4-Chloro-3-methylphenol
AB-53-NW-3S	91.05745	106478	< 490.		UG/KG	7/10/91		4-Chloroaniline

AB-53-NW-3S	91.05745	91587	< 490.		UG/KG	7/10/91	2-Chloronaphthalene
AB-53-NW-3S	91.05745	95578	< 490.		UG/KG	7/10/91	o-Chlorophenol
AB-53-NW-3S	91.05745	7005723	< 490.		UG/KG	7/10/91	4-Chlorophenylphenyl ether
AB-53-NW-3S	91.05745	218019	< 490.		UG/KG	7/10/91	Chrysene
AB-53-NW-3S	91.05745	84742	1400.	420.	UG/KG	7/10/91	Di-n-butyl phthalate
AB-53-NW-3S	91.05745	117840	< 490.		UG/KG	7/10/91	Di-n-octyl phthalate
AB-53-NW-3S	91.05745	53703	< 490.		UG/KG	7/10/91	Dibenzo[a,h]anthracene
AB-53-NW-3S	91.05745	132649	< 490.		UG/KG	7/10/91	Dibenzofuran
AB-53-NW-3S	91.05745	95501	< 490.		UG/KG	7/10/91	o-Dichlorobenzene (1,2)
AB-53-NW-3S	91.05745	541731	< 490.		UG/KG	7/10/91	m-Dichlorobenzene (1,3)
AB-53-NW-3S	91.05745	106467	< 490.		UG/KG	7/10/91	p-Dichlorobenzene (1,4)
AB-53-NW-3S	91.05745	91941	< 490.		UG/KG	7/10/91	3,3'-Dichlorobenzidine
AB-53-NW-3S	91.05745	120832	< 490.		UG/KG	7/10/91	2,4-Dichlorophenol
AB-53-NW-3S	91.05745	84662	< 490.		UG/KG	7/10/91	Diethyl phthalate
AB-53-NW-3S	91.05745	131113	< 490.		UG/KG	7/10/91	Dimethyl phthalate
AB-53-NW-3S	91.05745	105679	< 490.		UG/KG	7/10/91	2,4-Dimethylphenol
AB-53-NW-3S	91.05745	51285	< 490.		UG/KG	7/10/91	2,4-Dinitrophenol
AB-53-NW-3S	91.05745	121142	< 490.		UG/KG	7/10/91	2,4-Dinitrotoluene
AB-53-NW-3S	91.05745	606202	< 490.		UG/KG	7/10/91	2,6-Dinitrotoluene
AB-53-NW-3S	91.05745	206440	< 490.		UG/KG	7/10/91	Fluoranthene
AB-53-NW-3S	91.05745	86737	< 490.		UG/KG	7/10/91	Fluorene
AB-53-NW-3S	91.05745	118741	< 490.		UG/KG	7/10/91	Hexachlorobenzene
AB-53-NW-3S	91.05745	87683	< 490.		UG/KG	7/10/91	Hexachlorobutadiene
AB-53-NW-3S	91.05745	77474	< 490.		UG/KG	7/10/91	Hexachlorocyclopentadiene
AB-53-NW-3S	91.05745	67721	< 490.		UG/KG	7/10/91	Hexachloroethane
AB-53-NW-3S	91.05745	193395	< 490.		UG/KG	7/10/91	Indeno[1,2,3-cd]pyrene
AB-53-NW-3S	91.05745	78591	< 490.		UG/KG	7/10/91	Isophorone
AB-53-NW-3S	91.05745	534521	< 490.		UG/KG	7/10/91	2-Methyl-4,6-dinitrophenol
AB-53-NW-3S	91.05745	91576	< 490.		UG/KG	7/10/91	2-Methylnaphthalene
AB-53-NW-3S	91.05745	95487	< 490.		UG/KG	7/10/91	2-Methylphenol
AB-53-NW-3S	91.05745	106445	< 490.		UG/KG	7/10/91	4-Methylphenol
AB-53-NW-3S	91.05745	91203	< 490.		UG/KG	7/10/91	Naphthalene
AB-53-NW-3S	91.05745	88744	< 490.		UG/KG	7/10/91	2-Nitroaniline
AB-53-NW-3S	91.05745	99092	< 490.		UG/KG	7/10/91	3-Nitroaniline
AB-53-NW-3S	91.05745	100016	< 490.		UG/KG	7/10/91	4-Nitroaniline
AB-53-NW-3S	91.05745	98953	< 490.		UG/KG	7/10/91	Nitrobenzene
AB-53-NW-3S	91.05745	88755	< 490.		UG/KG	7/10/91	2-Nitrophenol
AB-53-NW-3S	91.05745	100027	< 490.		UG/KG	7/10/91	4-Nitrophenol
AB-53-NW-3S	91.05745	621647	< 490.		UG/KG	7/10/91	N-Nitrosodi-n-propylamine
AB-53-NW-3S	91.05745	62759	< 490.		UG/KG	7/10/91	N-Nitrosodimethylamine
AB-53-NW-3S	91.05745	86306	< 490.		UG/KG	7/10/91	N-Nitrosodiphenylamine
AB-53-NW-3S	91.05745	87865	< 490.		UG/KG	7/10/91	Pentachlorophenol
AB-53-NW-3S	91.05745	85018	< 490.		UG/KG	7/10/91	Phenanthrene
AB-53-NW-3S	91.05745	108952	< 490.		UG/KG	7/10/91	Phenol
AB-53-NW-3S	91.05745	129000	< 490.		UG/KG	7/10/91	Pyrene

AB-53-NW-3S	91.05745	120821	< 490.	UG/KG	7/10/91	1,2,4-Trichlorobenzene
AB-53-NW-3S	91.05745	95954	< 490.	UG/KG	7/10/91	2,4,5-Trichlorophenol
AB-53-NW-3S	91.05745	88062	< 490.	UG/KG	7/10/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05745

none

Customer Sample Duplicate Results for Sample # 91.05745

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05745

none

REPORT NUMBER: 10818

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: C ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05746

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/03/91 Date Analyzed: 7/05/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-4SQ	91.05746	83329	< 650.		UG/KG	7/10/91		Acenaphthene
AB-53-NW-4SQ	91.05746	208968	< 650.		UG/KG	7/10/91		Acenaphthylene
AB-53-NW-4SQ	91.05746	62533	< 650.		UG/KG	7/10/91		Aniline
AB-53-NW-4SQ	91.05746	120127	< 650.		UG/KG	7/10/91		Anthracene
AB-53-NW-4SQ	91.05746	103333	< 650.		UG/KG	7/10/91		Azobenzene
AB-53-NW-4SQ	91.05746	92875	< 650.		UG/KG	7/10/91		m-Benzidine
AB-53-NW-4SQ	91.05746	56553	< 650.		UG/KG	7/10/91		Benzo[a]anthracene
AB-53-NW-4SQ	91.05746	50328	< 650.		UG/KG	7/10/91		Benzo[a]pyrene
AB-53-NW-4SQ	91.05746	205992	< 650.		UG/KG	7/10/91		Benzo[b]fluoranthene
AB-53-NW-4SQ	91.05746	191242	< 650.		UG/KG	7/10/91		Benzo[g,h,i]perylene
AB-53-NW-4SQ	91.05746	207089	< 650.		UG/KG	7/10/91		Benzo[k]fluoranthene
AB-53-NW-4SQ	91.05746	65850	< 650.		UG/KG	7/10/91		Benzoic acid
AB-53-NW-4SQ	91.05746	100516	< 650.		UG/KG	7/10/91		Benzyl alcohol
AB-53-NW-4SQ	91.05746	111911	< 650.		UG/KG	7/10/91		Bis(2-chloroethoxy)methane
AB-53-NW-4SQ	91.05746	111444	< 650.		UG/KG	7/10/91		Bis(2-chloroethyl)ether
AB-53-NW-4SQ	91.05746	108601	< 650.		UG/KG	7/10/91		Bis(2-chloroisopropyl)ether
AB-53-NW-4SQ	91.05746	117817	< 650.		UG/KG	7/10/91		Bis(2-ethylhexyl)phthalate
AB-53-NW-4SQ	91.05746	101553	< 650.		UG/KG	7/10/91		4-Bromophenylphenyl ether
AB-53-NW-4SQ	91.05746	85687	< 650.		UG/KG	7/10/91		Butylbenzyl phthalate
AB-53-NW-4SQ	91.05746	59507	< 650.		UG/KG	7/10/91		4-Chloro-3-methylphenol
AB-53-NW-4SQ	91.05746	106478	< 650.		UG/KG	7/10/91		4-Chloroaniline

AB-53-NW-4SQ	91.05746	91587	< 650.	UG/KG	7/10/91	2-Chloronaphthalene
AB-53-NW-4SQ	91.05746	95578	< 650.	UG/KG	7/10/91	o-Chlorophenol
AB-53-NW-4SQ	91.05746	7005723	< 650.	UG/KG	7/10/91	4-Chlorophenylphenyl ether
AB-53-NW-4SQ	91.05746	218019	< 650.	UG/KG	7/10/91	Chrysene
AB-53-NW-4SQ	91.05746	84742	< 650.	UG/KG	7/10/91	Di-n-butyl phthalate
AB-53-NW-4SQ	91.05746	117840	< 650.	UG/KG	7/10/91	Di-n-octyl phthalate
AB-53-NW-4SQ	91.05746	53703	< 650.	UG/KG	7/10/91	Dibenzo[a,h]anthracene
AB-53-NW-4SQ	91.05746	132649	< 650.	UG/KG	7/10/91	Dibenzofuran
AB-53-NW-4SQ	91.05746	95501	< 650.	UG/KG	7/10/91	o-Dichlorobenzene (1,2)
AB-53-NW-4SQ	91.05746	541731	< 650.	UG/KG	7/10/91	m-Dichlorobenzene (1,3)
AB-53-NW-4SQ	91.05746	106467	< 650.	UG/KG	7/10/91	p-Dichlorobenzene (1,4)
AB-53-NW-4SQ	91.05746	91941	< 650.	UG/KG	7/10/91	3,3'-Dichlorobenzidine
AB-53-NW-4SQ	91.05746	120832	< 650.	UG/KG	7/10/91	2,4-Dichlorophenol
AB-53-NW-4SQ	91.05746	84662	< 650.	UG/KG	7/10/91	Diethyl phthalate
AB-53-NW-4SQ	91.05746	131113	< 650.	UG/KG	7/10/91	Dimethyl phthalate
AB-53-NW-4SQ	91.05746	105679	< 650.	UG/KG	7/10/91	2,4-Dimethylphenol
AB-53-NW-4SQ	91.05746	51285	< 650.	UG/KG	7/10/91	2,4-Dinitrophenol
AB-53-NW-4SQ	91.05746	121142	< 650.	UG/KG	7/10/91	2,4-Dinitrotoluene
AB-53-NW-4SQ	91.05746	606202	< 650.	UG/KG	7/10/91	2,6-Dinitrotoluene
AB-53-NW-4SQ	91.05746	206440	< 650.	UG/KG	7/10/91	Fluoranthene
AB-53-NW-4SQ	91.05746	86737	< 650.	UG/KG	7/10/91	Fluorene
AB-53-NW-4SQ	91.05746	118741	< 650.	UG/KG	7/10/91	Hexachlorobenzene
AB-53-NW-4SQ	91.05746	87683	< 650.	UG/KG	7/10/91	Hexachlorobutadiene
AB-53-NW-4SQ	91.05746	77474	< 650.	UG/KG	7/10/91	Hexachlorocyclopentadiene
AB-53-NW-4SQ	91.05746	67721	< 650.	UG/KG	7/10/91	Hexachloroethane
AB-53-NW-4SQ	91.05746	193395	< 650.	UG/KG	7/10/91	Indeno[1,2,3-cd]pyrene
AB-53-NW-4SQ	91.05746	78591	< 650.	UG/KG	7/10/91	Isophorone
AB-53-NW-4SQ	91.05746	534521	< 650.	UG/KG	7/10/91	2-Methyl-4,6-dinitrophenol
AB-53-NW-4SQ	91.05746	91576	< 650.	UG/KG	7/10/91	2-Methylnaphthalene
AB-53-NW-4SQ	91.05746	95487	< 650.	UG/KG	7/10/91	2-Methylphenol
AB-53-NW-4SQ	91.05746	106445	< 650.	UG/KG	7/10/91	4-Methylphenol
AB-53-NW-4SQ	91.05746	91203	< 650.	UG/KG	7/10/91	Naphthalene
AB-53-NW-4SQ	91.05746	88744	< 650.	UG/KG	7/10/91	2-Nitroaniline
AB-53-NW-4SQ	91.05746	99092	< 650.	UG/KG	7/10/91	3-Nitroaniline
AB-53-NW-4SQ	91.05746	100016	< 650.	UG/KG	7/10/91	4-Nitroaniline
AB-53-NW-4SQ	91.05746	98953	< 650.	UG/KG	7/10/91	Nitrobenzene
AB-53-NW-4SQ	91.05746	88755	< 650.	UG/KG	7/10/91	2-Nitrophenol
AB-53-NW-4SQ	91.05746	100027	< 650.	UG/KG	7/10/91	4-Nitrophenol
AB-53-NW-4SQ	91.05746	621647	< 650.	UG/KG	7/10/91	N-Nitrosodi-n-propylamine
AB-53-NW-4SQ	91.05746	62759	< 650.	UG/KG	7/10/91	N-Nitrosodimethylamine
AB-53-NW-4SQ	91.05746	86306	< 650.	UG/KG	7/10/91	N-Nitrosodiphenylamine
AB-53-NW-4SQ	91.05746	87865	< 650.	UG/KG	7/10/91	Pentachlorophenol
AB-53-NW-4SQ	91.05746	85018	< 650.	UG/KG	7/10/91	Phenanthrene
AB-53-NW-4SQ	91.05746	108952	< 650.	UG/KG	7/10/91	Phenol
AB-53-NW-4SQ	91.05746	129000	< 650.	UG/KG	7/10/91	Pyrene

AB-53-NW-4SQ 91.05746	120821	< 650.	UG/KG	7/10/91	1,2,4-Trichlorobenzene
AB-53-NW-4SQ 91.05746	95954	< 650.	UG/KG	7/10/91	2,4,5-Trichlorophenol
AB-53-NW-4SQ 91.05746	88062	< 650.	UG/KG	7/10/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05746

none

Customer Sample Duplicate Results for Sample # 91.05746

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05746

none

REPORT NUMBER: 10818

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: C ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05751

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/03/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-1S	91.05751	83329	< 480.		UG/KG	7/10/91		Acenaphthene
AB-53-NE-1S	91.05751	208968	< 480.		UG/KG	7/10/91		Acenaphthylene
AB-53-NE-1S	91.05751	62533	< 480.		UG/KG	7/10/91		Aniline
AB-53-NE-1S	91.05751	120127	< 480.		UG/KG	7/10/91		Anthracene
AB-53-NE-1S	91.05751	103333	< 480.		UG/KG	7/10/91		Azobenzene
AB-53-NE-1S	91.05751	92875	< 480.		UG/KG	7/10/91		m-Benzidine
AB-53-NE-1S	91.05751	56553	< 480.		UG/KG	7/10/91		Benzo[a]anthracene
AB-53-NE-1S	91.05751	50328	< 480.		UG/KG	7/10/91		Benzo[a]pyrene
AB-53-NE-1S	91.05751	205992	< 480.		UG/KG	7/10/91		Benzo[b]fluoranthene
AB-53-NE-1S	91.05751	191242	< 480.		UG/KG	7/10/91		Benzo[g,h,i]perylene
AB-53-NE-1S	91.05751	207089	< 480.		UG/KG	7/10/91		Benzo[k]fluoranthene
AB-53-NE-1S	91.05751	65850	< 480.		UG/KG	7/10/91		Benzoic acid
AB-53-NE-1S	91.05751	100516	< 480.		UG/KG	7/10/91		Benzyl alcohol
AB-53-NE-1S	91.05751	111911	< 480.		UG/KG	7/10/91		Bis(2-chloroethoxy)methane
AB-53-NE-1S	91.05751	111444	< 480.		UG/KG	7/10/91		Bis(2-chloroethyl)ether
AB-53-NE-1S	91.05751	108601	< 480.		UG/KG	7/10/91		Bis(2-chloroisopropyl)ether
AB-53-NE-1S	91.05751	117817	< 480.		UG/KG	7/10/91		Bis(2-ethylhexyl)phthalate
AB-53-NE-1S	91.05751	101553	< 480.		UG/KG	7/10/91		4-Bromophenylphenyl ether
AB-53-NE-1S	91.05751	85687	< 480.		UG/KG	7/10/91		Butylbenzyl phthalate
AB-53-NE-1S	91.05751	59507	< 480.		UG/KG	7/10/91		4-Chloro-3-methylphenol
AB-53-NE-1S	91.05751	106478	< 480.		UG/KG	7/10/91		4-Chloroaniline

AB-53-NE-1S	91.05751	91587	< 480.	UG/KG	7/10/91	2-Chloronaphthalene
AB-53-NE-1S	91.05751	95578	< 480.	UG/KG	7/10/91	o-Chlorophenol
AB-53-NE-1S	91.05751	7005723	< 480.	UG/KG	7/10/91	4-Chlorophenylphenyl ether
AB-53-NE-1S	91.05751	218019	< 480.	UG/KG	7/10/91	Chrysene
AB-53-NE-1S	91.05751	84742	< 480.	UG/KG	7/10/91	Di-n-butyl phthalate
AB-53-NE-1S	91.05751	117840	< 480.	UG/KG	7/10/91	Di-n-octyl phthalate
AB-53-NE-1S	91.05751	53703	< 480.	UG/KG	7/10/91	Dibenzo[a,h]anthracene
AB-53-NE-1S	91.05751	132649	< 480.	UG/KG	7/10/91	Dibenzofuran
AB-53-NE-1S	91.05751	95501	< 480.	UG/KG	7/10/91	o-Dichlorobenzene (1,2)
AB-53-NE-1S	91.05751	541731	< 480.	UG/KG	7/10/91	m-Dichlorobenzene (1,3)
AB-53-NE-1S	91.05751	106467	< 480.	UG/KG	7/10/91	p-Dichlorobenzene (1,4)
AB-53-NE-1S	91.05751	91941	< 480.	UG/KG	7/10/91	3,3'-Dichlorobenzidine
AB-53-NE-1S	91.05751	120832	< 480.	UG/KG	7/10/91	2,4-Dichlorophenol
AB-53-NE-1S	91.05751	84662	< 480.	UG/KG	7/10/91	Diethyl phthalate
AB-53-NE-1S	91.05751	131113	< 480.	UG/KG	7/10/91	Dimethyl phthalate
AB-53-NE-1S	91.05751	105679	< 480.	UG/KG	7/10/91	2,4-Dimethylphenol
AB-53-NE-1S	91.05751	51285	< 480.	UG/KG	7/10/91	2,4-Dinitrophenol
AB-53-NE-1S	91.05751	121142	< 480.	UG/KG	7/10/91	2,4-Dinitrotoluene
AB-53-NE-1S	91.05751	606202	< 480.	UG/KG	7/10/91	2,6-Dinitrotoluene
AB-53-NE-1S	91.05751	206440	< 480.	UG/KG	7/10/91	Fluoranthene
AB-53-NE-1S	91.05751	86737	< 480.	UG/KG	7/10/91	Fluorene
AB-53-NE-1S	91.05751	118741	< 480.	UG/KG	7/10/91	Hexachlorobenzene
AB-53-NE-1S	91.05751	87683	< 480.	UG/KG	7/10/91	Hexachlorobutadiene
AB-53-NE-1S	91.05751	77474	< 480.	UG/KG	7/10/91	Hexachlorocyclopentadiene
AB-53-NE-1S	91.05751	67721	< 480.	UG/KG	7/10/91	Hexachloroethane
AB-53-NE-1S	91.05751	193395	< 480.	UG/KG	7/10/91	Indeno[1,2,3-cd]pyrene
AB-53-NE-1S	91.05751	78591	< 480.	UG/KG	7/10/91	Isophorone
AB-53-NE-1S	91.05751	534521	< 480.	UG/KG	7/10/91	2-Methyl-4,6-dinitrophenol
AB-53-NE-1S	91.05751	91576	< 480.	UG/KG	7/10/91	2-Methylnaphthalene
AB-53-NE-1S	91.05751	95487	< 480.	UG/KG	7/10/91	2-Methylphenol
AB-53-NE-1S	91.05751	106445	< 480.	UG/KG	7/10/91	4-Methylphenol
AB-53-NE-1S	91.05751	91203	< 480.	UG/KG	7/10/91	Naphthalene
AB-53-NE-1S	91.05751	88744	< 480.	UG/KG	7/10/91	2-Nitroaniline
AB-53-NE-1S	91.05751	99092	< 480.	UG/KG	7/10/91	3-Nitroaniline
AB-53-NE-1S	91.05751	100016	< 480.	UG/KG	7/10/91	4-Nitroaniline
AB-53-NE-1S	91.05751	98953	< 480.	UG/KG	7/10/91	Nitrobenzene
AB-53-NE-1S	91.05751	88755	< 480.	UG/KG	7/10/91	2-Nitrophenol
AB-53-NE-1S	91.05751	100027	< 480.	UG/KG	7/10/91	4-Nitrophenol
AB-53-NE-1S	91.05751	621647	< 480.	UG/KG	7/10/91	N-Nitrosodi-n-propylamine
AB-53-NE-1S	91.05751	62759	< 480.	UG/KG	7/10/91	N-Nitrosodimethylamine
AB-53-NE-1S	91.05751	86306	< 480.	UG/KG	7/10/91	N-Nitrosodiphenylamine
AB-53-NE-1S	91.05751	87865	< 480.	UG/KG	7/10/91	Pentachlorophenol
AB-53-NE-1S	91.05751	85018	< 480.	UG/KG	7/10/91	Phenanthrene
AB-53-NE-1S	91.05751	108952	< 480.	UG/KG	7/10/91	Phenol
AB-53-NE-1S	91.05751	129000	< 480.	UG/KG	7/10/91	Pyrene

AB-53-NE-1S	91.05751	120821	< 480.	UG/KG	7/10/91	1,2,4-Trichlorobenzene
AB-53-NE-1S	91.05751	95954	< 480.	UG/KG	7/10/91	2,4,5-Trichlorophenol
AB-53-NE-1S	91.05751	88062	< 480.	UG/KG	7/10/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05751

none

Customer Sample Duplicate Results for Sample # 91.05751

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05751

none

Matrix Spike Results for Sample # 91.05751

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	AMOUNT SPIKED	AMOUNT RECOVERED	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-1S	91.05751	83329	2416.63	1300.	UG/KG	7/10/91		Acenaphthene
AB-53-NE-1S	91.05751	59507	4833.25	2300.	UG/KG	7/10/91		4-Chloro-3-methylphenol
AB-53-NE-1S	91.05751	95578	4833.25	1600.	UG/KG	7/10/91		o-Chlorophenol
AB-53-NE-1S	91.05751	106467	2416.63	570.	UG/KG	7/10/91		p-Dichlorobenzene (1,4)
AB-53-NE-1S	91.05751	121142	2416.63	1100.	UG/KG	7/10/91		2,4-Dinitrotoluene
AB-53-NE-1S	91.05751	100027	4833.25	2200.	UG/KG	7/10/91		4-Nitrophenol
AB-53-NE-1S	91.05751	621647	2416.63	1100.	UG/KG	7/10/91		N-Nitrosodi-n-propylamine
AB-53-NE-1S	91.05751	87865	4833.25	2800.	UG/KG	7/10/91		Pentachlorophenol
AB-53-NE-1S	91.05751	108952	4833.25	2000.	UG/KG	7/10/91		Phenol
AB-53-NE-1S	91.05751	129000	2416.63	1600.	UG/KG	7/10/91		Pyrene
AB-53-NE-1S	91.05751	120821	2416.63	910.	UG/KG	7/10/91		1,2,4-Trichlorobenzene

Matrix Spike Duplicate Results for Sample # 91.05751

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	AMOUNT SPIKED	AMOUNT RECOVERED	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-1S	91.05751	83329	2460.63	1900.	UG/KG	7/10/91		Acenaphthene
AB-53-NE-1S	91.05751	59507	4921.26	3400.	UG/KG	7/10/91		4-Chloro-3-methylphenol
AB-53-NE-1S	91.05751	95578	4921.26	3100.	UG/KG	7/10/91		o-Chlorophenol
AB-53-NE-1S	91.05751	106467	2460.63	1600.	UG/KG	7/10/91		p-Dichlorobenzene (1,4)
AB-53-NE-1S	91.05751	121142	2460.63	1500.	UG/KG	7/10/91		2,4-Dinitrotoluene
AB-53-NE-1S	91.05751	100027	4921.26	3100.	UG/KG	7/10/91		4-Nitrophenol
AB-53-NE-1S	91.05751	621647	2460.63	2100.	UG/KG	7/10/91		N-Nitrosodi-n-propylamine

AB-53-NE-1S	91.05751	87865	4921.26	3900.	UG/KG	7/10/91	Pentachlorophenol
AB-53-NE-1S	91.05751	108952	4921.26	3600.	UG/KG	7/10/91	Phenol
AB-53-NE-1S	91.05751	129000	2460.63	2300.	UG/KG	7/10/91	Pyrene
AB-53-NE-1S	91.05751	120821	2460.63	2000.	UG/KG	7/10/91	1,2,4-Trichlorobenzene

REPORT NUMBER: 10818

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: C ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05752

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/03/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-2S	91.05752	83329	< 630.		UG/KG	7/10/91		Acenaphthene
AB-53-NE-2S	91.05752	208968	< 630.		UG/KG	7/10/91		Acenaphthylene
AB-53-NE-2S	91.05752	62533	< 630.		UG/KG	7/10/91		Aniline
AB-53-NE-2S	91.05752	120127	< 630.		UG/KG	7/10/91		Anthracene
AB-53-NE-2S	91.05752	103333	< 630.		UG/KG	7/10/91		Azobenzene
AB-53-NE-2S	91.05752	92875	< 630.		UG/KG	7/10/91		m-Benzidine
AB-53-NE-2S	91.05752	56553	< 630.		UG/KG	7/10/91		Benzo[a]anthracene
AB-53-NE-2S	91.05752	50328	< 630.		UG/KG	7/10/91		Benzo[a]pyrene
AB-53-NE-2S	91.05752	205992	< 630.		UG/KG	7/10/91		Benzo[b]fluoranthene
AB-53-NE-2S	91.05752	191242	< 630.		UG/KG	7/10/91		Benzo[g,h,i]perylene
AB-53-NE-2S	91.05752	207089	< 630.		UG/KG	7/10/91		Benzo[k]fluoranthene
AB-53-NE-2S	91.05752	65850	< 630.		UG/KG	7/10/91		Benzoic acid
AB-53-NE-2S	91.05752	100516	< 630.		UG/KG	7/10/91		Benzyl alcohol
AB-53-NE-2S	91.05752	111911	< 630.		UG/KG	7/10/91		Bis(2-chloroethoxy)methane
AB-53-NE-2S	91.05752	111444	< 630.		UG/KG	7/10/91		Bis(2-chloroethyl)ether
AB-53-NE-2S	91.05752	108601	< 630.		UG/KG	7/10/91		Bis(2-chloroisopropyl)ether
AB-53-NE-2S	91.05752	117817	< 630.		UG/KG	7/10/91		Bis(2-ethylhexyl)phthalate
AB-53-NE-2S	91.05752	101553	< 630.		UG/KG	7/10/91		4-Bromophenylphenyl ether
AB-53-NE-2S	91.05752	85687	< 630.		UG/KG	7/10/91		Butylbenzyl phthalate
AB-53-NE-2S	91.05752	59507	< 630.		UG/KG	7/10/91		4-Chloro-3-methylphenol
AB-53-NE-2S	91.05752	106478	< 630.		UG/KG	7/10/91		4-Chloroaniline

AB-53-NE-2S	91.05752	91587	< 630.	UG/KG	7/10/91	2-Chloronaphthalene
AB-53-NE-2S	91.05752	95578	< 630.	UG/KG	7/10/91	o-Chlorophenol
AB-53-NE-2S	91.05752	7005723	< 630.	UG/KG	7/10/91	4-Chlorophenylphenyl ether
AB-53-NE-2S	91.05752	218019	< 630.	UG/KG	7/10/91	Chrysene
AB-53-NE-2S	91.05752	84742	< 630.	UG/KG	7/10/91	Di-n-butyl phthalate
AB-53-NE-2S	91.05752	117840	< 630.	UG/KG	7/10/91	Di-n-octyl phthalate
AB-53-NE-2S	91.05752	53703	< 630.	UG/KG	7/10/91	Dibenzo[a,h]anthracene
AB-53-NE-2S	91.05752	132649	< 630.	UG/KG	7/10/91	Dibenzofuran
AB-53-NE-2S	91.05752	95501	< 630.	UG/KG	7/10/91	o-Dichlorobenzene (1,2)
AB-53-NE-2S	91.05752	541731	< 630.	UG/KG	7/10/91	m-Dichlorobenzene (1,3)
AB-53-NE-2S	91.05752	106467	< 630.	UG/KG	7/10/91	p-Dichlorobenzene (1,4)
AB-53-NE-2S	91.05752	91941	< 630.	UG/KG	7/10/91	3,3'-Dichlorobenzidine
AB-53-NE-2S	91.05752	120832	< 630.	UG/KG	7/10/91	2,4-Dichlorophenol
AB-53-NE-2S	91.05752	84662	< 630.	UG/KG	7/10/91	Diethyl phthalate
AB-53-NE-2S	91.05752	131113	< 630.	UG/KG	7/10/91	Dimethyl phthalate
AB-53-NE-2S	91.05752	105679	< 630.	UG/KG	7/10/91	2,4-Dimethylphenol
AB-53-NE-2S	91.05752	51285	< 630.	UG/KG	7/10/91	2,4-Dinitrophenol
AB-53-NE-2S	91.05752	121142	< 630.	UG/KG	7/10/91	2,4-Dinitrotoluene
AB-53-NE-2S	91.05752	606202	< 630.	UG/KG	7/10/91	2,6-Dinitrotoluene
AB-53-NE-2S	91.05752	206440	< 630.	UG/KG	7/10/91	Fluoranthene
AB-53-NE-2S	91.05752	86737	< 630.	UG/KG	7/10/91	Fluorene
AB-53-NE-2S	91.05752	118741	< 630.	UG/KG	7/10/91	Hexachlorobenzene
AB-53-NE-2S	91.05752	87683	< 630.	UG/KG	7/10/91	Hexachlorobutadiene
AB-53-NE-2S	91.05752	77474	< 630.	UG/KG	7/10/91	Hexachlorocyclopentadiene
AB-53-NE-2S	91.05752	67721	< 630.	UG/KG	7/10/91	Hexachloroethane
AB-53-NE-2S	91.05752	193395	< 630.	UG/KG	7/10/91	Indeno[1,2,3-cd]pyrene
AB-53-NE-2S	91.05752	78591	< 630.	UG/KG	7/10/91	Isophorone
AB-53-NE-2S	91.05752	534521	< 630.	UG/KG	7/10/91	2-Methyl-4,6-dinitrophenol
AB-53-NE-2S	91.05752	91576	< 630.	UG/KG	7/10/91	2-Methylnaphthalene
AB-53-NE-2S	91.05752	95487	< 630.	UG/KG	7/10/91	2-Methylphenol
AB-53-NE-2S	91.05752	106445	< 630.	UG/KG	7/10/91	4-Methylphenol
AB-53-NE-2S	91.05752	91203	< 630.	UG/KG	7/10/91	Naphthalene
AB-53-NE-2S	91.05752	88744	< 630.	UG/KG	7/10/91	2-Nitroaniline
AB-53-NE-2S	91.05752	99092	< 630.	UG/KG	7/10/91	3-Nitroaniline
AB-53-NE-2S	91.05752	100016	< 630.	UG/KG	7/10/91	4-Nitroaniline
AB-53-NE-2S	91.05752	98953	< 630.	UG/KG	7/10/91	Nitrobenzene
AB-53-NE-2S	91.05752	88755	< 630.	UG/KG	7/10/91	2-Nitrophenol
AB-53-NE-2S	91.05752	100027	< 630.	UG/KG	7/10/91	4-Nitrophenol
AB-53-NE-2S	91.05752	621647	< 630.	UG/KG	7/10/91	N-Nitrosodi-n-propylamine
AB-53-NE-2S	91.05752	62759	< 630.	UG/KG	7/10/91	N-Nitrosodimethylamine
AB-53-NE-2S	91.05752	86306	< 630.	UG/KG	7/10/91	N-Nitrosodiphenylamine
AB-53-NE-2S	91.05752	87865	< 630.	UG/KG	7/10/91	Pentachlorophenol
AB-53-NE-2S	91.05752	85018	< 630.	UG/KG	7/10/91	Phenanthrene
AB-53-NE-2S	91.05752	108952	< 630.	UG/KG	7/10/91	Phenol
AB-53-NE-2S	91.05752	129000	< 630.	UG/KG	7/10/91	Pyrene

AB-53-NE-2S	91.05752	120821	< 630.	UG/KG	7/10/91	1,2,4-Trichlorobenzene
AB-53-NE-2S	91.05752	95954	< 630.	UG/KG	7/10/91	2,4,5-Trichlorophenol
AB-53-NE-2S	91.05752	88062	< 630.	UG/KG	7/10/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05752

none

Customer Sample Duplicate Results for Sample # 91.05752

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05752

none

REPORT NUMBER: 10818

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: C ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05753

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/03/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-3S	91.05753	83329	< 650.		UG/KG	7/10/91		Acenaphthene
AB-53-NE-3S	91.05753	208968	< 650.		UG/KG	7/10/91		Acenaphthylene
AB-53-NE-3S	91.05753	62533	< 650.		UG/KG	7/10/91		Aniline
AB-53-NE-3S	91.05753	120127	< 650.		UG/KG	7/10/91		Anthracene
AB-53-NE-3S	91.05753	103333	< 650.		UG/KG	7/10/91		Azobenzene
AB-53-NE-3S	91.05753	92875	< 650.		UG/KG	7/10/91		m-Benzidine
AB-53-NE-3S	91.05753	56553	< 650.		UG/KG	7/10/91		Benzo[a]anthracene
AB-53-NE-3S	91.05753	50328	< 650.		UG/KG	7/10/91		Benzo[a]pyrene
AB-53-NE-3S	91.05753	205992	< 650.		UG/KG	7/10/91		Benzo[b]fluoranthene
AB-53-NE-3S	91.05753	191242	< 650.		UG/KG	7/10/91		Benzo[g,h,i]perylene
AB-53-NE-3S	91.05753	207089	< 650.		UG/KG	7/10/91		Benzo[k]fluoranthene
AB-53-NE-3S	91.05753	65850	< 650.		UG/KG	7/10/91		Benzoic acid
AB-53-NE-3S	91.05753	100516	< 650.		UG/KG	7/10/91		Benzyl alcohol
AB-53-NE-3S	91.05753	111911	< 650.		UG/KG	7/10/91		Bis(2-chloroethoxy)methane
AB-53-NE-3S	91.05753	111444	< 650.		UG/KG	7/10/91		Bis(2-chloroethyl)ether
AB-53-NE-3S	91.05753	108601	< 650.		UG/KG	7/10/91		Bis(2-chloroisopropyl)ether
AB-53-NE-3S	91.05753	117817	< 650.		UG/KG	7/10/91		Bis(2-ethylhexyl)phthalate
AB-53-NE-3S	91.05753	101553	< 650.		UG/KG	7/10/91		4-Bromophenylphenyl ether
AB-53-NE-3S	91.05753	85687	< 650.		UG/KG	7/10/91		Butylbenzyl phthalate
AB-53-NE-3S	91.05753	59507	< 650.		UG/KG	7/10/91		4-Chloro-3-methylphenol
AB-53-NE-3S	91.05753	106478	< 650.		UG/KG	7/10/91		4-Chloroaniline

AB-53-NE-3S	91.05753	91587	< 650.	UG/KG	7/10/91	2-Chloronaphthalene
AB-53-NE-3S	91.05753	95578	< 650.	UG/KG	7/10/91	o-Chlorophenol
AB-53-NE-3S	91.05753	7005723	< 650.	UG/KG	7/10/91	4-Chlorophenylphenyl ether
AB-53-NE-3S	91.05753	218019	< 650.	UG/KG	7/10/91	Chrysene
AB-53-NE-3S	91.05753	84742	< 650.	UG/KG	7/10/91	Di-n-butyl phthalate
AB-53-NE-3S	91.05753	117840	< 650.	UG/KG	7/10/91	Di-n-octyl phthalate
AB-53-NE-3S	91.05753	53703	< 650.	UG/KG	7/10/91	Dibenzo[a,h]anthracene
AB-53-NE-3S	91.05753	132649	< 650.	UG/KG	7/10/91	Dibenzofuran
AB-53-NE-3S	91.05753	95501	< 650.	UG/KG	7/10/91	o-Dichlorobenzene (1,2)
AB-53-NE-3S	91.05753	541731	< 650.	UG/KG	7/10/91	m-Dichlorobenzene (1,3)
AB-53-NE-3S	91.05753	106467	< 650.	UG/KG	7/10/91	p-Dichlorobenzene (1,4)
AB-53-NE-3S	91.05753	91941	< 650.	UG/KG	7/10/91	3,3'-Dichlorobenzidine
AB-53-NE-3S	91.05753	120832	< 650.	UG/KG	7/10/91	2,4-Dichlorophenol
AB-53-NE-3S	91.05753	84662	< 650.	UG/KG	7/10/91	Diethyl phthalate
AB-53-NE-3S	91.05753	131113	< 650.	UG/KG	7/10/91	Dimethyl phthalate
AB-53-NE-3S	91.05753	105679	< 650.	UG/KG	7/10/91	2,4-Dimethylphenol
AB-53-NE-3S	91.05753	51285	< 650.	UG/KG	7/10/91	2,4-Dinitrophenol
AB-53-NE-3S	91.05753	121142	< 650.	UG/KG	7/10/91	2,4-Dinitrotoluene
AB-53-NE-3S	91.05753	606202	< 650.	UG/KG	7/10/91	2,6-Dinitrotoluene
AB-53-NE-3S	91.05753	206440	< 650.	UG/KG	7/10/91	Fluoranthene
AB-53-NE-3S	91.05753	86737	< 650.	UG/KG	7/10/91	Fluorene
AB-53-NE-3S	91.05753	118741	< 650.	UG/KG	7/10/91	Hexachlorobenzene
AB-53-NE-3S	91.05753	87683	< 650.	UG/KG	7/10/91	Hexachlorobutadiene
AB-53-NE-3S	91.05753	77474	< 650.	UG/KG	7/10/91	Hexachlorocyclopentadiene
AB-53-NE-3S	91.05753	67721	< 650.	UG/KG	7/10/91	Hexachloroethane
AB-53-NE-3S	91.05753	193395	< 650.	UG/KG	7/10/91	Indeno[1,2,3-cd]pyrene
AB-53-NE-3S	91.05753	78591	< 650.	UG/KG	7/10/91	Isophorone
AB-53-NE-3S	91.05753	534521	< 650.	UG/KG	7/10/91	2-Methyl-4,6-dinitrophenol
AB-53-NE-3S	91.05753	91576	< 650.	UG/KG	7/10/91	2-Methylnaphthalene
AB-53-NE-3S	91.05753	95487	< 650.	UG/KG	7/10/91	2-Methylphenol
AB-53-NE-3S	91.05753	106445	< 650.	UG/KG	7/10/91	4-Methylphenol
AB-53-NE-3S	91.05753	91203	< 650.	UG/KG	7/10/91	Naphthalene
AB-53-NE-3S	91.05753	88744	< 650.	UG/KG	7/10/91	2-Nitroaniline
AB-53-NE-3S	91.05753	99092	< 650.	UG/KG	7/10/91	3-Nitroaniline
AB-53-NE-3S	91.05753	100016	< 650.	UG/KG	7/10/91	4-Nitroaniline
AB-53-NE-3S	91.05753	98953	< 650.	UG/KG	7/10/91	Nitrobenzene
AB-53-NE-3S	91.05753	88755	< 650.	UG/KG	7/10/91	2-Nitrophenol
AB-53-NE-3S	91.05753	100027	< 650.	UG/KG	7/10/91	4-Nitrophenol
AB-53-NE-3S	91.05753	621647	< 650.	UG/KG	7/10/91	N-Nitrosodi-n-propylamine
AB-53-NE-3S	91.05753	62759	< 650.	UG/KG	7/10/91	N-Nitrosodimethylamine
AB-53-NE-3S	91.05753	86306	< 650.	UG/KG	7/10/91	N-Nitrosodiphenylamine
AB-53-NE-3S	91.05753	87865	< 650.	UG/KG	7/10/91	Pentachlorophenol
AB-53-NE-3S	91.05753	85018	< 650.	UG/KG	7/10/91	Phenanthrene
AB-53-NE-3S	91.05753	108952	< 650.	UG/KG	7/10/91	Phenol
AB-53-NE-3S	91.05753	129000	< 650.	UG/KG	7/10/91	Pyrene

AB-53-NE-3S	91.05753	120821	< 650.	UG/KG	7/10/91	1,2,4-Trichlorobenzene
AB-53-NE-3S	91.05753	95954	< 650.	UG/KG	7/10/91	2,4,5-Trichlorophenol
AB-53-NE-3S	91.05753	88062	< 650.	UG/KG	7/10/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05753

none

Customer Sample Duplicate Results for Sample # 91.05753

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05753

none

REPORT NUMBER 10818

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: C ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05757

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/03/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-SO-1S	91.05757	83329	< 660.		UG/KG	7/10/91		Acenaphthene
AB-53-SO-1S	91.05757	208968	< 660.		UG/KG	7/10/91		Acenaphthylene
AB-53-SO-1S	91.05757	62533	< 660.		UG/KG	7/10/91		Aniline
AB-53-SO-1S	91.05757	120127	< 660.		UG/KG	7/10/91		Anthracene
AB-53-SO-1S	91.05757	103333	< 660.		UG/KG	7/10/91		Azobenzene
AB-53-SO-1S	91.05757	92875	< 660.		UG/KG	7/10/91		m-Benzidine
AB-53-SO-1S	91.05757	56553	< 660.		UG/KG	7/10/91		Benzo[a]anthracene
AB-53-SO-1S	91.05757	50328	< 660.		UG/KG	7/10/91		Benzo[a]pyrene
AB-53-SO-1S	91.05757	205992	< 660.		UG/KG	7/10/91		Benzo[b]fluoranthene
AB-53-SO-1S	91.05757	191242	< 660.		UG/KG	7/10/91		Benzo[g,h,i]perylene
AB-53-SO-1S	91.05757	207089	< 660.		UG/KG	7/10/91		Benzo[k]fluoranthene
AB-53-SO-1S	91.05757	65850	< 660.		UG/KG	7/10/91		Benzoic acid
AB-53-SO-1S	91.05757	100516	< 660.		UG/KG	7/10/91		Benzyl alcohol
AB-53-SO-1S	91.05757	111911	< 660.		UG/KG	7/10/91		Bis(2-chloroethoxy)methane
AB-53-SO-1S	91.05757	111444	< 660.		UG/KG	7/10/91		Bis(2-chloroethyl)ether
AB-53-SO-1S	91.05757	108601	< 660.		UG/KG	7/10/91		Bis(2-chloroisopropyl)ether
AB-53-SO-1S	91.05757	117817	< 660.		UG/KG	7/10/91		Bis(2-ethylhexyl)phthalate
AB-53-SO-1S	91.05757	101553	< 660.		UG/KG	7/10/91		4-Bromophenylphenyl ether
AB-53-SO-1S	91.05757	85687	< 660.		UG/KG	7/10/91		Butylbenzyl phthalate
AB-53-SO-1S	91.05757	59507	< 660.		UG/KG	7/10/91		4-Chloro-3-methylphenol
AB-53-SO-1S	91.05757	106478	< 660.		UG/KG	7/10/91		4-Chloroaniline

AB-53-SO-1S	91.05757	91587	< 660.		UG/KG	7/10/91	2-Chloronaphthalene
AB-53-SO-1S	91.05757	95578	< 660.		UG/KG	7/10/91	o-Chlorophenol
AB-53-SO-1S	91.05757	7005723	< 660.		UG/KG	7/10/91	4-Chlorophenylphenyl ether
AB-53-SO-1S	91.05757	218019	< 660.		UG/KG	7/10/91	Chrysene
AB-53-SO-1S	91.05757	84742	1400.	420.	UG/KG	7/10/91	Di-n-butyl phthalate
AB-53-SO-1S	91.05757	117840	< 660.		UG/KG	7/10/91	Di-n-octyl phthalate
AB-53-SO-1S	91.05757	53703	< 660.		UG/KG	7/10/91	Dibenzo[a,h]anthracene
AB-53-SO-1S	91.05757	132649	< 660.		UG/KG	7/10/91	Dibenzofuran
AB-53-SO-1S	91.05757	95501	< 660.		UG/KG	7/10/91	o-Dichlorobenzene (1,2)
AB-53-SO-1S	91.05757	541731	< 660.		UG/KG	7/10/91	m-Dichlorobenzene (1,3)
AB-53-SO-1S	91.05757	106467	< 660.		UG/KG	7/10/91	p-Dichlorobenzene (1,4)
AB-53-SO-1S	91.05757	91941	< 660.		UG/KG	7/10/91	3,3'-Dichlorobenzidine
AB-53-SO-1S	91.05757	120832	< 660.		UG/KG	7/10/91	2,4-Dichlorophenol
AB-53-SO-1S	91.05757	84662	< 660.		UG/KG	7/10/91	Diethyl phthalate
AB-53-SO-1S	91.05757	131113	< 660.		UG/KG	7/10/91	Dimethyl phthalate
AB-53-SO-1S	91.05757	105679	< 660.		UG/KG	7/10/91	2,4-Dimethylphenol
AB-53-SO-1S	91.05757	51285	< 660.		UG/KG	7/10/91	2,4-Dinitrophenol
AB-53-SO-1S	91.05757	121142	< 660.		UG/KG	7/10/91	2,4-Dinitrotoluene
AB-53-SO-1S	91.05757	606202	< 660.		UG/KG	7/10/91	2,6-Dinitrotoluene
AB-53-SO-1S	91.05757	206440	< 660.		UG/KG	7/10/91	Fluoranthene
AB-53-SO-1S	91.05757	86737	< 660.		UG/KG	7/10/91	Fluorene
AB-53-SO-1S	91.05757	118741	< 660.		UG/KG	7/10/91	Hexachlorobenzene
AB-53-SO-1S	91.05757	87683	< 660.		UG/KG	7/10/91	Hexachlorobutadiene
AB-53-SO-1S	91.05757	77474	< 660.		UG/KG	7/10/91	Hexachlorocyclopentadiene
AB-53-SO-1S	91.05757	67721	< 660.		UG/KG	7/10/91	Hexachloroethane
AB-53-SO-1S	91.05757	193395	< 660.		UG/KG	7/10/91	Indeno[1,2,3-cd]pyrene
AB-53-SO-1S	91.05757	78591	< 660.		UG/KG	7/10/91	Isophorone
AB-53-SO-1S	91.05757	534521	< 660.		UG/KG	7/10/91	2-Methyl-4,6-dinitrophenol
AB-53-SO-1S	91.05757	91576	< 660.		UG/KG	7/10/91	2-Methylnaphthalene
AB-53-SO-1S	91.05757	95487	< 660.		UG/KG	7/10/91	2-Methylphenol
AB-53-SO-1S	91.05757	106445	< 660.		UG/KG	7/10/91	4-Methylphenol
AB-53-SO-1S	91.05757	91203	< 660.		UG/KG	7/10/91	Naphthalene
AB-53-SO-1S	91.05757	88744	< 660.		UG/KG	7/10/91	2-Nitroaniline
AB-53-SO-1S	91.05757	99092	< 660.		UG/KG	7/10/91	3-Nitroaniline
AB-53-SO-1S	91.05757	100016	< 660.		UG/KG	7/10/91	4-Nitroaniline
AB-53-SO-1S	91.05757	98953	< 660.		UG/KG	7/10/91	Nitrobenzene
AB-53-SO-1S	91.05757	88755	< 660.		UG/KG	7/10/91	2-Nitrophenol
AB-53-SO-1S	91.05757	100027	< 660.		UG/KG	7/10/91	4-Nitrophenol
AB-53-SO-1S	91.05757	621647	< 660.		UG/KG	7/10/91	N-Nitrosodi-n-propylamine
AB-53-SO-1S	91.05757	62759	< 660.		UG/KG	7/10/91	N-Nitrosodimethylamine
AB-53-SO-1S	91.05757	86306	< 660.		UG/KG	7/10/91	N-Nitrosodiphenylamine
AB-53-SO-1S	91.05757	87865	< 660.		UG/KG	7/10/91	Pentachlorophenol
AB-53-SO-1S	91.05757	85018	< 660.		UG/KG	7/10/91	Phenanthrene
AB-53-SO-1S	91.05757	108952	< 660.		UG/KG	7/10/91	Phenol
AB-53-SO-1S	91.05757	129000	< 660.		UG/KG	7/10/91	Pyrene

AB-53-SO-1S	91.05757	120821	< 660.	UG/KG	7/10/91	1,2,4-Trichlorobenzene
AB-53-SO-1S	91.05757	95954	< 660.	UG/KG	7/10/91	2,4,5-Trichlorophenol
AB-53-SO-1S	91.05757	88062	< 660.	UG/KG	7/10/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05757

none

Customer Sample Duplicate Results for Sample # 91.05757

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05757

none

REPORT NUMBER: 10818

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: C ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05758

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/03/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-SO-2S	91.05758	83329	< 660.		UG/KG	7/10/91		Acenaphthene
AB-53-SO-2S	91.05758	208968	< 660.		UG/KG	7/10/91		Acenaphthylene
AB-53-SO-2S	91.05758	62533	< 660.		UG/KG	7/10/91		Aniline
AB-53-SO-2S	91.05758	120127	< 660.		UG/KG	7/10/91		Anthracene
AB-53-SO-2S	91.05758	103333	< 660.		UG/KG	7/10/91		Azobenzene
AB-53-SO-2S	91.05758	92875	< 660.		UG/KG	7/10/91		m-Benzidine
AB-53-SO-2S	91.05758	56553	< 660.		UG/KG	7/10/91		Benzo[a]anthracene
AB-53-SO-2S	91.05758	50328	< 660.		UG/KG	7/10/91		Benzo[a]pyrene
AB-53-SO-2S	91.05758	205992	< 660.		UG/KG	7/10/91		Benzo[b]fluoranthene
AB-53-SO-2S	91.05758	191242	< 660.		UG/KG	7/10/91		Benzo[g,h,i]perylene
AB-53-SO-2S	91.05758	207089	< 660.		UG/KG	7/10/91		Benzo[k]fluoranthene
AB-53-SO-2S	91.05758	65850	< 660.		UG/KG	7/10/91		Benzoic acid
AB-53-SO-2S	91.05758	100516	< 660.		UG/KG	7/10/91		Benzyl alcohol
AB-53-SO-2S	91.05758	111911	< 660.		UG/KG	7/10/91		Bis(2-chloroethoxy)methane
AB-53-SO-2S	91.05758	111444	< 660.		UG/KG	7/10/91		Bis(2-chloroethyl)ether
AB-53-SO-2S	91.05758	108601	< 660.		UG/KG	7/10/91		Bis(2-chloroisopropyl)ether
AB-53-SO-2S	91.05758	117817	< 660.		UG/KG	7/10/91		Bis(2-ethylhexyl)phthalate
AB-53-SO-2S	91.05758	101553	< 660.		UG/KG	7/10/91		4-Bromophenylphenyl ether
AB-53-SO-2S	91.05758	85687	< 660.		UG/KG	7/10/91		Butylbenzyl phthalate
AB-53-SO-2S	91.05758	59507	< 660.		UG/KG	7/10/91		4-Chloro-3-methylphenol
AB-53-SO-2S	91.05758	106478	< 660.		UG/KG	7/10/91		4-Chloroaniline

AB-53-SO-2S	91.05758	91587	< 660.	UG/KG	7/10/91	2-Chloronaphthalene
AB-53-SO-2S	91.05758	95578	< 660.	UG/KG	7/10/91	o-Chlorophenol
AB-53-SO-2S	91.05758	7005723	< 660.	UG/KG	7/10/91	4-Chlorophenylphenyl ether
AB-53-SO-2S	91.05758	218019	< 660.	UG/KG	7/10/91	Chrysene
AB-53-SO-2S	91.05758	84742	< 660.	UG/KG	7/10/91	Di-n-butyl phthalate
AB-53-SO-2S	91.05758	117840	< 660.	UG/KG	7/10/91	Di-n-octyl phthalate
AB-53-SO-2S	91.05758	53703	< 660.	UG/KG	7/10/91	Dibenzo[a,h]anthracene
AB-53-SO-2S	91.05758	132649	< 660.	UG/KG	7/10/91	Dibenzofuran
AB-53-SO-2S	91.05758	95501	< 660.	UG/KG	7/10/91	o-Dichlorobenzene (1,2)
AB-53-SO-2S	91.05758	541731	< 660.	UG/KG	7/10/91	m-Dichlorobenzene (1,3)
AB-53-SO-2S	91.05758	106467	< 660.	UG/KG	7/10/91	p-Dichlorobenzene (1,4)
AB-53-SO-2S	91.05758	91941	< 660.	UG/KG	7/10/91	3,3'-Dichlorobenzidine
AB-53-SO-2S	91.05758	120832	< 660.	UG/KG	7/10/91	2,4-Dichlorophenol
AB-53-SO-2S	91.05758	84662	< 660.	UG/KG	7/10/91	Diethyl phthalate
AB-53-SO-2S	91.05758	131113	< 660.	UG/KG	7/10/91	Dimethyl phthalate
AB-53-SO-2S	91.05758	105679	< 660.	UG/KG	7/10/91	2,4-Dimethylphenol
AB-53-SO-2S	91.05758	51285	< 660.	UG/KG	7/10/91	2,4-Dinitrophenol
AB-53-SO-2S	91.05758	121142	< 660.	UG/KG	7/10/91	2,4-Dinitrotoluene
AB-53-SO-2S	91.05758	606202	< 660.	UG/KG	7/10/91	2,6-Dinitrotoluene
AB-53-SO-2S	91.05758	206440	< 660.	UG/KG	7/10/91	Fluoranthene
AB-53-SO-2S	91.05758	86737	< 660.	UG/KG	7/10/91	Fluorene
AB-53-SO-2S	91.05758	118741	< 660.	UG/KG	7/10/91	Hexachlorobenzene
AB-53-SO-2S	91.05758	87683	< 660.	UG/KG	7/10/91	Hexachlorobutadiene
AB-53-SO-2S	91.05758	77474	< 660.	UG/KG	7/10/91	Hexachlorocyclopentadiene
AB-53-SO-2S	91.05758	67721	< 660.	UG/KG	7/10/91	Hexachloroethane
AB-53-SO-2S	91.05758	193395	< 660.	UG/KG	7/10/91	Indeno[1,2,3-cd]pyrene
AB-53-SO-2S	91.05758	78591	< 660.	UG/KG	7/10/91	Isophorone
AB-53-SO-2S	91.05758	534521	< 660.	UG/KG	7/10/91	2-Methyl-4,6-dinitrophenol
AB-53-SO-2S	91.05758	91576	< 660.	UG/KG	7/10/91	2-Methylnaphthalene
AB-53-SO-2S	91.05758	95487	< 660.	UG/KG	7/10/91	2-Methylphenol
AB-53-SO-2S	91.05758	106445	< 660.	UG/KG	7/10/91	4-Methylphenol
AB-53-SO-2S	91.05758	91203	< 660.	UG/KG	7/10/91	Naphthalene
AB-53-SO-2S	91.05758	88744	< 660.	UG/KG	7/10/91	2-Nitroaniline
AB-53-SO-2S	91.05758	99092	< 660.	UG/KG	7/10/91	3-Nitroaniline
AB-53-SO-2S	91.05758	100016	< 660.	UG/KG	7/10/91	4-Nitroaniline
AB-53-SO-2S	91.05758	98953	< 660.	UG/KG	7/10/91	Nitrobenzene
AB-53-SO-2S	91.05758	88755	< 660.	UG/KG	7/10/91	2-Nitrophenol
AB-53-SO-2S	91.05758	100027	< 660.	UG/KG	7/10/91	4-Nitrophenol
AB-53-SO-2S	91.05758	621647	< 660.	UG/KG	7/10/91	N-Nitrosodi-n-propylamine
AB-53-SO-2S	91.05758	62759	< 660.	UG/KG	7/10/91	N-Nitrosodimethylamine
AB-53-SO-2S	91.05758	86306	< 660.	UG/KG	7/10/91	N-Nitrosodiphenylamine
AB-53-SO-2S	91.05758	87865	< 660.	UG/KG	7/10/91	Pentachlorophenol
AB-53-SO-2S	91.05758	85018	< 660.	UG/KG	7/10/91	Phenanthrene
AB-53-SO-2S	91.05758	108952	< 660.	UG/KG	7/10/91	Phenol
AB-53-SO-2S	91.05758	129000	< 660.	UG/KG	7/10/91	Pyrene

AB-53-SO-2S	91.05758	120821	< 660.	UG/KG	7/10/91	1,2,4-Trichlorobenzene
AB-53-SO-2S	91.05758	95954	< 660.	UG/KG	7/10/91	2,4,5-Trichlorophenol
AB-53-SO-2S	91.05758	88062	< 660.	UG/KG	7/10/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05758

none

Customer Sample Duplicate Results for Sample # 91.05758

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05758

none

REPORT NUMBER: 10818

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: C ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05759

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/03/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-SO-3S	91.05759	83329	< 490.		UG/KG	7/10/91		Acenaphthene
AB-53-SO-3S	91.05759	208968	< 490.		UG/KG	7/10/91		Acenaphthylene
AB-53-SO-3S	91.05759	62533	< 490.		UG/KG	7/10/91		Aniline
AB-53-SO-3S	91.05759	120127	< 490.		UG/KG	7/10/91		Anthracene
AB-53-SO-3S	91.05759	103333	< 490.		UG/KG	7/10/91		Azobenzene
AB-53-SO-3S	91.05759	92875	< 490.		UG/KG	7/10/91		m-Benzidine
AB-53-SO-3S	91.05759	56553	< 490.		UG/KG	7/10/91		Benzo[a]anthracene
AB-53-SO-3S	91.05759	50328	< 490.		UG/KG	7/10/91		Benzo[a]pyrene
AB-53-SO-3S	91.05759	205992	< 490.		UG/KG	7/10/91		Benzo[b]fluoranthene
AB-53-SO-3S	91.05759	191242	< 490.		UG/KG	7/10/91		Benzo[g,h,i]perylene
AB-53-SO-3S	91.05759	207089	< 490.		UG/KG	7/10/91		Benzo[k]fluoranthene
AB-53-SO-3S	91.05759	65850	< 490.		UG/KG	7/10/91		Benzoic acid
AB-53-SO-3S	91.05759	100516	< 490.		UG/KG	7/10/91		Benzyl alcohol
AB-53-SO-3S	91.05759	111911	< 490.		UG/KG	7/10/91		Bis(2-chloroethoxy)methane
AB-53-SO-3S	91.05759	111444	< 490.		UG/KG	7/10/91		Bis(2-chloroethyl)ether
AB-53-SO-3S	91.05759	108601	< 490.		UG/KG	7/10/91		Bis(2-chloroisopropyl)ether
AB-53-SO-3S	91.05759	117817	< 490.		UG/KG	7/10/91		Bis(2-ethylhexyl)phthalate
AB-53-SO-3S	91.05759	101553	< 490.		UG/KG	7/10/91		4-Bromophenylphenyl ether
AB-53-SO-3S	91.05759	85687	< 490.		UG/KG	7/10/91		Butylbenzyl phthalate
AB-53-SO-3S	91.05759	59507	< 490.		UG/KG	7/10/91		4-Chloro-3-methylphenol
AB-53-SO-3S	91.05759	106478	< 490.		UG/KG	7/10/91		4-Chloroaniline

AB-53-SO-3S	91.05759	91587	< 490.	UG/KG	7/10/91	2-Chloronaphthalene
AB-53-SO-3S	91.05759	95578	< 490.	UG/KG	7/10/91	o-Chlorophenol
AB-53-SO-3S	91.05759	7005723	< 490.	UG/KG	7/10/91	4-Chlorophenylphenyl ether
AB-53-SO-3S	91.05759	218019	< 490.	UG/KG	7/10/91	Chrysene
AB-53-SO-3S	91.05759	84742	< 490.	UG/KG	7/10/91	Di-n-butyl phthalate
AB-53-SO-3S	91.05759	117840	< 490.	UG/KG	7/10/91	Di-n-octyl phthalate
AB-53-SO-3S	91.05759	53703	< 490.	UG/KG	7/10/91	Dibenzo[a,h]anthracene
AB-53-SO-3S	91.05759	132649	< 490.	UG/KG	7/10/91	Dibenzofuran
AB-53-SO-3S	91.05759	95501	< 490.	UG/KG	7/10/91	o-Dichlorobenzene (1,2)
AB-53-SO-3S	91.05759	541731	< 490.	UG/KG	7/10/91	m-Dichlorobenzene (1,3)
AB-53-SO-3S	91.05759	106467	< 490.	UG/KG	7/10/91	p-Dichlorobenzene (1,4)
AB-53-SO-3S	91.05759	91941	< 490.	UG/KG	7/10/91	3,3'-Dichlorobenzidine
AB-53-SO-3S	91.05759	120832	< 490.	UG/KG	7/10/91	2,4-Dichlorophenol
AB-53-SO-3S	91.05759	84662	< 490.	UG/KG	7/10/91	Diethyl phthalate
AB-53-SO-3S	91.05759	131113	< 490.	UG/KG	7/10/91	Dimethyl phthalate
AB-53-SO-3S	91.05759	105679	< 490.	UG/KG	7/10/91	2,4-Dimethylphenol
AB-53-SO-3S	91.05759	51285	< 490.	UG/KG	7/10/91	2,4-Dinitrophenol
AB-53-SO-3S	91.05759	121142	< 490.	UG/KG	7/10/91	2,4-Dinitrotoluene
AB-53-SO-3S	91.05759	606202	< 490.	UG/KG	7/10/91	2,6-Dinitrotoluene
AB-53-SO-3S	91.05759	206440	< 490.	UG/KG	7/10/91	Fluoranthene
AB-53-SO-3S	91.05759	86737	< 490.	UG/KG	7/10/91	Fluorene
AB-53-SO-3S	91.05759	118741	< 490.	UG/KG	7/10/91	Hexachlorobenzene
AB-53-SO-3S	91.05759	87683	< 490.	UG/KG	7/10/91	Hexachlorobutadiene
AB-53-SO-3S	91.05759	77474	< 490.	UG/KG	7/10/91	Hexachlorocyclopentadiene
AB-53-SO-3S	91.05759	67721	< 490.	UG/KG	7/10/91	Hexachloroethane
AB-53-SO-3S	91.05759	193395	< 490.	UG/KG	7/10/91	Indeno[1,2,3-cd]pyrene
AB-53-SO-3S	91.05759	78591	< 490.	UG/KG	7/10/91	Isophorone
AB-53-SO-3S	91.05759	534521	< 490.	UG/KG	7/10/91	2-Methyl-4,6-dinitrophenol
AB-53-SO-3S	91.05759	91576	< 490.	UG/KG	7/10/91	2-Methylnaphthalene
AB-53-SO-3S	91.05759	95487	< 490.	UG/KG	7/10/91	2-Methylphenol
AB-53-SO-3S	91.05759	106445	< 490.	UG/KG	7/10/91	4-Methylphenol
AB-53-SO-3S	91.05759	91203	< 490.	UG/KG	7/10/91	Naphthalene
AB-53-SO-3S	91.05759	88744	< 490.	UG/KG	7/10/91	2-Nitroaniline
AB-53-SO-3S	91.05759	99092	< 490.	UG/KG	7/10/91	3-Nitroaniline
AB-53-SO-3S	91.05759	100016	< 490.	UG/KG	7/10/91	4-Nitroaniline
AB-53-SO-3S	91.05759	98953	< 490.	UG/KG	7/10/91	Nitrobenzene
AB-53-SO-3S	91.05759	88755	< 490.	UG/KG	7/10/91	2-Nitrophenol
AB-53-SO-3S	91.05759	100027	< 490.	UG/KG	7/10/91	4-Nitrophenol
AB-53-SO-3S	91.05759	621647	< 490.	UG/KG	7/10/91	N-Nitrosodi-n-propylamine
AB-53-SO-3S	91.05759	62759	< 490.	UG/KG	7/10/91	N-Nitrosodimethylamine
AB-53-SO-3S	91.05759	86306	< 490.	UG/KG	7/10/91	N-Nitrosodiphenylamine
AB-53-SO-3S	91.05759	87865	< 490.	UG/KG	7/10/91	Pentachlorophenol
AB-53-SO-3S	91.05759	85018	< 490.	UG/KG	7/10/91	Phenanthrene
AB-53-SO-3S	91.05759	108952	< 490.	UG/KG	7/10/91	Phenol
AB-53-SO-3S	91.05759	129000	< 490.	UG/KG	7/10/91	Pyrene

AB-53-SO-3S	91.05759	120821	< 490.	UG/KG	7/10/91	1,2,4-Trichlorobenzene
AB-53-SO-3S	91.05759	95954	< 490.	UG/KG	7/10/91	2,4,5-Trichlorophenol
AB-53-SO-3S	91.05759	88062	< 490.	UG/KG	7/10/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05759

none

Customer Sample Duplicate Results for Sample # 91.05759

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05759

none

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********** HSE-9 QUALITY ASSURANCE REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: C ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

SUMMARY OF CONTROL STATUS OF OPEN (NON-BLIND) QA SAMPLES RUN WITH THIS BATCH

There were no open (non-blind) Quality Control materials run with the samples reported above for one of the following reasons:

____ Only qualitative data requested

____ Only Blind QC samples run with this batch.

____ No QC samples run with this sample batch.

____ No QC samples for this constituent and matrix type available within HSE-9

SUMMARY OF CONTROL STATUS OF BLANK QC SAMPLES RUN WITH THIS BATCH

Blank Results

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	RESULT	UNCERTAINTY	UNITS	CERTIFIED VALUE	CERTIFIED VALUE UNCERTAINTY	COMPLETION DATE	COMMENT	COMPOUN
00.20227	91.05774	83329	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Acenaphthene
00.20227	91.05774	208968	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Acenaphthylene
00.20227	91.05774	62533	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Aniline
00.20227	91.05774	120127	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Anthracene
00.20227	91.05774	103333	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Azobenzene
00.20227	91.05774	92875	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	m-Benzidine
00.20227	91.05774	56553	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Benzo[a]anthracene
00.20227	91.05774	50328	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Benzo[a]pyrene
00.20227	91.05774	205992	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Benzo[b]fluoranthene
00.20227	91.05774	191242	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Benzo[g,h,i]perylene
00.20227	91.05774	207089	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Benzo[k]fluoranthene
00.20227	91.05774	65850	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Benzoic acid
00.20227	91.05774	100516	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Benzyl alcohol
00.20227	91.05774	111911	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Bis(2-chloroethoxy)methane
00.20227	91.05774	111444	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Bis(2-chloroethyl)ether
00.20227	91.05774	108601	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Bis(2-chloroisopropyl)ether
00.20227	91.05774	117817	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Bis(2-ethylhexyl)phthalate
00.20227	91.05774	101553	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	4-Bromophenylphenyl ether
00.20227	91.05774	85687	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Butylbenzyl phthalate
00.20227	91.05774	59507	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	4-Chloro-3-methylphenol
00.20227	91.05774	106478	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	4-Chloroaniline
00.20227	91.05774	91587	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	2-Chloronaphthalene
00.20227	91.05774	95578	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	o-Chlorophenol
00.20227	91.05774	7005723	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	4-Chlorophenylphenyl ether
00.20227	91.05774	218019	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Chrysene
00.20227	91.05774	84742	600.	180.	UG/KG	0.0		7/10/91	OUT OF CONTROL	Di-n-butyl phthalate
00.20227	91.05774	117840	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Di-n-octyl phthalate
00.20227	91.05774	53703	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Dibenzo[a,h]anthracene
00.20227	91.05774	132649	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	Dibenzofuran
00.20227	91.05774	95501	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	o-Dichlorobenzene (1,2)
00.20227	91.05774	541731	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	m-Dichlorobenzene (1,3)
00.20227	91.05774	106467	< 330.		UG/KG	0.0		7/10/91	UNDER CONTROL	p-Dichlorobenzene (1,4)

00.20227	91.05774	91941	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	3,3'-Dichlorobenzidine
00.20227	91.05774	120832	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	2,4-Dichlorophenol
00.20227	91.05774	84662	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Diethyl phthalate
00.20227	91.05774	131113	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Dimethyl phthalate
00.20227	91.05774	105679	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	2,4-Dimethylphenol
00.20227	91.05774	51285	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	2,4-Dinitrophenol
00.20227	91.05774	121142	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	2,4-Dinitrotoluene
00.20227	91.05774	606202	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	2,6-Dinitrotoluene
00.20227	91.05774	206440	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Fluoranthene
00.20227	91.05774	86737	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Fluorene
00.20227	91.05774	118741	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Hexachlorobenzene
00.20227	91.05774	87683	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Hexachlorobutadiene
00.20227	91.05774	77474	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Hexachlorocyclopentadiene
00.20227	91.05774	67721	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Hexachloroethane
00.20227	91.05774	193395	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Indeno[1,2,3-cd]pyrene
00.20227	91.05774	78591	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Isophorone
00.20227	91.05774	534521	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	2-Methyl-4,6-dinitrophenol
00.20227	91.05774	91576	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	2-Methylnaphthalene
00.20227	91.05774	95487	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	2-Methylphenol
00.20227	91.05774	106445	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	4-Methylphenol
00.20227	91.05774	91203	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Naphthalene
00.20227	91.05774	88744	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	2-Nitroaniline
00.20227	91.05774	99092	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	3-Nitroaniline
00.20227	91.05774	100016	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	4-Nitroaniline
00.20227	91.05774	98953	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Nitrobenzene
00.20227	91.05774	88755	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	2-Nitrophenol
00.20227	91.05774	100027	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	4-Nitrophenol
00.20227	91.05774	621647	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	N-Nitrosodi-n-propylamine
00.20227	91.05774	62759	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	N-Nitrosodimethylamine
00.20227	91.05774	86306	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	N-Nitrosodiphenylamine
00.20227	91.05774	87865	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Pentachlorophenol
00.20227	91.05774	85018	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Phenanthrene
00.20227	91.05774	108952	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Phenol
00.20227	91.05774	129000	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	Pyrene
00.20227	91.05774	120821	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	1,2,4-Trichlorobenzene
00.20227	91.05774	95954	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	2,4,5-Trichlorophenol
00.20227	91.05774	88062	< 330.	UG/KG	0.0	7/10/91	UNDER CONTROL	2,4,6-Trichlorophenol

Blank Spike Results

none

Blank Spike Duplicate Results

none

SUMMARY OF CONTROL STATUS OF BLIND QA SAMPLES RUN WITH THIS BATCH

Blind QC Results, Sample # 91.05773

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/03/91 Date Analyzed: 7/05/91

SAMPLE NUM	ANALYSIS	RESULT	UNCERTAINTY	UNITS	CERTIFIED VALUE	CERTIFIED VALUE UNCERTAINTY	COMPLETION DATE	COMMENT	COMPOUND-NAME
91.05773	83329	3.3	0.99	MG/KG	5.8	0.6	7/10/91	WARNING 2-3 SIG	Acenaphthene
91.05773	208968	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Acenaphthylene
91.05773	62533	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Aniline
91.05773	120127	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Anthracene
91.05773	103333	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Azobenzene
91.05773	92875	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	m-Benzidine
91.05773	56553	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Benzo[a]anthracene
91.05773	50328	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Benzo[a]pyrene
91.05773	205992	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Benzo[b]fluoranthene
91.05773	191242	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Benzo[g,h,i]perylene
91.05773	207089	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Benzo[k]fluoranthene
91.05773	65850	0.35	0.105	MG/KG	0.0		7/10/91	OUT OF CONTROL	Benzoic acid
91.05773	100516	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Benzyl alcohol
91.05773	111911	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Bis(2-chloroethoxy)methane
91.05773	111444	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Bis(2-chloroethyl)ether
91.05773	108601	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Bis(2-chloroisopropyl)ether
91.05773	117817	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Bis(2-ethylhexyl)phthalate
91.05773	101553	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	4-Bromophenylphenyl ether
91.05773	85687	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Butylbenzyl phthalate
91.05773	59507	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	4-Chloro-3-methylphenol
91.05773	106478	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	4-Chloroaniline
91.05773	91587	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	2-Chloronaphthalene
91.05773	95578	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	o-Chlorophenol
91.05773	7005723	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	4-Chlorophenylphenyl ether
91.05773	218019	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Chrysene
91.05773	84742	0.6	0.18	MG/KG	0.0		7/10/91	OUT OF CONTROL	Di-n-butyl phthalate
91.05773	117840	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Di-n-octyl phthalate
91.05773	53703	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Dibenzo[a,h]anthracene
91.05773	132649	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Dibenzofuran
91.05773	95501	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	o-Dichlorobenzene (1,2)
91.05773	541731	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	m-Dichlorobenzene (1,3)

91.05773	106467	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	p-Dichlorobenzene (1,4)
91.05773	91941	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	3,3'-Dichlorobenzidine
91.05773	120832	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	2,4-Dichlorophenol
91.05773	84662	3.3	0.99	MG/KG	5.6	0.6	7/10/91	UNDER CONTROL	Diethyl phthalate
91.05773	131113	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Dimethyl phthalate
91.05773	105679	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	2,4-Dimethylphenol
91.05773	51285	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	2,4-Dinitrophenol
91.05773	121142	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	2,4-Dinitrotoluene
91.05773	606202	3.8	1.14	MG/KG	5.8	0.6	7/10/91	UNDER CONTROL	2,6-Dinitrotoluene
91.05773	206440	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Fluoranthene
91.05773	86737	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Fluorene
91.05773	118741	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Hexachlorobenzene
91.05773	87683	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Hexachlorobutadiene
91.05773	77474	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Hexachlorocyclopentadiene
91.05773	67721	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Hexachloroethane
91.05773	193395	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Indeno[1,2,3-cd]pyrene
91.05773	78591	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Isophorone
91.05773	534521	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	2-Methyl-4,6-dinitrophenol
91.05773	91576	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	2-Methylnaphthalene
91.05773	95487	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	2-Methylphenol
91.05773	106445	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	4-Methylphenol
91.05773	91203	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Naphthalene
91.05773	88744	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	2-Nitroaniline
91.05773	99092	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	3-Nitroaniline
91.05773	100016	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	4-Nitroaniline
91.05773	98953	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Nitrobenzene
91.05773	88755	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	2-Nitrophenol
91.05773	100027	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	4-Nitrophenol
91.05773	621647	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	N-Nitrosodi-n-propylamine
91.05773	62759	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	N-Nitrosodimethylamine
91.05773	86306	3.4	1.02	MG/KG	5.4	0.5	7/10/91	UNDER CONTROL	N-Nitrosodiphenylamine
91.05773	87865	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Pentachlorophenol
91.05773	85018	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Phenanthrene
91.05773	108952	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Phenol
91.05773	129000	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	Pyrene
91.05773	120821	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	1,2,4-Trichlorobenzene
91.05773	95954	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	2,4,5-Trichlorophenol
91.05773	88062	< 0.33		MG/KG	0.0		7/10/91	UNDER CONTROL	2,4,6-Trichlorophenol

SURROGATE RESULTS FOR EPA SEMIVOLATILES

Surrogate 1 = 2-Fluorophenol (CAS # = 367124)
Surrogate 2 = Phenol-d5 (CAS # = 4165622)
Surrogate 3 = Nitrobenzene-d5 (CAS # = 4165600)
Surrogate 4 = 2-Fluorobiphenyl (CAS # = 321608)

Surrogate 5 = 2,4,6-Tribromophenol (CAS # = 118796)
Surrogate 6 = p-Terphenyl-d14 (CAS # =)

SAMPLE NUMBER	UNITS	Surrogate 1	Surrogate 2	Surrogate 3	Surrogate 4	Surrogate 5	Surrogate 6	COMPLETION DATE
91.05743	%	49.29	54.83	51.5	68.28	84.22	82.76	10-Jul-1991
91.05744	%	58.67	71.09	63.66	78.12	84.93	82.6	10-Jul-1991
91.05745	%	57.76	70.75	61.24	75.74	89.2	75.08	10-Jul-1991
91.05746	%	47.59	60.76	51.28	61.28	78.36	80.92	10-Jul-1991
91.05751	%	24.29	41.56	32.04	53.04	69.4	65.52	10-Jul-1991
91.05751	%	59.02	72.54	71.24	80.76	98.67	94.98	10-Jul-1991
91.05751	%	27.75	50.49	37.52	63.54	79.56	78.88	10-Jul-1991
91.05752	%	33.25	54.99	48.3	63.2	84.31	81.24	10-Jul-1991
91.05753	%	26.66	46.08	38.04	54.9	90.44	79.1	10-Jul-1991
91.05757	%	47.82	66.01	58.12	73.44	68.14	75.3	10-Jul-1991
91.05758	%	27.77	46.61	39.72	60.52	66.3	80.9	10-Jul-1991
91.05759	%	49.97	65.42	59.66	70.92	67.9	75.82	10-Jul-1991
91.05773	%	63.93	74.58	67.14	73.58	80.18	77.22	10-Jul-1991
91.05774	%	52.35	59.71	61.04	75.4	76.05	75.16	10-Jul-1991

EPA Limits:

Water	%	21 - 100	10 - 94	35 - 114	43 - 116	10 - 123	33 - 141
Soil	%	25 - 121	24 - 113	23 - 120	30 - 115	19 - 122	18 - 137

REPORT NUMBER: 10818

Analyst	Reviewer	Section Leader	QA Officer
7.11.91	7-11-91	7/11/91	7/11/91
Date	Date	Date	Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in 'Quality Assurance for Health and Environmental Chemistry: 1986,' LA-11114-MS, pp. 3-4.

****

TO: ALICE BARR
THRU: CHRIS LEIBMAN
FROM: TONEY BEGAY
REQUEST: 11673.

The following samples were analyzed for Volatile Organic Components (VOC'S) using SW 846 Purge and Trap (P/T) GC/MS method 8260 of analysis:

91.05740	91.05741	91.05742	91.05743	91.05744
91.05745	91.05746	91.05747	91.05748	91.05749
91.05750	91.05751	91.05752	91.05753	91.05754
91.05755	91.05756	91.05757	91.05758	91.05759
91.05762	91.05763	91.05764		

The matrices of these samples were sludge and wastewater. They were relatively radioactive. The samples were received in 40mL capacity vials.

Approximately 5 gram aliquot of the sludge samples was weighed out and 5 mL of ISM/PSS spiked water was added to the sample and analyzed. 5mL aliquot of the wastewater samples were spiked with ISM/PSS mix and analyzed.

Since the method blank samples were not blank subtracted, a copy of the results have been included in the report. **The 7 and 14 day holding time for the appropriate matrices were satisfied.**

RESULTS:

SAMPLE	COMPOUND	CONC.	LOQ
91.05743	TOLUENE	68.0 ug/kg	5 ug/kg
91.05744	TOLUENE	42.0 ug/kg	5 ug/kg
91.05746	TOLUENE	25.0 ug/kg	5 ug/kg
91.05758	TOLUENE	14.0 ug/kg	5 ug/kg
	p-ISOPROPYLTOLUENE	8.7 ug/kg	5 ug/kg

QC SUMMARY:

Sample 91.05743 was used for the sludge matrix spike recovery determinations. All the matrix spike compound recoveries were within the control limits except for toluene, which was above. This is a result of toluene being present in the sample. Unfortunately, the sample had a bad purge and had to be analyzed another day. This resulted in a higher toluene concentration value and therefore, a definitive matrix spike recovery could not be done.

Sample 91.05741 was used for the wastewater matrix spike recovery determinations. All the matrix spike compound recoveries were within the control limits.

There were alot of samples that had surrogate recoveries out of control. The following are the recoveries and their relation to the control limits:

SAMPLE	1,2-DCE(d4)	TOLUENE(d8)	4-BFB
91.05740			BELOW
91.05741	ABOVE	ABOVE	
91.05742		ABOVE	
91.05743			ABOVE
91.05744			ABOVE
91.05745	ABOVE		
91.05746	ABOVE		
91.05747			BELOW
91.05748			BELOW
91.05751			ABOVE
91.05752			ABOVE
91.05753			ABOVE
91.05754	ABOVE		
91.05757	ABOVE		ABOVE
91.05758			ABOVE
91.05759	ABOVE		ABOVE
91.05763	ABOVE	ABOVE	
91.05764	ABOVE		

LOS ALAMOS NATIONAL LABORATORY
HEALTH, SAFETY AND ENVIRONMENT DIVISION
HSE-9
SURROGATE RECOVERIES FOR VOLATILES
IN WATER TYPE MATRICES

REQUEST #: 11673

NUMBER OF SAMPLES: 18
MATRIX W
ANALYST: TRB
Date: 07/08/91

SURROGATE RECOVERIES

SURROGATE
RECOVERIES IN PERCENT (%)

	SAMPLE NUMBERS	TYPE	d4-1,2-dichloro-ethene	toluene-(d8)	4-bromo-fluoro-benzene
1	B91.05766	BLANK	94	96	103
2	S91.05740	SAMPLE	79	103	81 *
3	S91.05741	SAMPLE	259 *	116 *	90
4	S91.05742	SAMPLE	103	111 *	91
5	S91.05747	SAMPLE	83	106	85 *
6	S91.05748	SAMPLE	108	104	85 *
7	S91.05749	SAMPLE	99	106	86
8	S91.05750	SAMPLE	110	107	88
9	S91.05754	SAMPLE	126 *	107	93
10	S91.05755	SAMPLE	94	106	89
11	S91.05756	SAMPLE	91	106	93
12	S91.05762	SAMPLE	86	104	92
13	S91.05763	SAMPLE	216 *	113 *	93
14	S91.05764	SAMPLE	152 *	108	96
15	B91.05767	BLANK	88	107	84 *
16	M91.05741	MATRIX SPIK	88	105	82 *
17	D91.05741	MATRIX SP-D	91	107	83 *
18	S91.05765	SAMPLE	220 *	117 *	92
19					
20					
21					
22					
	Average % Surrogate Recovery...		115	106	89
	Defined Lower QC Limits (%)....		76	88	86
	Defined Upper QC Limits (%)....		114	110	115
	Observed Lower QC Limits (%)...		79	96	81
	Observed Upper QC Limits (%)...		259	116	103

"*" If % Surrogate Recovery is Followed by a "*", it is out of QC Limits.

Reviewed By: 7/9/91

B91.05772

LOS ALAMOS NATIONAL LABORATORY
HEALTH, SAFETY AND ENVIRONMENT DIVISION
HSE-9
SURROGATE RECOVERIES FOR VOLATILES
SOIL

REQUEST #: 11673

NUMBER OF SAMPLES: 15
MATRIX: S
ANALYST: TRB
Date: 07/08/91

SURROGATE RECOVERIES

SURROGATE
RECOVERIES IN PERCENT (%)

	SAMPLE NUMBERS	TYPE	d4-1,2-dichloro-ethane	toluene-(d8)	4-bromo-fluoro-benzene
1	B91.05771	BLANK	109	109	101
2	B91.05744	SAMPLE	113	105	122 *
3	B91.05745	SAMPLE	160 *	118	107
4	B91.05746	SAMPLE	122 *	105	115
5	B91.05751	SAMPLE	117	100	155 *
6	B91.05752	SAMPLE	172 *	97	161 *
7	B91.05753	SAMPLE	165 *	118 *	176
8	B91.05743	MATRIX SPK	103 *	117	140 *
9	B91.05749	MATRIX SP-DUP	33	94	114 *
10	B91.05772	BLANK	103 *	104	97
11	B91.05742	SAMPLE	115	99	101 *
12	B91.05750	SAMPLE	104	101	104 *
13	B91.05753	SAMPLE	97	97	131 *
14	B91.05757	SAMPLE	134 *	94	129 *
15	B91.05758	SAMPLE	119	95	121 *
16					
17					
18					
19					
20					
21					
22					

Average % Surrogate Recovery...	157	105	128
Defined Lower QC Limits (%)....	70	81	71
Defined Upper QC Limits (%)....	121	117	121
Observed Lower QC Limits (%)....	33	94	95
Observed Upper QC Limits (%)...	365	118	176

"*" If % Surrogate Recovery is Followed by a "*", it is out of QC Limits

Reviewed By: 7/9/91

7-8-91

LOS ALAMOS NATIONAL LABORATORY
HEALTH, SAFETY AND ENVIRONMENT DIVISION
HSE-9
MATRIX SPIKE RECOVERIES FOR VOLATILES

		DRY WT/VOL (G or ML)		DILUTION FACTOR	AMOUNT SPIKED	LOQ (UG/KG OR UG/
REQUEST #:	11673					
NUMBER OF SAMPLES:	18					
SPIKE ID: (STARTS M OR E)	M91.05741	SPIKE	5	1	50	5
SPIKE DUP ID: (STARTS D OR F)	D91.05741	SPIKE-DUP	5	1	50	5
RAW DATA WITH:	---					
ANALYST:	TRB					

	SPIKE REC.	SPIKE-DUP REC.	SPIKE % REC.	SPIKE-DUP % REC.	RPD	LOW. REC. LIM.	UPP. REC. LIM.	RPD LIM.
1,1-Dichlorethene	43	45	86%	90%	5%	61	145	14
Benzene	52	51	104%	102%	2%	76	127	11
Trichlorethene	50	49	100%	98%	2%	71	120	14
Toluene	50	48	100%	96%	4%	76	125	13
Chlorobenzene	51	48	102%	96%	6%	75	130	13

7/8/91

"*" If % Matrix Recovery is Followed by a "*", it is out of QC Limits.

Reviewed By: 7/9/91

LOS ALAMOS NATIONAL LABORATORY
HEALTH, SAFETY AND ENVIRONMENT DIVISION
HSE-9
MATRIX SPIKE RECOVERIES FOR VOLATILES

		DRY WT/VOL (G or ML)		DILUTION FACTOR	AMOUNT SPIKED	LOQ (UG/KG OR UG/
REQUEST #:	11673					
NUMBER OF SAMPLES:	15					
SPIKE ID: (STARTS M OR E)	M91.05743	SPIKE	5.68	1	44	5
SPIKE DUP ID: (STARTS D OR F)	D91.05743	SPIKE-DUP	5.39	1	-7	5
RAW DATA LOC:	---					
ANALYST:	---					

	SPIKE RED.	SPIKE-DUP RED.	SPIKE % REC.	SPIKE DUP % REC.	RPD	LOW. REC. %	UPP. REC. %	RPD %
1-Dichloroethene	83	38	83%	80%	84%+	59	172	22
Benzene	35	35	35%	7-%	14%	66	142	31
Trichloroethene	57	--	83%	77%	16%	66	137	3-
Toluene	63	100	143%+	115%	40%+	57	139	31
Chlorobenzene	43	44	74%	73%	1%	63	133	31

7/8/91

+ If % Matrix Recovery is followed by a "*", it is 0.5 of TC limits.

7/9/91

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05740

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/06/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-1W	91.05740	67641	< 20.		UG/L	7/09/91		Acetone
AB-53-NW-1W	91.05740	107028	< 100.		UG/L	7/09/91		Acrolein
AB-53-NW-1W	91.05740	107131	< 100.		UG/L	7/09/91		Acrylonitrile
AB-53-NW-1W	91.05740	71432	< 5.		UG/L	7/09/91		Benzene
AB-53-NW-1W	91.05740	108861	< 5.		UG/L	7/09/91		Bromobenzene
AB-53-NW-1W	91.05740	74975	< 5.		UG/L	7/09/91		Bromochloromethane
AB-53-NW-1W	91.05740	75274	< 5.		UG/L	7/09/91		Bromodichloromethane
AB-53-NW-1W	91.05740	75252	< 5.		UG/L	7/09/91		Bromoform
AB-53-NW-1W	91.05740	74839	< 10.		UG/L	7/09/91		Bromomethane
AB-53-NW-1W	91.05740	78933	< 20.		UG/L	7/09/91		2-Butanone
AB-53-NW-1W	91.05740	104518	< 5.		UG/L	7/09/91		n-Butylbenzene
AB-53-NW-1W	91.05740	135988	< 5.		UG/L	7/09/91		sec-Butylbenzene
AB-53-NW-1W	91.05740	98066	< 5.		UG/L	7/09/91		tert-Butylbenzene
AB-53-NW-1W	91.05740	75150	< 5.		UG/L	7/09/91		Carbon disulfide
AB-53-NW-1W	91.05740	56235	< 5.		UG/L	7/09/91		Carbon tetrachloride
AB-53-NW-1W	91.05740	108907	< 5.		UG/L	7/09/91		Chlorobenzene
AB-53-NW-1W	91.05740	124481	< 5.		UG/L	7/09/91		Chlorodibromomethane
AB-53-NW-1W	91.05740	75003	< 10.		UG/L	7/09/91		Chloroethane
AB-53-NW-1W	91.05740	110758	< 50.		UG/L	7/09/91		2-Chloroethylvinyl ether
AB-53-NW-1W	91.05740	67663	< 5.		UG/L	7/09/91		Chloroform
AB-53-NW-	91.05740	74873	< 10.		UG/L	7/09/91		Chloromethane

AB-53-NW-1W	91.05740	95498	< 5.	UG/L	7/09/91	o-Chlorotoluene
AB-53-NW-1W	91.05740	106434	< 5.	UG/L	7/09/91	p-Chlorotoluene
AB-53-NW-1W	91.05740	96128	< 10.	UG/L	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NW-1W	91.05740	106934	< 5.	UG/L	7/09/91	1,2-Dibromoethane
AB-53-NW-1W	91.05740	74953	< 5.	UG/L	7/09/91	Dibromomethane
AB-53-NW-1W	91.05740	95501	< 5.	UG/L	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NW-1W	91.05740	541731	< 5.	UG/L	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NW-1W	91.05740	106467	< 5.	UG/L	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NW-1W	91.05740	75718	< 10.	UG/L	7/09/91	Dichlorodifluoromethane
AB-53-NW-1W	91.05740	75343	< 5.	UG/L	7/09/91	1,1-Dichloroethane
AB-53-NW-1W	91.05740	107062	< 5.	UG/L	7/09/91	1,2-Dichloroethane
AB-53-NW-1W	91.05740	75354	< 5.	UG/L	7/09/91	1,1-Dichloroethene
AB-53-NW-1W	91.05740	156605	< 5.	UG/L	7/09/91	trans-1,2-Dichloroethene
AB-53-NW-1W	91.05740	156592	< 5.	UG/L	7/09/91	cis-1,2-Dichloroethylene
AB-53-NW-1W	91.05740	78875	< 5.	UG/L	7/09/91	1,2-Dichloropropane
AB-53-NW-1W	91.05740	142289	< 5.	UG/L	7/09/91	1,3-Dichloropropane
AB-53-NW-1W	91.05740	594207	< 5.	UG/L	7/09/91	2,2-Dichloropropane
AB-53-NW-1W	91.05740	563586	< 5.	UG/L	7/09/91	1,1-Dichloropropene
AB-53-NW-1W	91.05740	10061015	< 5.	UG/L	7/09/91	cis-1,3-Dichloropropene
AB-53-NW-1W	91.05740	10061026	< 5.	UG/L	7/09/91	trans-1,3-Dichloropropene
AB-53-NW-1W	91.05740	100414	< 5.	UG/L	7/09/91	Ethylbenzene
AB-53-NW-1W	91.05740	591786	< 20.	UG/L	7/09/91	2-Hexanone
AB-53-NW-1W	91.05740	98828	< 5.	UG/L	7/09/91	Isopropylbenzene
AB-53-NW-1W	91.05740	99876	< 5.	UG/L	7/09/91	4-Isopropyltoluene
AB-53-NW-1W	91.05740	74884	< 5.	UG/L	7/09/91	Methyl iodide
AB-53-NW-1W	91.05740	108101	< 20.	UG/L	7/09/91	4-Methyl-2-pentanone
AB-53-NW-1W	91.05740	75092	< 5.	UG/L	7/09/91	Methylene chloride
AB-53-NW-1W	91.05740	103651	< 5.	UG/L	7/09/91	Propylbenzene
AB-53-NW-1W	91.05740	100425	< 5.	UG/L	7/09/91	Styrene
AB-53-NW-1W	91.05740	630206	< 5.	UG/L	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NW-1W	91.05740	79345	< 5.	UG/L	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NW-1W	91.05740	127184	< 5.	UG/L	7/09/91	Tetrachloroethylene
AB-53-NW-1W	91.05740	108883	< 5.	UG/L	7/09/91	Toluene
AB-53-NW-1W	91.05740	76131	< 5.	UG/L	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NW-1W	91.05740	71556	< 5.	UG/L	7/09/91	1,1,1-Trichloroethane
AB-53-NW-1W	91.05740	79005	< 5.	UG/L	7/09/91	1,1,2-Trichloroethane
AB-53-NW-1W	91.05740	79016	< 5.	UG/L	7/09/91	Trichloroethene
AB-53-NW-1W	91.05740	75694	< 5.	UG/L	7/09/91	Trichlorofluoromethane
AB-53-NW-1W	91.05740	96184	< 5.	UG/L	7/09/91	1,2,3-Trichloropropane
AB-53-NW-1W	91.05740	95636	< 5.	UG/L	7/09/91	1,2,4-Trimethylbenzene
AB-53-NW-1W	91.05740	108678	< 5.	UG/L	7/09/91	1,3,5-Trimethylbenzene
AB-53-NW-1W	91.05740	108054	< 10.	UG/L	7/09/91	Vinyl acetate
AB-53-NW-1W	91.05740	75014	< 10.	UG/L	7/09/91	Vinyl chloride
AB-53-NW-1W	91.05740	1330207	< 5.	UG/L	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05740

none

Customer Sample Duplicate Results for Sample # 91.05740

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05740

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05741

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/06/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-2W	91.05741	67641	< 20.		UG/L	7/09/91		Acetone
AB-53-NW-2W	91.05741	107028	< 100.		UG/L	7/09/91		Acrolein
AB-53-NW-2W	91.05741	107131	< 100.		UG/L	7/09/91		Acrylonitrile
AB-53-NW-2W	91.05741	71432	< 5.		UG/L	7/09/91		Benzene
AB-53-NW-2W	91.05741	108861	< 5.		UG/L	7/09/91		Bromobenzene
AB-53-NW-2W	91.05741	74975	< 5.		UG/L	7/09/91		Bromochloromethane
AB-53-NW-2W	91.05741	75274	< 5.		UG/L	7/09/91		Bromodichloromethane
AB-53-NW-2W	91.05741	75252	< 5.		UG/L	7/09/91		Bromoform
AB-53-NW-2W	91.05741	74839	< 10.		UG/L	7/09/91		Bromomethane
AB-53-NW-2W	91.05741	78933	< 20.		UG/L	7/09/91		2-Butanone
AB-53-NW-2W	91.05741	104518	< 5.		UG/L	7/09/91		n-Butylbenzene
AB-53-NW-2W	91.05741	135988	< 5.		UG/L	7/09/91		sec-Butylbenzene
AB-53-NW-2W	91.05741	98066	< 5.		UG/L	7/09/91		tert-Butylbenzene
AB-53-NW-2W	91.05741	75150	< 5.		UG/L	7/09/91		Carbon disulfide
AB-53-NW-2W	91.05741	56235	< 5.		UG/L	7/09/91		Carbon tetrachloride
AB-53-NW-2W	91.05741	108907	< 5.		UG/L	7/09/91		Chlorobenzene
AB-53-NW-2W	91.05741	124481	< 5.		UG/L	7/09/91		Chlorodibromomethane
AB-53-NW-2W	91.05741	75003	< 10.		UG/L	7/09/91		Chloroethane
AB-53-NW-2W	91.05741	110758	< 50.		UG/L	7/09/91		2-Chloroethylvinyl ether
AB-53-NW-2W	91.05741	67663	< 5.		UG/L	7/09/91		Chloroform
AB-53-NW-2W	91.05741	74873	< 10.		UG/L	7/09/91		Chloromethane

AB-53-NW-2W	91.05741	95498	< 5.	UG/L	7/09/91	o-Chlorotoluene
AB-53-NW-2W	91.05741	106434	< 5.	UG/L	7/09/91	p-Chlorotoluene
AB-53-NW-2W	91.05741	96128	< 10.	UG/L	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NW-2W	91.05741	106934	< 5.	UG/L	7/09/91	1,2-Dibromoethane
AB-53-NW-2W	91.05741	74953	< 5.	UG/L	7/09/91	Dibromomethane
AB-53-NW-2W	91.05741	95501	< 5.	UG/L	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NW-2W	91.05741	541731	< 5.	UG/L	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NW-2W	91.05741	106467	< 5.	UG/L	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NW-2W	91.05741	75718	< 10.	UG/L	7/09/91	Dichlorodifluoromethane
AB-53-NW-2W	91.05741	75343	< 5.	UG/L	7/09/91	1,1-Dichloroethane
AB-53-NW-2W	91.05741	107062	< 5.	UG/L	7/09/91	1,2-Dichloroethane
AB-53-NW-2W	91.05741	75354	< 5.	UG/L	7/09/91	1,1-Dichloroethene
AB-53-NW-2W	91.05741	156605	< 5.	UG/L	7/09/91	trans-1,2-Dichloroethene
AB-53-NW-2W	91.05741	156592	< 5.	UG/L	7/09/91	cis-1,2-Dichloroethylene
AB-53-NW-2W	91.05741	78875	< 5.	UG/L	7/09/91	1,2-Dichloropropane
AB-53-NW-2W	91.05741	142289	< 5.	UG/L	7/09/91	1,3-Dichloropropane
AB-53-NW-2W	91.05741	594207	< 5.	UG/L	7/09/91	2,2-Dichloropropane
AB-53-NW-2W	91.05741	563586	< 5.	UG/L	7/09/91	1,1-Dichloropropene
AB-53-NW-2W	91.05741	10061015	< 5.	UG/L	7/09/91	cis-1,3-Dichloropropene
AB-53-NW-2W	91.05741	10061026	< 5.	UG/L	7/09/91	trans-1,3-Dichloropropene
AB-53-NW-2W	91.05741	100414	< 5.	UG/L	7/09/91	Ethylbenzene
AB-53-NW-2W	91.05741	591786	< 20.	UG/L	7/09/91	2-Hexanone
AB-53-NW-2W	91.05741	98828	< 5.	UG/L	7/09/91	Isopropylbenzene
AB-53-NW-2W	91.05741	99876	< 5.	UG/L	7/09/91	4-Isopropyltoluene
AB-53-NW-2W	91.05741	74884	< 5.	UG/L	7/09/91	Methyl iodide
AB-53-NW-2W	91.05741	108101	< 20.	UG/L	7/09/91	4-Methyl-2-pentanone
AB-53-NW-2W	91.05741	75092	< 5.	UG/L	7/09/91	Methylene chloride
AB-53-NW-2W	91.05741	103651	< 5.	UG/L	7/09/91	Propylbenzene
AB-53-NW-2W	91.05741	100425	< 5.	UG/L	7/09/91	Styrene
AB-53-NW-2W	91.05741	630206	< 5.	UG/L	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NW-2W	91.05741	79345	< 5.	UG/L	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NW-2W	91.05741	127184	< 5.	UG/L	7/09/91	Tetrachloroethylene
AB-53-NW-2W	91.05741	108883	< 5.	UG/L	7/09/91	Toluene
AB-53-NW-2W	91.05741	76131	< 5.	UG/L	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NW-2W	91.05741	71556	< 5.	UG/L	7/09/91	1,1,1-Trichloroethane
AB-53-NW-2W	91.05741	79005	< 5.	UG/L	7/09/91	1,1,2-Trichloroethane
AB-53-NW-2W	91.05741	79016	< 5.	UG/L	7/09/91	Trichloroethene
AB-53-NW-2W	91.05741	75694	< 5.	UG/L	7/09/91	Trichlorofluoromethane
AB-53-NW-2W	91.05741	96184	< 5.	UG/L	7/09/91	1,2,3-Trichloropropane
AB-53-NW-2W	91.05741	95636	< 5.	UG/L	7/09/91	1,2,4-Trimethylbenzene
AB-53-NW-2W	91.05741	108678	< 5.	UG/L	7/09/91	1,3,5-Trimethylbenzene
AB-53-NW-2W	91.05741	108054	< 10.	UG/L	7/09/91	Vinyl acetate
AB-53-NW-2W	91.05741	75014	< 10.	UG/L	7/09/91	Vinyl chloride
AB-53-NW-2W	91.05741	1330207	< 5.	UG/L	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05741

none

Customer Sample Duplicate Results for Sample # 91.05741

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05741

none

Matrix Spike Results for Sample # 91.05741

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	AMOUNT SPIKED	AMOUNT RECOVERED	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-2W	91.05741	71432	50.	52.	UG/L	7/09/91		Benzene
AB-53-NW-2W	91.05741	108907	50.	51.	UG/L	7/09/91		Chlorobenzene
AB-53-NW-2W	91.05741	75343	50.	43.	UG/L	7/09/91		1,1-Dichloroethane
AB-53-NW-2W	91.05741	108883	50.	50.	UG/L	7/09/91		Toluene
AB-53-NW-2W	91.05741	79016	50.	50.	UG/L	7/09/91		Trichloroethene

Matrix Spike Duplicate Results for Sample # 91.05741

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	AMOUNT SPIKED	AMOUNT RECOVERED	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-2W	91.05741	71432	50.	51.	UG/L	7/09/91		Benzene
AB-53-NW-2W	91.05741	108907	50.	48.	UG/L	7/09/91		Chlorobenzene
AB-53-NW-2W	91.05741	75343	50.	45.	UG/L	7/09/91		1,1-Dichloroethane
AB-53-NW-2W	91.05741	108883	50.	48.	UG/L	7/09/91		Toluene
AB-53-NW-2W	91.05741	79016	50.	49.	UG/L	7/09/91		Trichloroethene

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05742

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/06/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-3W	91.05742	67641	< 20.		UG/L	7/09/91		Acetone
AB-53-NW-3W	91.05742	107028	< 100.		UG/L	7/09/91		Acrolein
AB-53-NW-3W	91.05742	107131	< 100.		UG/L	7/09/91		Acrylonitrile
AB-53-NW-3W	91.05742	71432	< 5.		UG/L	7/09/91		Benzene
AB-53-NW-3W	91.05742	108861	< 5.		UG/L	7/09/91		Bromobenzene
AB-53-NW-3W	91.05742	74975	< 5.		UG/L	7/09/91		Bromochloromethane
AB-53-NW-3W	91.05742	75274	< 5.		UG/L	7/09/91		Bromodichloromethane
AB-53-NW-3W	91.05742	75252	< 5.		UG/L	7/09/91		Bromoform
AB-53-NW-3W	91.05742	74839	< 10.		UG/L	7/09/91		Bromomethane
AB-53-NW-3W	91.05742	78933	< 20.		UG/L	7/09/91		2-Butanone
AB-53-NW-3W	91.05742	104518	< 5.		UG/L	7/09/91		n-Butylbenzene
AB-53-NW-3W	91.05742	135988	< 5.		UG/L	7/09/91		sec-Butylbenzene
AB-53-NW-3W	91.05742	98066	< 5.		UG/L	7/09/91		tert-Butylbenzene
AB-53-NW-3W	91.05742	75150	< 5.		UG/L	7/09/91		Carbon disulfide
AB-53-NW-3W	91.05742	56235	< 5.		UG/L	7/09/91		Carbon tetrachloride
AB-53-NW-3W	91.05742	108907	< 5.		UG/L	7/09/91		Chlorobenzene
AB-53-NW-3W	91.05742	124481	< 5.		UG/L	7/09/91		Chlorodibromomethane
AB-53-NW-3W	91.05742	75003	< 10.		UG/L	7/09/91		Chloroethane
AB-53-NW-3W	91.05742	110758	< 50.		UG/L	7/09/91		2-Chloroethylvinyl ether
AB-53-NW-3W	91.05742	67663	< 5.		UG/L	7/09/91		Chloroform
AB-53-NW-3W	91.05742	74873	< 10.		UG/L	7/09/91		Chloromethane

AB-53-NW-3W	91.05742	95498	< 5.	UG/L	7/09/91	o-Chlorotoluene
AB-53-NW-3W	91.05742	106434	< 5.	UG/L	7/09/91	p-Chlorotoluene
AB-53-NW-3W	91.05742	96128	< 10.	UG/L	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NW-3W	91.05742	106934	< 5.	UG/L	7/09/91	1,2-Dibromoethane
AB-53-NW-3W	91.05742	74953	< 5.	UG/L	7/09/91	Dibromomethane
AB-53-NW-3W	91.05742	95501	< 5.	UG/L	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NW-3W	91.05742	541731	< 5.	UG/L	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NW-3W	91.05742	106467	< 5.	UG/L	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NW-3W	91.05742	75718	< 10.	UG/L	7/09/91	Dichlorodifluoromethane
AB-53-NW-3W	91.05742	75343	< 5.	UG/L	7/09/91	1,1-Dichloroethane
AB-53-NW-3W	91.05742	107062	< 5.	UG/L	7/09/91	1,2-Dichloroethane
AB-53-NW-3W	91.05742	75354	< 5.	UG/L	7/09/91	1,1-Dichloroethene
AB-53-NW-3W	91.05742	156605	< 5.	UG/L	7/09/91	trans-1,2-Dichloroethene
AB-53-NW-3W	91.05742	156592	< 5.	UG/L	7/09/91	cis-1,2-Dichloroethylene
AB-53-NW-3W	91.05742	78875	< 5.	UG/L	7/09/91	1,2-Dichloropropane
AB-53-NW-3W	91.05742	142289	< 5.	UG/L	7/09/91	1,3-Dichloropropane
AB-53-NW-3W	91.05742	594207	< 5.	UG/L	7/09/91	2,2-Dichloropropane
AB-53-NW-3W	91.05742	563586	< 5.	UG/L	7/09/91	1,1-Dichloropropene
AB-53-NW-3W	91.05742	10061015	< 5.	UG/L	7/09/91	cis-1,3-Dichloropropene
AB-53-NW-3W	91.05742	10061026	< 5.	UG/L	7/09/91	trans-1,3-Dichloropropene
AB-53-NW-3W	91.05742	100414	< 5.	UG/L	7/09/91	Ethylbenzene
AB-53-NW-3W	91.05742	591786	< 20.	UG/L	7/09/91	2-Hexanone
AB-53-NW-3W	91.05742	98828	< 5.	UG/L	7/09/91	Isopropylbenzene
AB-53-NW-3W	91.05742	99876	< 5.	UG/L	7/09/91	4-Isopropyltoluene
AB-53-NW-3W	91.05742	74884	< 5.	UG/L	7/09/91	Methyl iodide
AB-53-NW-3W	91.05742	108101	< 20.	UG/L	7/09/91	4-Methyl-2-pentanone
AB-53-NW-3W	91.05742	75092	< 5.	UG/L	7/09/91	Methylene chloride
AB-53-NW-3W	91.05742	103651	< 5.	UG/L	7/09/91	Propylbenzene
AB-53-NW-3W	91.05742	100425	< 5.	UG/L	7/09/91	Styrene
AB-53-NW-3W	91.05742	630206	< 5.	UG/L	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NW-3W	91.05742	79345	< 5.	UG/L	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NW-3W	91.05742	127184	< 5.	UG/L	7/09/91	Tetrachloroethylene
AB-53-NW-3W	91.05742	108883	< 5.	UG/L	7/09/91	Toluene
AB-53-NW-3W	91.05742	76131	< 5.	UG/L	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NW-3W	91.05742	71556	< 5.	UG/L	7/09/91	1,1,1-Trichloroethane
AB-53-NW-3W	91.05742	79005	< 5.	UG/L	7/09/91	1,1,2-Trichloroethane
AB-53-NW-3W	91.05742	79016	< 5.	UG/L	7/09/91	Trichloroethene
AB-53-NW-3W	91.05742	75694	< 5.	UG/L	7/09/91	Trichlorofluoromethane
AB-53-NW-3W	91.05742	96184	< 5.	UG/L	7/09/91	1,2,3-Trichloropropane
AB-53-NW-3W	91.05742	95636	< 5.	UG/L	7/09/91	1,2,4-Trimethylbenzene
AB-53-NW-3W	91.05742	108678	< 5.	UG/L	7/09/91	1,3,5-Trimethylbenzene
AB-53-NW-3W	91.05742	108054	< 10.	UG/L	7/09/91	Vinyl acetate
AB-53-NW-3W	91.05742	75014	< 10.	UG/L	7/09/91	Vinyl chloride
AB-53-NW-3W	91.05742	1330207	< 5.	UG/L	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05742

none

Customer Sample Duplicate Results for Sample # 91.05742

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05742

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05743

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/07/91 Date Analyzed: 7/07/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-1S	91.05743	67641	< 20.		UG/KG	7/09/91		Acetone
AB-53-NW-1S	91.05743	107028	< 100.		UG/KG	7/09/91		Acrolein
AB-53-NW-1S	91.05743	107131	< 100.		UG/KG	7/09/91		Acrylonitrile
AB-53-NW-1S	91.05743	71432	< 5.		UG/KG	7/09/91		Benzene
AB-53-NW-1S	91.05743	108861	< 5.		UG/KG	7/09/91		Bromobenzene
AB-53-NW-1S	91.05743	74975	< 5.		UG/KG	7/09/91		Bromochloromethane
AB-53-NW-1S	91.05743	75274	< 5.		UG/KG	7/09/91		Bromodichloromethane
AB-53-NW-1S	91.05743	75252	< 5.		UG/KG	7/09/91		Bromoform
AB-53-NW-1S	91.05743	74839	< 10.		UG/KG	7/09/91		Bromomethane
AB-53-NW-1S	91.05743	78933	< 20.		UG/KG	7/09/91		2-Butanone
AB-53-NW-1S	91.05743	104518	< 5.		UG/KG	7/09/91		n-Butylbenzene
AB-53-NW-1S	91.05743	135988	< 5.		UG/KG	7/09/91		sec-Butylbenzene
AB-53-NW-1S	91.05743	98066	< 5.		UG/KG	7/09/91		tert-Butylbenzene
AB-53-NW-1S	91.05743	75150	< 5.		UG/KG	7/09/91		Carbon disulfide
AB-53-NW-1S	91.05743	56235	< 5.		UG/KG	7/09/91		Carbon tetrachloride
AB-53-NW-1S	91.05743	108907	< 5.		UG/KG	7/09/91		Chlorobenzene
AB-53-NW-1S	91.05743	124481	< 5.		UG/KG	7/09/91		Chlorodibromomethane
AB-53-NW-1S	91.05743	75003	< 10.		UG/KG	7/09/91		Chloroethane
AB-53-NW-1S	91.05743	110758	< 50.		UG/KG	7/09/91		2-Chloroethylvinyl ether
AB-53-NW-1S	91.05743	67663	< 5.		UG/KG	7/09/91		Chloroform
AB-53-NW-1S	91.05743	74873	< 10.		UG/KG	7/09/91		Chloromethane

AB-53-NW-1S	91.05743	95498	< 5.		UG/KG	7/09/91	o-Chlorotoluene
AB-53-NW-1S	91.05743	106434	< 5.		UG/KG	7/09/91	p-Chlorotoluene
AB-53-NW-1S	91.05743	96128	< 10.		UG/KG	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NW-1S	91.05743	106934	< 5.		UG/KG	7/09/91	1,2-Dibromoethane
AB-53-NW-1S	91.05743	74953	< 5.		UG/KG	7/09/91	Dibromomethane
AB-53-NW-1S	91.05743	95501	< 5.		UG/KG	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NW-1S	91.05743	541731	< 5.		UG/KG	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NW-1S	91.05743	106467	< 5.		UG/KG	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NW-1S	91.05743	75718	< 10.		UG/KG	7/09/91	Dichlorodifluoromethane
AB-53-NW-1S	91.05743	75343	< 5.		UG/KG	7/09/91	1,1-Dichloroethane
AB-53-NW-1S	91.05743	107062	< 5.		UG/KG	7/09/91	1,2-Dichloroethane
AB-53-NW-1S	91.05743	75354	< 5.		UG/KG	7/09/91	1,1-Dichloroethene
AB-53-NW-1S	91.05743	156605	< 5.		UG/KG	7/09/91	trans-1,2-Dichloroethene
AB-53-NW-1S	91.05743	156592	< 5.		UG/KG	7/09/91	cis-1,2-Dichloroethylene
AB-53-NW-1S	91.05743	78875	< 5.		UG/KG	7/09/91	1,2-Dichloropropane
AB-53-NW-1S	91.05743	142289	< 5.		UG/KG	7/09/91	1,3-Dichloropropane
AB-53-NW-1S	91.05743	594207	< 5.		UG/KG	7/09/91	2,2-Dichloropropane
AB-53-NW-1S	91.05743	563586	< 5.		UG/KG	7/09/91	1,1-Dichloropropene
AB-53-NW-1S	91.05743	10061015	< 5.		UG/KG	7/09/91	cis-1,3-Dichloropropene
AB-53-NW-1S	91.05743	10061026	< 5.		UG/KG	7/09/91	trans-1,3-Dichloropropene
AB-53-NW-1S	91.05743	100414	< 5.		UG/KG	7/09/91	Ethylbenzene
AB-53-NW-1S	91.05743	591786	< 20.		UG/KG	7/09/91	2-Hexanone
AB-53-NW-1S	91.05743	98828	< 5.		UG/KG	7/09/91	Isopropylbenzene
AB-53-NW-1S	91.05743	99876	< 5.		UG/KG	7/09/91	4-Isopropyltoluene
AB-53-NW-1S	91.05743	74884	< 5.		UG/KG	7/09/91	Methyl iodide
AB-53-NW-1S	91.05743	108101	< 20.		UG/KG	7/09/91	4-Methyl-2-pentanone
AB-53-NW-1S	91.05743	75092	< 5.		UG/KG	7/09/91	Methylene chloride
AB-53-NW-1S	91.05743	103651	< 5.		UG/KG	7/09/91	Propylbenzene
AB-53-NW-1S	91.05743	100425	< 5.		UG/KG	7/09/91	Styrene
AB-53-NW-1S	91.05743	630206	< 5.		UG/KG	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NW-1S	91.05743	79345	< 5.		UG/KG	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NW-1S	91.05743	127184	< 5.		UG/KG	7/09/91	Tetrachloroethylene
AB-53-NW-1S	91.05743	108883	68.	20.4	UG/KG	7/09/91	Toluene
AB-53-NW-1S	91.05743	76131	< 5.		UG/KG	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NW-1S	91.05743	71556	< 5.		UG/KG	7/09/91	1,1,1-Trichloroethane
AB-53-NW-1S	91.05743	79005	< 5.		UG/KG	7/09/91	1,1,2-Trichloroethane
AB-53-NW-1S	91.05743	79016	< 5.		UG/KG	7/09/91	Trichloroethene
AB-53-NW-1S	91.05743	75694	< 5.		UG/KG	7/09/91	Trichlorofluoromethane
AB-53-NW-1S	91.05743	96184	< 5.		UG/KG	7/09/91	1,2,3-Trichloropropane
AB-53-NW-1S	91.05743	95636	< 5.		UG/KG	7/09/91	1,2,4-Trimethylbenzene
AB-53-NW-1S	91.05743	108678	< 5.		UG/KG	7/09/91	1,3,5-Trimethylbenzene
AB-53-NW-1S	91.05743	108054	< 10.		UG/KG	7/09/91	Vinyl acetate
AB-53-NW-1S	91.05743	75014	< 10.		UG/KG	7/09/91	Vinyl chloride
AB-53-NW-1S	91.05743	1330207	< 5.		UG/KG	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05743

none

Customer Sample Duplicate Results for Sample # 91.05743

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05743

none

Matrix Spike Results for Sample # 91.05743

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	AMOUNT SPIKED	AMOUNT RECOVERED	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-1S	91.05743	71432	44.48	38.	UG/KG	7/09/91		Benzene
AB-53-NW-1S	91.05743	108907	44.48	42.	UG/KG	7/09/91		Chlorobenzene
AB-53-NW-1S	91.05743	75343	44.48	28.	UG/KG	7/09/91		1,1-Dichloroethane
AB-53-NW-1S	91.05743	108883	44.48	63.	UG/KG	7/09/91		Toluene
AB-53-NW-1S	91.05743	79016	44.48	37.	UG/KG	7/09/91		Trichloroethene

Matrix Spike Duplicate Results for Sample # 91.05743

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	AMOUNT SPIKED	AMOUNT RECOVERED	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-1S	91.05743	71432	47.26	35.	UG/KG	7/09/91		Benzene
AB-53-NW-1S	91.05743	108907	47.26	44.	UG/KG	7/09/91		Chlorobenzene
AB-53-NW-1S	91.05743	75343	47.26	38.	UG/KG	7/09/91		1,1-Dichloroethane
AB-53-NW-1S	91.05743	108883	47.26	100.	UG/KG	7/09/91		Toluene
AB-53-NW-1S	91.05743	79016	47.26	46.	UG/KG	7/09/91		Trichloroethene

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05744

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/05/91 Date Analyzed: 7/05/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-2S	91.05744	67641	< 20.		UG/KG	7/09/91		Acetone
AB-53-NW-2S	91.05744	107028	< 100.		UG/KG	7/09/91		Acrolein
AB-53-NW-2S	91.05744	107131	< 100.		UG/KG	7/09/91		Acrylonitrile
AB-53-NW-2S	91.05744	71432	< 5.		UG/KG	7/09/91		Benzene
AB-53-NW-2S	91.05744	108861	< 5.		UG/KG	7/09/91		Bromobenzene
AB-53-NW-2S	91.05744	74975	< 5.		UG/KG	7/09/91		Bromochloromethane
AB-53-NW-2S	91.05744	75274	< 5.		UG/KG	7/09/91		Bromodichloromethane
AB-53-NW-2S	91.05744	75252	< 5.		UG/KG	7/09/91		Bromoform
AB-53-NW-2S	91.05744	74839	< 10.		UG/KG	7/09/91		Bromomethane
AB-53-NW-2S	91.05744	78933	< 20.		UG/KG	7/09/91		2-Butanone
AB-53-NW-2S	91.05744	104518	< 5.		UG/KG	7/09/91		n-Butylbenzene
AB-53-NW-2S	91.05744	135988	< 5.		UG/KG	7/09/91		sec-Butylbenzene
AB-53-NW-2S	91.05744	98066	< 5.		UG/KG	7/09/91		tert-Butylbenzene
AB-53-NW-2S	91.05744	75150	< 5.		UG/KG	7/09/91		Carbon disulfide
AB-53-NW-2S	91.05744	56235	< 5.		UG/KG	7/09/91		Carbon tetrachloride
AB-53-NW-2S	91.05744	108907	< 5.		UG/KG	7/09/91		Chlorobenzene
AB-53-NW-2S	91.05744	124481	< 5.		UG/KG	7/09/91		Chlorodibromomethane
AB-53-NW-2S	91.05744	75003	< 10.		UG/KG	7/09/91		Chloroethane
AB-53-NW-2S	91.05744	110758	< 50.		UG/KG	7/09/91		2-Chloroethylvinyl ether
AB-53-NW-2S	91.05744	67663	< 5.		UG/KG	7/09/91		Chloroform
AB-53-NW-2S	91.05744	74873	< 10.		UG/KG	7/09/91		Chloromethane

AB-53-NW-2S	91.05744	95498	< 5.	UG/KG	7/09/91	o-Chlorotoluene
AB-53-NW-2S	91.05744	106434	< 5.	UG/KG	7/09/91	p-Chlorotoluene
AB-53-NW-2S	91.05744	96128	< 10.	UG/KG	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NW-2S	91.05744	106934	< 5.	UG/KG	7/09/91	1,2-Dibromoethane
AB-53-NW-2S	91.05744	74953	< 5.	UG/KG	7/09/91	Dibromomethane
AB-53-NW-2S	91.05744	95501	< 5.	UG/KG	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NW-2S	91.05744	541731	< 5.	UG/KG	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NW-2S	91.05744	106467	< 5.	UG/KG	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NW-2S	91.05744	75718	< 10.	UG/KG	7/09/91	Dichlorodifluoromethane
AB-53-NW-2S	91.05744	75343	< 5.	UG/KG	7/09/91	1,1-Dichloroethane
AB-53-NW-2S	91.05744	107062	< 5.	UG/KG	7/09/91	1,2-Dichloroethane
AB-53-NW-2S	91.05744	75354	< 5.	UG/KG	7/09/91	1,1-Dichloroethene
AB-53-NW-2S	91.05744	156605	< 5.	UG/KG	7/09/91	trans-1,2-Dichloroethene
AB-53-NW-2S	91.05744	156592	< 5.	UG/KG	7/09/91	cis-1,2-Dichloroethylene
AB-53-NW-2S	91.05744	78875	< 5.	UG/KG	7/09/91	1,2-Dichloropropane
AB-53-NW-2S	91.05744	142289	< 5.	UG/KG	7/09/91	1,3-Dichloropropane
AB-53-NW-2S	91.05744	594207	< 5.	UG/KG	7/09/91	2,2-Dichloropropane
AB-53-NW-2S	91.05744	563586	< 5.	UG/KG	7/09/91	1,1-Dichloropropene
AB-53-NW-2S	91.05744	10061015	< 5.	UG/KG	7/09/91	cis-1,3-Dichloropropene
AB-53-NW-2S	91.05744	10061026	< 5.	UG/KG	7/09/91	trans-1,3-Dichloropropene
AB-53-NW-2S	91.05744	100414	< 5.	UG/KG	7/09/91	Ethylbenzene
AB-53-NW-2S	91.05744	591786	< 20.	UG/KG	7/09/91	2-Hexanone
AB-53-NW-2S	91.05744	98828	< 5.	UG/KG	7/09/91	Isopropylbenzene
AB-53-NW-2S	91.05744	99876	< 5.	UG/KG	7/09/91	4-Isopropyltoluene
AB-53-NW-2S	91.05744	74884	< 5.	UG/KG	7/09/91	Methyl iodide
AB-53-NW-2S	91.05744	108101	< 20.	UG/KG	7/09/91	4-Methyl-2-pentanone
AB-53-NW-2S	91.05744	75092	< 5.	UG/KG	7/09/91	Methylene chloride
AB-53-NW-2S	91.05744	103651	< 5.	UG/KG	7/09/91	Propylbenzene
AB-53-NW-2S	91.05744	100425	< 5.	UG/KG	7/09/91	Styrene
AB-53-NW-2S	91.05744	630206	< 5.	UG/KG	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NW-2S	91.05744	79345	< 5.	UG/KG	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NW-2S	91.05744	127184	< 5.	UG/KG	7/09/91	Tetrachloroethylene
AB-53-NW-2S	91.05744	108883	[illegible]	UG/KG	7/09/91	Toluene
AB-53-NW-2S	91.05744	76131	< 5.	UG/KG	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NW-2S	91.05744	71556	< 5.	UG/KG	7/09/91	1,1,1-Trichloroethane
AB-53-NW-2S	91.05744	79005	< 5.	UG/KG	7/09/91	1,1,2-Trichloroethane
AB-53-NW-2S	91.05744	79016	< 5.	UG/KG	7/09/91	Trichloroethene
AB-53-NW-2S	91.05744	75694	< 5.	UG/KG	7/09/91	Trichlorofluoromethane
AB-53-NW-2S	91.05744	96184	< 5.	UG/KG	7/09/91	1,2,3-Trichloropropane
AB-53-NW-2S	91.05744	95636	< 5.	UG/KG	7/09/91	1,2,4-Trimethylbenzene
AB-53-NW-2S	91.05744	108678	< 5.	UG/KG	7/09/91	1,3,5-Trimethylbenzene
AB-53-NW-2S	91.05744	108054	< 10.	UG/KG	7/09/91	Vinyl acetate
AB-53-NW-2S	91.05744	75014	< 10.	UG/KG	7/09/91	Vinyl chloride
AB-53-NW-2S	91.05744	1330207	< 5.	UG/KG	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05744

none

Customer Sample Duplicate Results for Sample # 91.05744

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05744

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05745

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/05/91 Date Analyzed: 7/05/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-3S	91.05745	67641	< 20.		UG/KG	7/09/91		Acetone
AB-53-NW-3S	91.05745	107028	< 100.		UG/KG	7/09/91		Acrolein
AB-53-NW-3S	91.05745	107131	< 100.		UG/KG	7/09/91		Acrylonitrile
AB-53-NW-3S	91.05745	71432	< 5.		UG/KG	7/09/91		Benzene
AB-53-NW-3S	91.05745	108861	< 5.		UG/KG	7/09/91		Bromobenzene
AB-53-NW-3S	91.05745	74975	< 5.		UG/KG	7/09/91		Bromochloromethane
AB-53-NW-3S	91.05745	75274	< 5.		UG/KG	7/09/91		Bromodichloromethane
AB-53-NW-3S	91.05745	75252	< 5.		UG/KG	7/09/91		Bromoform
AB-53-NW-3S	91.05745	74839	< 10.		UG/KG	7/09/91		Bromomethane
AB-53-NW-3S	91.05745	78933	< 20.		UG/KG	7/09/91		2-Butanone
AB-53-NW-3S	91.05745	104518	< 5.		UG/KG	7/09/91		n-Butylbenzene
AB-53-NW-3S	91.05745	135988	< 5.		UG/KG	7/09/91		sec-Butylbenzene
AB-53-NW-3S	91.05745	98066	< 5.		UG/KG	7/09/91		tert-Butylbenzene
AB-53-NW-3S	91.05745	75150	< 5.		UG/KG	7/09/91		Carbon disulfide
AB-53-NW-3S	91.05745	56235	< 5.		UG/KG	7/09/91		Carbon tetrachloride
AB-53-NW-3S	91.05745	108907	< 5.		UG/KG	7/09/91		Chlorobenzene
AB-53-NW-3S	91.05745	124481	< 5.		UG/KG	7/09/91		Chlorodibromomethane
AB-53-NW-3S	91.05745	75003	< 10.		UG/KG	7/09/91		Chloroethane
AB-53-NW-3S	91.05745	110758	< 50.		UG/KG	7/09/91		2-Chloroethylvinyl ether
AB-53-NW-3S	91.05745	67663	< 5.		UG/KG	7/09/91		Chloroform
AB-53-NW-3S	91.05745	74873	< 10.		UG/KG	7/09/91		Chloromethane

AB-53-NW-3S	91.05745	95498	< 5.	UG/KG	7/09/91	o-Chlorotoluene
AB-53-NW-3S	91.05745	106434	< 5.	UG/KG	7/09/91	p-Chlorotoluene
AB-53-NW-3S	91.05745	96128	< 10.	UG/KG	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NW-3S	91.05745	106934	< 5.	UG/KG	7/09/91	1,2-Dibromoethane
AB-53-NW-3S	91.05745	74953	< 5.	UG/KG	7/09/91	Dibromomethane
AB-53-NW-3S	91.05745	95501	< 5.	UG/KG	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NW-3S	91.05745	541731	< 5.	UG/KG	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NW-3S	91.05745	106467	< 5.	UG/KG	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NW-3S	91.05745	75718	< 10.	UG/KG	7/09/91	Dichlorodifluoromethane
AB-53-NW-3S	91.05745	75343	< 5.	UG/KG	7/09/91	1,1-Dichloroethane
AB-53-NW-3S	91.05745	107062	< 5.	UG/KG	7/09/91	1,2-Dichloroethane
AB-53-NW-3S	91.05745	75354	< 5.	UG/KG	7/09/91	1,1-Dichloroethene
AB-53-NW-3S	91.05745	156605	< 5.	UG/KG	7/09/91	trans-1,2-Dichloroethene
AB-53-NW-3S	91.05745	156592	< 5.	UG/KG	7/09/91	cis-1,2-Dichloroethylene
AB-53-NW-3S	91.05745	78875	< 5.	UG/KG	7/09/91	1,2-Dichloropropane
AB-53-NW-3S	91.05745	142289	< 5.	UG/KG	7/09/91	1,3-Dichloropropane
AB-53-NW-3S	91.05745	594207	< 5.	UG/KG	7/09/91	2,2-Dichloropropane
AB-53-NW-3S	91.05745	563586	< 5.	UG/KG	7/09/91	1,1-Dichloropropene
AB-53-NW-3S	91.05745	10061015	< 5.	UG/KG	7/09/91	cis-1,3-Dichloropropene
AB-53-NW-3S	91.05745	10061026	< 5.	UG/KG	7/09/91	trans-1,3-Dichloropropene
AB-53-NW-3S	91.05745	100414	< 5.	UG/KG	7/09/91	Ethylbenzene
AB-53-NW-3S	91.05745	591786	< 20.	UG/KG	7/09/91	2-Hexanone
AB-53-NW-3S	91.05745	98828	< 5.	UG/KG	7/09/91	Isopropylbenzene
AB-53-NW-3S	91.05745	99876	< 5.	UG/KG	7/09/91	4-Isopropyltoluene
AB-53-NW-3S	91.05745	74884	< 5.	UG/KG	7/09/91	Methyl iodide
AB-53-NW-3S	91.05745	108101	< 20.	UG/KG	7/09/91	4-Methyl-2-pentanone
AB-53-NW-3S	91.05745	75092	< 5.	UG/KG	7/09/91	Methylene chloride
AB-53-NW-3S	91.05745	103651	< 5.	UG/KG	7/09/91	Propylbenzene
AB-53-NW-3S	91.05745	100425	< 5.	UG/KG	7/09/91	Styrene
AB-53-NW-3S	91.05745	630206	< 5.	UG/KG	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NW-3S	91.05745	79345	< 5.	UG/KG	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NW-3S	91.05745	127184	< 5.	UG/KG	7/09/91	Tetrachloroethylene
AB-53-NW-3S	91.05745	108883	< 5.	UG/KG	7/09/91	Toluene
AB-53-NW-3S	91.05745	76131	< 5.	UG/KG	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NW-3S	91.05745	71556	< 5.	UG/KG	7/09/91	1,1,1-Trichloroethane
AB-53-NW-3S	91.05745	79005	< 5.	UG/KG	7/09/91	1,1,2-Trichloroethane
AB-53-NW-3S	91.05745	79016	< 5.	UG/KG	7/09/91	Trichloroethene
AB-53-NW-3S	91.05745	75694	< 5.	UG/KG	7/09/91	Trichlorofluoromethane
AB-53-NW-3S	91.05745	96184	< 5.	UG/KG	7/09/91	1,2,3-Trichloropropane
AB-53-NW-3S	91.05745	95636	< 5.	UG/KG	7/09/91	1,2,4-Trimethylbenzene
AB-53-NW-3S	91.05745	108678	< 5.	UG/KG	7/09/91	1,3,5-Trimethylbenzene
AB-53-NW-3S	91.05745	108054	< 10.	UG/KG	7/09/91	Vinyl acetate
AB-53-NW-3S	91.05745	75014	< 10.	UG/KG	7/09/91	Vinyl chloride
AB-53-NW-3S	91.05745	1330207	< 5.	UG/KG	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05745

none

Customer Sample Duplicate Results for Sample # 91.05745

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05745

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91,05746

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/05/91 Date Analyzed: 7/05/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-4SQ	91.05746	67641	< 20.		UG/KG	7/09/91		Acetone
AB-53-NW-4SQ	91.05746	107028	< 100.		UG/KG	7/09/91		Acrolein
AB-53-NW-4SQ	91.05746	107131	< 100.		UG/KG	7/09/91		Acrylonitrile
AB-53-NW-4SQ	91.05746	71432	< 5.		UG/KG	7/09/91		Benzene
AB-53-NW-4SQ	91.05746	108861	< 5.		UG/KG	7/09/91		Bromobenzene
AB-53-NW-4SQ	91.05746	74975	< 5.		UG/KG	7/09/91		Bromochloromethane
AB-53-NW-4SQ	91.05746	75274	< 5.		UG/KG	7/09/91		Bromodichloromethane
AB-53-NW-4SQ	91.05746	75252	< 5.		UG/KG	7/09/91		Bromoform
AB-53-NW-4SQ	91.05746	74839	< 10.		UG/KG	7/09/91		Bromomethane
AB-53-NW-4SQ	91.05746	78933	< 20.		UG/KG	7/09/91		2-Butanone
AB-53-NW-4SQ	91.05746	104518	< 5.		UG/KG	7/09/91		n-Butylbenzene
AB-53-NW-4SQ	91.05746	135988	< 5.		UG/KG	7/09/91		sec-Butylbenzene
AB-53-NW-4SQ	91.05746	98066	< 5.		UG/KG	7/09/91		tert-Butylbenzene
AB-53-NW-4SQ	91.05746	75150	< 5.		UG/KG	7/09/91		Carbon disulfide
AB-53-NW-4SQ	91.05746	56235	< 5.		UG/KG	7/09/91		Carbon tetrachloride
AB-53-NW-4SQ	91.05746	108907	< 5.		UG/KG	7/09/91		Chlorobenzene
AB-53-NW-4SQ	91.05746	124481	< 5.		UG/KG	7/09/91		Chlorodibromomethane
AB-53-NW-4SQ	91.05746	75003	< 10.		UG/KG	7/09/91		Chloroethane
AB-53-NW-4SQ	91.05746	110758	< 50.		UG/KG	7/09/91		2-Chloroethylvinyl ether
AB-53-NW-4SQ	91.05746	67663	< 5.		UG/KG	7/09/91		Chloroform
AB-53-NW-4SQ	91.05746	74873	< 10.		UG/KG	7/09/91		Chloromethane

AB-53-NW-4SQ	91.05746	95498	< 5.	UG/KG	7/09/91	o-Chlorotoluene
AB-53-NW-4SQ	91.05746	106434	< 5.	UG/KG	7/09/91	p-Chlorotoluene
AB-53-NW-4SQ	91.05746	96128	< 10.	UG/KG	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NW-4SQ	91.05746	106934	< 5.	UG/KG	7/09/91	1,2-Dibromoethane
AB-53-NW-4SQ	91.05746	74953	< 5.	UG/KG	7/09/91	Dibromomethane
AB-53-NW-4SQ	91.05746	95501	< 5.	UG/KG	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NW-4SQ	91.05746	541731	< 5.	UG/KG	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NW-4SQ	91.05746	106467	< 5.	UG/KG	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NW-4SQ	91.05746	75718	< 10.	UG/KG	7/09/91	Dichlorodifluoromethane
AB-53-NW-4SQ	91.05746	75343	< 5.	UG/KG	7/09/91	1,1-Dichloroethane
AB-53-NW-4SQ	91.05746	107062	< 5.	UG/KG	7/09/91	1,2-Dichloroethane
AB-53-NW-4SQ	91.05746	75354	< 5.	UG/KG	7/09/91	1,1-Dichloroethene
AB-53-NW-4SQ	91.05746	156605	< 5.	UG/KG	7/09/91	trans-1,2-Dichloroethene
AB-53-NW-4SQ	91.05746	156592	< 5.	UG/KG	7/09/91	cis-1,2-Dichloroethylene
AB-53-NW-4SQ	91.05746	78875	< 5.	UG/KG	7/09/91	1,2-Dichloropropane
AB-53-NW-4SQ	91.05746	142289	< 5.	UG/KG	7/09/91	1,3-Dichloropropane
AB-53-NW-4SQ	91.05746	594207	< 5.	UG/KG	7/09/91	2,2-Dichloropropane
AB-53-NW-4SQ	91.05746	563586	< 5.	UG/KG	7/09/91	1,1-Dichloropropene
AB-53-NW-4SQ	91.05746	10061015	< 5.	UG/KG	7/09/91	cis-1,3-Dichloropropene
AB-53-NW-4SQ	91.05746	10061026	< 5.	UG/KG	7/09/91	trans-1,3-Dichloropropene
AB-53-NW-4SQ	91.05746	100414	< 5.	UG/KG	7/09/91	Ethylbenzene
AB-53-NW-4SQ	91.05746	591786	< 20.	UG/KG	7/09/91	2-Hexanone
AB-53-NW-4SQ	91.05746	98828	< 5.	UG/KG	7/09/91	Isopropylbenzene
AB-53-NW-4SQ	91.05746	99876	< 5.	UG/KG	7/09/91	4-Isopropyltoluene
AB-53-NW-4SQ	91.05746	74884	< 5.	UG/KG	7/09/91	Methyl iodide
AB-53-NW-4SQ	91.05746	108101	< 20.	UG/KG	7/09/91	4-Methyl-2-pentanone
AB-53-NW-4SQ	91.05746	75092	< 5.	UG/KG	7/09/91	Methylene chloride
AB-53-NW-4SQ	91.05746	103651	< 5.	UG/KG	7/09/91	Propylbenzene
AB-53-NW-4SQ	91.05746	100425	< 5.	UG/KG	7/09/91	Styrene
AB-53-NW-4SQ	91.05746	630206	< 5.	UG/KG	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NW-4SQ	91.05746	79345	< 5.	UG/KG	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NW-4SQ	91.05746	127184	< 5.	UG/KG	7/09/91	Tetrachloroethylene
AB-53-NW-4SQ	91.05746	108883	[redacted]	UG/KG	7/09/91	Toluene
AB-53-NW-4SQ	91.05746	76131	< 5.	UG/KG	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NW-4SQ	91.05746	71556	< 5.	UG/KG	7/09/91	1,1,1-Trichloroethane
AB-53-NW-4SQ	91.05746	79005	< 5.	UG/KG	7/09/91	1,1,2-Trichloroethane
AB-53-NW-4SQ	91.05746	79016	< 5.	UG/KG	7/09/91	Trichloroethene
AB-53-NW-4SQ	91.05746	75694	< 5.	UG/KG	7/09/91	Trichlorofluoromethane
AB-53-NW-4SQ	91.05746	96184	< 5.	UG/KG	7/09/91	1,2,3-Trichloropropane
AB-53-NW-4SQ	91.05746	95636	< 5.	UG/KG	7/09/91	1,2,4-Trimethylbenzene
AB-53-NW-4SQ	91.05746	108678	< 5.	UG/KG	7/09/91	1,3,5-Trimethylbenzene
AB-53-NW-4SQ	91.05746	108054	< 10.	UG/KG	7/09/91	Vinyl acetate
AB-53-NW-4SQ	91.05746	75014	< 10.	UG/KG	7/09/91	Vinyl chloride
AB-53-NW-4SQ	91.05746	1330207	< 5.	UG/KG	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05746

none

Customer Sample Duplicate Results for Sample # 91.05746

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05746

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05747

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/06/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-1W	91.05747	67641	< 20.		UG/L	7/09/91		Acetone
AB-53-NE-1W	91.05747	107028	< 100.		UG/L	7/09/91		Acrolein
AB-53-NE-1W	91.05747	107131	< 100.		UG/L	7/09/91		Acrylonitrile
AB-53-NE-1W	91.05747	71432	< 5.		UG/L	7/09/91		Benzene
AB-53-NE-1W	91.05747	108861	< 5.		UG/L	7/09/91		Bromobenzene
AB-53-NE-1W	91.05747	74975	< 5.		UG/L	7/09/91		Bromochloromethane
AB-53-NE-1W	91.05747	75274	< 5.		UG/L	7/09/91		Bromodichloromethane
AB-53-NE-1W	91.05747	75252	< 5.		UG/L	7/09/91		Bromoform
AB-53-NE-1W	91.05747	74839	< 10.		UG/L	7/09/91		Bromomethane
AB-53-NE-1W	91.05747	78933	< 20.		UG/L	7/09/91		2-Butanone
AB-53-NE-1W	91.05747	104518	< 5.		UG/L	7/09/91		n-Butylbenzene
AB-53-NE-1W	91.05747	135988	< 5.		UG/L	7/09/91		sec-Butylbenzene
AB-53-NE-1W	91.05747	98066	< 5.		UG/L	7/09/91		tert-Butylbenzene
AB-53-NE-1W	91.05747	75150	< 5.		UG/L	7/09/91		Carbon disulfide
AB-53-NE-1W	91.05747	56235	< 5.		UG/L	7/09/91		Carbon tetrachloride
AB-53-NE-1W	91.05747	108907	< 5.		UG/L	7/09/91		Chlorobenzene
AB-53-NE-1W	91.05747	124481	< 5.		UG/L	7/09/91		Chlorodibromomethane
AB-53-NE-1W	91.05747	75003	< 10.		UG/L	7/09/91		Chloroethane
AB-53-NE-1W	91.05747	110758	< 50.		UG/L	7/09/91		2-Chloroethylvinyl ether
AB-53-NE-1W	91.05747	67663	< 5.		UG/L	7/09/91		Chloroform
AB-53-NE-1W	91.05747	74873	< 10.		UG/L	7/09/91		Chloromethane

AB-53-NE-1W	91.05747	95498	< 5.	UG/L	7/09/91	o-Chlorotoluene
AB-53-NE-1W	91.05747	106434	< 5.	UG/L	7/09/91	p-Chlorotoluene
AB-53-NE-1W	91.05747	96128	< 10.	UG/L	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NE-1W	91.05747	106934	< 5.	UG/L	7/09/91	1,2-Dibromoethane
AB-53-NE-1W	91.05747	74953	< 5.	UG/L	7/09/91	Dibromomethane
AB-53-NE-1W	91.05747	95501	< 5.	UG/L	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NE-1W	91.05747	541731	< 5.	UG/L	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NE-1W	91.05747	106467	< 5.	UG/L	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NE-1W	91.05747	75718	< 10.	UG/L	7/09/91	Dichlorodifluoromethane
AB-53-NE-1W	91.05747	75343	< 5.	UG/L	7/09/91	1,1-Dichloroethane
AB-53-NE-1W	91.05747	107062	< 5.	UG/L	7/09/91	1,2-Dichloroethane
AB-53-NE-1W	91.05747	75354	< 5.	UG/L	7/09/91	1,1-Dichloroethene
AB-53-NE-1W	91.05747	156605	< 5.	UG/L	7/09/91	trans-1,2-Dichloroethene
AB-53-NE-1W	91.05747	156592	< 5.	UG/L	7/09/91	cis-1,2-Dichloroethylene
AB-53-NE-1W	91.05747	78875	< 5.	UG/L	7/09/91	1,2-Dichloropropane
AB-53-NE-1W	91.05747	142289	< 5.	UG/L	7/09/91	1,3-Dichloropropane
AB-53-NE-1W	91.05747	594207	< 5.	UG/L	7/09/91	2,2-Dichloropropane
AB-53-NE-1W	91.05747	563586	< 5.	UG/L	7/09/91	1,1-Dichloropropene
AB-53-NE-1W	91.05747	10061015	< 5.	UG/L	7/09/91	cis-1,3-Dichloropropene
AB-53-NE-1W	91.05747	10061026	< 5.	UG/L	7/09/91	trans-1,3-Dichloropropene
AB-53-NE-1W	91.05747	100414	< 5.	UG/L	7/09/91	Ethylbenzene
AB-53-NE-1W	91.05747	591786	< 20.	UG/L	7/09/91	2-Hexanone
AB-53-NE-1W	91.05747	98828	< 5.	UG/L	7/09/91	Isopropylbenzene
AB-53-NE-1W	91.05747	99876	< 5.	UG/L	7/09/91	4-Isopropyltoluene
AB-53-NE-1W	91.05747	74884	< 5.	UG/L	7/09/91	Methyl iodide
AB-53-NE-1W	91.05747	108101	< 20.	UG/L	7/09/91	4-Methyl-2-pentanone
AB-53-NE-1W	91.05747	75092	< 5.	UG/L	7/09/91	Methylene chloride
AB-53-NE-1W	91.05747	103651	< 5.	UG/L	7/09/91	Propylbenzene
AB-53-NE-1W	91.05747	100425	< 5.	UG/L	7/09/91	Styrene
AB-53-NE-1W	91.05747	630206	< 5.	UG/L	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NE-1W	91.05747	79345	< 5.	UG/L	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NE-1W	91.05747	127184	< 5.	UG/L	7/09/91	Tetrachloroethylene
AB-53-NE-1W	91.05747	108883	< 5.	UG/L	7/09/91	Toluene
AB-53-NE-1W	91.05747	76131	< 5.	UG/L	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NE-1W	91.05747	71556	< 5.	UG/L	7/09/91	1,1,1-Trichloroethane
AB-53-NE-1W	91.05747	79005	< 5.	UG/L	7/09/91	1,1,2-Trichloroethane
AB-53-NE-1W	91.05747	79016	< 5.	UG/L	7/09/91	Trichloroethene
AB-53-NE-1W	91.05747	75694	< 5.	UG/L	7/09/91	Trichlorofluoromethane
AB-53-NE-1W	91.05747	96184	< 5.	UG/L	7/09/91	1,2,3-Trichloropropane
AB-53-NE-1W	91.05747	95636	< 5.	UG/L	7/09/91	1,2,4-Trimethylbenzene
AB-53-NE-1W	91.05747	108678	< 5.	UG/L	7/09/91	1,3,5-Trimethylbenzene
AB-53-NE-1W	91.05747	108054	< 10.	UG/L	7/09/91	Vinyl acetate
AB-53-NE-1W	91.05747	75014	< 10.	UG/L	7/09/91	Vinyl chloride
AB-53-NE-1W	91.05747	1330207	< 5.	UG/L	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05747

none

Customer Sample Duplicate Results for Sample # 91.05747

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05747

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05748

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/06/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-2W	91.05748	67641	< 20.		UG/L	7/09/91		Acetone
AB-53-NE-2W	91.05748	107028	< 100.		UG/L	7/09/91		Acrolein
AB-53-NE-2W	91.05748	107131	< 100.		UG/L	7/09/91		Acrylonitrile
AB-53-NE-2W	91.05748	71432	< 5.		UG/L	7/09/91		Benzene
AB-53-NE-2W	91.05748	108861	< 5.		UG/L	7/09/91		Bromobenzene
AB-53-NE-2W	91.05748	74975	< 5.		UG/L	7/09/91		Bromochloromethane
AB-53-NE-2W	91.05748	75274	< 5.		UG/L	7/09/91		Bromodichloromethane
AB-53-NE-2W	91.05748	75252	< 5.		UG/L	7/09/91		Bromoform
AB-53-NE-2W	91.05748	74839	< 10.		UG/L	7/09/91		Bromomethane
AB-53-NE-2W	91.05748	78933	< 20.		UG/L	7/09/91		2-Butanone
AB-53-NE-2W	91.05748	104518	< 5.		UG/L	7/09/91		n-Butylbenzene
AB-53-NE-2W	91.05748	135988	< 5.		UG/L	7/09/91		sec-Butylbenzene
AB-53-NE-2W	91.05748	98066	< 5.		UG/L	7/09/91		tert-Butylbenzene
AB-53-NE-2W	91.05748	75150	< 5.		UG/L	7/09/91		Carbon disulfide
AB-53-NE-2W	91.05748	56235	< 5.		UG/L	7/09/91		Carbon tetrachloride
AB-53-NE-2W	91.05748	108907	< 5.		UG/L	7/09/91		Chlorobenzene
AB-53-NE-2W	91.05748	124481	< 5.		UG/L	7/09/91		Chlorodibromomethane
AB-53-NE-2W	91.05748	75003	< 10.		UG/L	7/09/91		Chloroethane
AB-53-NE-2W	91.05748	110758	< 50.		UG/L	7/09/91		2-Chloroethylvinyl ether
AB-53-NE-2W	91.05748	67663	< 5.		UG/L	7/09/91		Chloroform
AB-53-NE-2W	91.05748	74873	< 10.		UG/L	7/09/91		Chloromethane

AB-53-NE-2W	91.05748	95498	< 5.	UG/L	7/09/91	o-Chlorotoluene
AB-53-NE-2W	91.05748	106434	< 5.	UG/L	7/09/91	p-Chlorotoluene
AB-53-NE-2W	91.05748	96128	< 10.	UG/L	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NE-2W	91.05748	106934	< 5.	UG/L	7/09/91	1,2-Dibromoethane
AB-53-NE-2W	91.05748	74953	< 5.	UG/L	7/09/91	Dibromomethane
AB-53-NE-2W	91.05748	95501	< 5.	UG/L	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NE-2W	91.05748	541731	< 5.	UG/L	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NE-2W	91.05748	106467	< 5.	UG/L	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NE-2W	91.05748	75718	< 10.	UG/L	7/09/91	Dichlorodifluoromethane
AB-53-NE-2W	91.05748	75343	< 5.	UG/L	7/09/91	1,1-Dichloroethane
AB-53-NE-2W	91.05748	107062	< 5.	UG/L	7/09/91	1,2-Dichloroethane
AB-53-NE-2W	91.05748	75354	< 5.	UG/L	7/09/91	1,1-Dichloroethene
AB-53-NE-2W	91.05748	156605	< 5.	UG/L	7/09/91	trans-1,2-Dichloroethene
AB-53-NE-2W	91.05748	156592	< 5.	UG/L	7/09/91	cis-1,2-Dichloroethylene
AB-53-NE-2W	91.05748	78875	< 5.	UG/L	7/09/91	1,2-Dichloropropane
AB-53-NE-2W	91.05748	142289	< 5.	UG/L	7/09/91	1,3-Dichloropropane
AB-53-NE-2W	91.05748	594207	< 5.	UG/L	7/09/91	2,2-Dichloropropane
AB-53-NE-2W	91.05748	563586	< 5.	UG/L	7/09/91	1,1-Dichloropropene
AB-53-NE-2W	91.05748	10061015	< 5.	UG/L	7/09/91	cis-1,3-Dichloropropene
AB-53-NE-2W	91.05748	10061026	< 5.	UG/L	7/09/91	trans-1,3-Dichloropropene
AB-53-NE-2W	91.05748	100414	< 5.	UG/L	7/09/91	Ethylbenzene
AB-53-NE-2W	91.05748	591786	< 20.	UG/L	7/09/91	2-Hexanone
AB-53-NE-2W	91.05748	98828	< 5.	UG/L	7/09/91	Isopropylbenzene
AB-53-NE-2W	91.05748	99876	< 5.	UG/L	7/09/91	4-Isopropyltoluene
AB-53-NE-2W	91.05748	74884	< 5.	UG/L	7/09/91	Methyl iodide
AB-53-NE-2W	91.05748	108101	< 20.	UG/L	7/09/91	4-Methyl-2-pentanone
AB-53-NE-2W	91.05748	75092	< 5.	UG/L	7/09/91	Methylene chloride
AB-53-NE-2W	91.05748	103651	< 5.	UG/L	7/09/91	Propylbenzene
AB-53-NE-2W	91.05748	100425	< 5.	UG/L	7/09/91	Styrene
AB-53-NE-2W	91.05748	630206	< 5.	UG/L	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NE-2W	91.05748	79345	< 5.	UG/L	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NE-2W	91.05748	127184	< 5.	UG/L	7/09/91	Tetrachloroethylene
AB-53-NE-2W	91.05748	108883	< 5.	UG/L	7/09/91	Toluene
AB-53-NE-2W	91.05748	76131	< 5.	UG/L	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NE-2W	91.05748	71556	< 5.	UG/L	7/09/91	1,1,1-Trichloroethane
AB-53-NE-2W	91.05748	79005	< 5.	UG/L	7/09/91	1,1,2-Trichloroethane
AB-53-NE-2W	91.05748	79016	< 5.	UG/L	7/09/91	Trichloroethene
AB-53-NE-2W	91.05748	75694	< 5.	UG/L	7/09/91	Trichlorofluoromethane
AB-53-NE-2W	91.05748	96184	< 5.	UG/L	7/09/91	1,2,3-Trichloropropane
AB-53-NE-2W	91.05748	95636	< 5.	UG/L	7/09/91	1,2,4-Trimethylbenzene
AB-53-NE-2W	91.05748	108678	< 5.	UG/L	7/09/91	1,3,5-Trimethylbenzene
AB-53-NE-2W	91.05748	108054	< 10.	UG/L	7/09/91	Vinyl acetate
AB-53-NE-2W	91.05748	75014	< 10.	UG/L	7/09/91	Vinyl chloride
AB-53-NE-2W	91.05748	1330207	< 5.	UG/L	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05748

none

Customer Sample Duplicate Results for Sample # 91.05748

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05748

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05749

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/06/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-3W	91.05749	67641	< 20.		UG/L	7/09/91		Acetone
AB-53-NE-3W	91.05749	107028	< 100.		UG/L	7/09/91		Acrolein
AB-53-NE-3W	91.05749	107131	< 100.		UG/L	7/09/91		Acrylonitrile
AB-53-NE-3W	91.05749	71432	< 5.		UG/L	7/09/91		Benzene
AB-53-NE-3W	91.05749	108861	< 5.		UG/L	7/09/91		Bromobenzene
AB-53-NE-3W	91.05749	74975	< 5.		UG/L	7/09/91		Bromochloromethane
AB-53-NE-3W	91.05749	75274	< 5.		UG/L	7/09/91		Bromodichloromethane
AB-53-NE-3W	91.05749	75252	< 5.		UG/L	7/09/91		Bromoform
AB-53-NE-3W	91.05749	74839	< 10.		UG/L	7/09/91		Bromomethane
AB-53-NE-3W	91.05749	78933	< 20.		UG/L	7/09/91		2-Butanone
AB-53-NE-3W	91.05749	104518	< 5.		UG/L	7/09/91		n-Butylbenzene
AB-53-NE-3W	91.05749	135988	< 5.		UG/L	7/09/91		sec-Butylbenzene
AB-53-NE-3W	91.05749	98066	< 5.		UG/L	7/09/91		tert-Butylbenzene
AB-53-NE-3W	91.05749	75150	< 5.		UG/L	7/09/91		Carbon disulfide
AB-53-NE-3W	91.05749	56235	< 5.		UG/L	7/09/91		Carbon tetrachloride
AB-53-NE-3W	91.05749	108907	< 5.		UG/L	7/09/91		Chlorobenzene
AB-53-NE-3W	91.05749	124481	< 5.		UG/L	7/09/91		Chlorodibromomethane
AB-53-NE-3W	91.05749	75003	< 10.		UG/L	7/09/91		Chloroethane
AB-53-NE-3W	91.05749	110758	< 50.		UG/L	7/09/91		2-Chloroethylvinyl ether
AB-53-NE-3W	91.05749	67663	< 5.		UG/L	7/09/91		Chloroform
AB-53-NE-3W	91.05749	74873	< 10.		UG/L	7/09/91		Chloromethane

AB-53-NE-3W	91.05749	95498	< 5.	UG/L	7/09/91	o-Chlorotoluene
AB-53-NE-3W	91.05749	106434	< 5.	UG/L	7/09/91	p-Chlorotoluene
AB-53-NE-3W	91.05749	96128	< 10.	UG/L	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NE-3W	91.05749	106934	< 5.	UG/L	7/09/91	1,2-Dibromoethane
AB-53-NE-3W	91.05749	74953	< 5.	UG/L	7/09/91	Dibromomethane
AB-53-NE-3W	91.05749	95501	< 5.	UG/L	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NE-3W	91.05749	541731	< 5.	UG/L	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NE-3W	91.05749	106467	< 5.	UG/L	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NE-3W	91.05749	75718	< 10.	UG/L	7/09/91	Dichlorodifluoromethane
AB-53-NE-3W	91.05749	75343	< 5.	UG/L	7/09/91	1,1-Dichloroethane
AB-53-NE-3W	91.05749	107062	< 5.	UG/L	7/09/91	1,2-Dichloroethane
AB-53-NE-3W	91.05749	75354	< 5.	UG/L	7/09/91	1,1-Dichloroethene
AB-53-NE-3W	91.05749	156605	< 5.	UG/L	7/09/91	trans-1,2-Dichloroethene
AB-53-NE-3W	91.05749	156592	< 5.	UG/L	7/09/91	cis-1,2-Dichloroethylene
AB-53-NE-3W	91.05749	78875	< 5.	UG/L	7/09/91	1,2-Dichloropropane
AB-53-NE-3W	91.05749	142289	< 5.	UG/L	7/09/91	1,3-Dichloropropane
AB-53-NE-3W	91.05749	594207	< 5.	UG/L	7/09/91	2,2-Dichloropropane
AB-53-NE-3W	91.05749	563586	< 5.	UG/L	7/09/91	1,1-Dichloropropene
AB-53-NE-3W	91.05749	10061015	< 5.	UG/L	7/09/91	cis-1,3-Dichloropropene
AB-53-NE-3W	91.05749	10061026	< 5.	UG/L	7/09/91	trans-1,3-Dichloropropene
AB-53-NE-3W	91.05749	100414	< 5.	UG/L	7/09/91	Ethylbenzene
AB-53-NE-3W	91.05749	591786	< 20.	UG/L	7/09/91	2-Hexanone
AB-53-NE-3W	91.05749	98828	< 5.	UG/L	7/09/91	Isopropylbenzene
AB-53-NE-3W	91.05749	99876	< 5.	UG/L	7/09/91	4-Isopropyltoluene
AB-53-NE-3W	91.05749	74884	< 5.	UG/L	7/09/91	Methyl iodide
AB-53-NE-3W	91.05749	108101	< 20.	UG/L	7/09/91	4-Methyl-2-pentanone
AB-53-NE-3W	91.05749	75092	< 5.	UG/L	7/09/91	Methylene chloride
AB-53-NE-3W	91.05749	103651	< 5.	UG/L	7/09/91	Propylbenzene
AB-53-NE-3W	91.05749	100425	< 5.	UG/L	7/09/91	Styrene
AB-53-NE-3W	91.05749	630206	< 5.	UG/L	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NE-3W	91.05749	79345	< 5.	UG/L	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NE-3W	91.05749	127184	< 5.	UG/L	7/09/91	Tetrachloroethylene
AB-53-NE-3W	91.05749	108883	< 5.	UG/L	7/09/91	Toluene
AB-53-NE-3W	91.05749	76131	< 5.	UG/L	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NE-3W	91.05749	71556	< 5.	UG/L	7/09/91	1,1,1-Trichloroethane
AB-53-NE-3W	91.05749	79005	< 5.	UG/L	7/09/91	1,1,2-Trichloroethane
AB-53-NE-3W	91.05749	79016	< 5.	UG/L	7/09/91	Trichloroethene
AB-53-NE-3W	91.05749	75694	< 5.	UG/L	7/09/91	Trichlorofluoromethane
AB-53-NE-3W	91.05749	96184	< 5.	UG/L	7/09/91	1,2,3-Trichloropropane
AB-53-NE-3W	91.05749	95636	< 5.	UG/L	7/09/91	1,2,4-Trimethylbenzene
AB-53-NE-3W	91.05749	108678	< 5.	UG/L	7/09/91	1,3,5-Trimethylbenzene
AB-53-NE-3W	91.05749	108054	< 10.	UG/L	7/09/91	Vinyl acetate
AB-53-NE-3W	91.05749	75014	< 10.	UG/L	7/09/91	Vinyl chloride
AB-53-NE-3W	91.05749	1330207	< 5.	UG/L	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05749

none

Customer Sample Duplicate Results for Sample # 91.05749

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05749

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05750

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/06/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-4WQ	91.05750	67641	< 20.		UG/L	7/09/91		Acetone
AB-53-NE-4WQ	91.05750	107028	< 100.		UG/L	7/09/91		Acrolein
AB-53-NE-4WQ	91.05750	107131	< 100.		UG/L	7/09/91		Acrylonitrile
AB-53-NE-4WQ	91.05750	71432	< 5.		UG/L	7/09/91		Benzene
AB-53-NE-4WQ	91.05750	108861	< 5.		UG/L	7/09/91		Bromobenzene
AB-53-NE-4WQ	91.05750	74975	< 5.		UG/L	7/09/91		Bromochloromethane
AB-53-NE-4WQ	91.05750	75274	< 5.		UG/L	7/09/91		Bromodichloromethane
AB-53-NE-4WQ	91.05750	75252	< 5.		UG/L	7/09/91		Bromoform
AB-53-NE-4WQ	91.05750	74839	< 10.		UG/L	7/09/91		Bromomethane
AB-53-NE-4WQ	91.05750	78933	< 20.		UG/L	7/09/91		2-Butanone
AB-53-NE-4WQ	91.05750	104518	< 5.		UG/L	7/09/91		n-Butylbenzene
AB-53-NE-4WQ	91.05750	135988	< 5.		UG/L	7/09/91		sec-Butylbenzene
AB-53-NE-4WQ	91.05750	98066	< 5.		UG/L	7/09/91		tert-Butylbenzene
AB-53-NE-4WQ	91.05750	75150	< 5.		UG/L	7/09/91		Carbon disulfide
AB-53-NE-4WQ	91.05750	56235	< 5.		UG/L	7/09/91		Carbon tetrachloride
AB-53-NE-4WQ	91.05750	108907	< 5.		UG/L	7/09/91		Chlorobenzene
AB-53-NE-4WQ	91.05750	124481	< 5.		UG/L	7/09/91		Chlorodibromomethane
AB-53-NE-4WQ	91.05750	75003	< 10.		UG/L	7/09/91		Chloroethane
AB-53-NE-4WQ	91.05750	110758	< 50.		UG/L	7/09/91		2-Chloroethylvinyl ether
AB-53-NE-4WQ	91.05750	67663	< 5.		UG/L	7/09/91		Chloroform
AB-53-NE-4WQ	91.05750	74873	< 10.		UG/L	7/09/91		Chloromethane

AB-53-NE-4WQ	91.05750	95498	< 5.	UG/L	7/09/91	o-Chlorotoluene
AB-53-NE-4WQ	91.05750	106434	< 5.	UG/L	7/09/91	p-Chlorotoluene
AB-53-NE-4WQ	91.05750	96128	< 10.	UG/L	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NE-4WQ	91.05750	106934	< 5.	UG/L	7/09/91	1,2-Dibromoethane
AB-53-NE-4WQ	91.05750	74953	< 5.	UG/L	7/09/91	Dibromomethane
AB-53-NE-4WQ	91.05750	95501	< 5.	UG/L	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NE-4WQ	91.05750	541731	< 5.	UG/L	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NE-4WQ	91.05750	106467	< 5.	UG/L	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NE-4WQ	91.05750	75718	< 10.	UG/L	7/09/91	Dichlorodifluoromethane
AB-53-NE-4WQ	91.05750	75343	< 5.	UG/L	7/09/91	1,1-Dichloroethane
AB-53-NE-4WQ	91.05750	107062	< 5.	UG/L	7/09/91	1,2-Dichloroethane
AB-53-NE-4WQ	91.05750	75354	< 5.	UG/L	7/09/91	1,1-Dichloroethene
AB-53-NE-4WQ	91.05750	156605	< 5.	UG/L	7/09/91	trans-1,2-Dichloroethene
AB-53-NE-4WQ	91.05750	156592	< 5.	UG/L	7/09/91	cis-1,2-Dichloroethylene
AB-53-NE-4WQ	91.05750	78875	< 5.	UG/L	7/09/91	1,2-Dichloropropane
AB-53-NE-4WQ	91.05750	142289	< 5.	UG/L	7/09/91	1,3-Dichloropropane
AB-53-NE-4WQ	91.05750	594207	< 5.	UG/L	7/09/91	2,2-Dichloropropane
AB-53-NE-4WQ	91.05750	563586	< 5.	UG/L	7/09/91	1,1-Dichloropropene
AB-53-NE-4WQ	91.05750	10061015	< 5.	UG/L	7/09/91	cis-1,3-Dichloropropene
AB-53-NE-4WQ	91.05750	10061026	< 5.	UG/L	7/09/91	trans-1,3-Dichloropropene
AB-53-NE-4WQ	91.05750	100414	< 5.	UG/L	7/09/91	Ethylbenzene
AB-53-NE-4WQ	91.05750	591786	< 20.	UG/L	7/09/91	2-Hexanone
AB-53-NE-4WQ	91.05750	98828	< 5.	UG/L	7/09/91	Isopropylbenzene
AB-53-NE-4WQ	91.05750	99876	< 5.	UG/L	7/09/91	4-Isopropyltoluene
AB-53-NE-4WQ	91.05750	74884	< 5.	UG/L	7/09/91	Methyl iodide
AB-53-NE-4WQ	91.05750	108101	< 20.	UG/L	7/09/91	4-Methyl-2-pentanone
AB-53-NE-4WQ	91.05750	75092	< 5.	UG/L	7/09/91	Methylene chloride
AB-53-NE-4WQ	91.05750	103651	< 5.	UG/L	7/09/91	Propylbenzene
AB-53-NE-4WQ	91.05750	100425	< 5.	UG/L	7/09/91	Styrene
AB-53-NE-4WQ	91.05750	630206	< 5.	UG/L	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NE-4WQ	91.05750	79345	< 5.	UG/L	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NE-4WQ	91.05750	127184	< 5.	UG/L	7/09/91	Tetrachloroethylene
AB-53-NE-4WQ	91.05750	108883	< 5.	UG/L	7/09/91	Toluene
AB-53-NE-4WQ	91.05750	76131	< 5.	UG/L	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NE-4WQ	91.05750	71556	< 5.	UG/L	7/09/91	1,1,1-Trichloroethane
AB-53-NE-4WQ	91.05750	79005	< 5.	UG/L	7/09/91	1,1,2-Trichloroethane
AB-53-NE-4WQ	91.05750	79016	< 5.	UG/L	7/09/91	Trichloroethene
AB-53-NE-4WQ	91.05750	75694	< 5.	UG/L	7/09/91	Trichlorofluoromethane
AB-53-NE-4WQ	91.05750	96184	< 5.	UG/L	7/09/91	1,2,3-Trichloropropane
AB-53-NE-4WQ	91.05750	95636	< 5.	UG/L	7/09/91	1,2,4-Trimethylbenzene
AB-53-NE-4WQ	91.05750	108678	< 5.	UG/L	7/09/91	1,3,5-Trimethylbenzene
AB-53-NE-4WQ	91.05750	108054	< 10.	UG/L	7/09/91	Vinyl acetate
AB-53-NE-4WQ	91.05750	75014	< 10.	UG/L	7/09/91	Vinyl chloride
AB-53-NE-4WQ	91.05750	1330207	< 5.	UG/L	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05750

none

Customer Sample Duplicate Results for Sample # 91.05750

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05750

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05751

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/05/91 Date Analyzed: 7/05/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-1S	91.05751	67641	< 20.		UG/KG	7/09/91		Acetone
AB-53-NE-1S	91.05751	107028	< 100.		UG/KG	7/09/91		Acrolein
AB-53-NE-1S	91.05751	107131	< 100.		UG/KG	7/09/91		Acrylonitrile
AB-53-NE-1S	91.05751	71432	< 5.		UG/KG	7/09/91		Benzene
AB-53-NE-1S	91.05751	108861	< 5.		UG/KG	7/09/91		Bromobenzene
AB-53-NE-1S	91.05751	74975	< 5.		UG/KG	7/09/91		Bromochloromethane
AB-53-NE-1S	91.05751	75274	< 5.		UG/KG	7/09/91		Bromodichloromethane
AB-53-NE-1S	91.05751	75252	< 5.		UG/KG	7/09/91		Bromoform
AB-53-NE-1S	91.05751	74839	< 10.		UG/KG	7/09/91		Bromomethane
AB-53-NE-1S	91.05751	78933	< 20.		UG/KG	7/09/91		2-Butanone
AB-53-NE-1S	91.05751	104518	< 5.		UG/KG	7/09/91		n-Butylbenzene
AB-53-NE-1S	91.05751	135988	< 5.		UG/KG	7/09/91		sec-Butylbenzene
AB-53-NE-1S	91.05751	98066	< 5.		UG/KG	7/09/91		tert-Butylbenzene
AB-53-NE-1S	91.05751	75150	< 5.		UG/KG	7/09/91		Carbon disulfide
AB-53-NE-1S	91.05751	56235	< 5.		UG/KG	7/09/91		Carbon tetrachloride
AB-53-NE-1S	91.05751	108907	< 5.		UG/KG	7/09/91		Chlorobenzene
AB-53-NE-1S	91.05751	124481	< 5.		UG/KG	7/09/91		Chlorodibromomethane
AB-53-NE-1S	91.05751	75003	< 10.		UG/KG	7/09/91		Chloroethane
AB-53-NE-1S	91.05751	110758	< 50.		UG/KG	7/09/91		2-Chloroethylvinyl ether
AB-53-NE-1S	91.05751	67663	< 5.		UG/KG	7/09/91		Chloroform
A 3-NE-1S	91.05751	74873	< 10.		UG/	7/09/91		Chloromethane

AB-53-NE-1S	91.05751	95498	< 5.	UG/KG	7/09/91	o-Chlorotoluene
AB-53-NE-1S	91.05751	106434	< 5.	UG/KG	7/09/91	p-Chlorotoluene
AB-53-NE-1S	91.05751	96128	< 10.	UG/KG	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NE-1S	91.05751	106934	< 5.	UG/KG	7/09/91	1,2-Dibromoethane
AB-53-NE-1S	91.05751	74953	< 5.	UG/KG	7/09/91	Dibromomethane
AB-53-NE-1S	91.05751	95501	< 5.	UG/KG	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NE-1S	91.05751	541731	< 5.	UG/KG	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NE-1S	91.05751	106467	< 5.	UG/KG	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NE-1S	91.05751	75718	< 10.	UG/KG	7/09/91	Dichlorodifluoromethane
AB-53-NE-1S	91.05751	75343	< 5.	UG/KG	7/09/91	1,1-Dichloroethane
AB-53-NE-1S	91.05751	107062	< 5.	UG/KG	7/09/91	1,2-Dichloroethane
AB-53-NE-1S	91.05751	75354	< 5.	UG/KG	7/09/91	1,1-Dichloroethene
AB-53-NE-1S	91.05751	156605	< 5.	UG/KG	7/09/91	trans-1,2-Dichloroethene
AB-53-NE-1S	91.05751	156592	< 5.	UG/KG	7/09/91	cis-1,2-Dichloroethylene
AB-53-NE-1S	91.05751	78875	< 5.	UG/KG	7/09/91	1,2-Dichloropropane
AB-53-NE-1S	91.05751	142289	< 5.	UG/KG	7/09/91	1,3-Dichloropropane
AB-53-NE-1S	91.05751	594207	< 5.	UG/KG	7/09/91	2,2-Dichloropropane
AB-53-NE-1S	91.05751	563586	< 5.	UG/KG	7/09/91	1,1-Dichloropropene
AB-53-NE-1S	91.05751	10061015	< 5.	UG/KG	7/09/91	cis-1,3-Dichloropropene
AB-53-NE-1S	91.05751	10061026	< 5.	UG/KG	7/09/91	trans-1,3-Dichloropropene
AB-53-NE-1S	91.05751	100414	< 5.	UG/KG	7/09/91	Ethylbenzene
AB-53-NE-1S	91.05751	591786	< 20.	UG/KG	7/09/91	2-Hexanone
AB-53-NE-1S	91.05751	98828	< 5.	UG/KG	7/09/91	Isopropylbenzene
AB-53-NE-1S	91.05751	99876	< 5.	UG/KG	7/09/91	4-Isopropyltoluene
AB-53-NE-1S	91.05751	74884	< 5.	UG/KG	7/09/91	Methyl iodide
AB-53-NE-1S	91.05751	108101	< 20.	UG/KG	7/09/91	4-Methyl-2-pentanone
AB-53-NE-1S	91.05751	75092	< 5.	UG/KG	7/09/91	Methylene chloride
AB-53-NE-1S	91.05751	103651	< 5.	UG/KG	7/09/91	Propylbenzene
AB-53-NE-1S	91.05751	100425	< 5.	UG/KG	7/09/91	Styrene
AB-53-NE-1S	91.05751	630206	< 5.	UG/KG	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NE-1S	91.05751	79345	< 5.	UG/KG	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NE-1S	91.05751	127184	< 5.	UG/KG	7/09/91	Tetrachloroethylene
AB-53-NE-1S	91.05751	108883	< 5.	UG/KG	7/09/91	Toluene
AB-53-NE-1S	91.05751	76131	< 5.	UG/KG	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NE-1S	91.05751	71556	< 5.	UG/KG	7/09/91	1,1,1-Trichloroethane
AB-53-NE-1S	91.05751	79005	< 5.	UG/KG	7/09/91	1,1,2-Trichloroethane
AB-53-NE-1S	91.05751	79016	< 5.	UG/KG	7/09/91	Trichloroethene
AB-53-NE-1S	91.05751	75694	< 5.	UG/KG	7/09/91	Trichlorofluoromethane
AB-53-NE-1S	91.05751	96184	< 5.	UG/KG	7/09/91	1,2,3-Trichloropropane
AB-53-NE-1S	91.05751	95636	< 5.	UG/KG	7/09/91	1,2,4-Trimethylbenzene
AB-53-NE-1S	91.05751	108678	< 5.	UG/KG	7/09/91	1,3,5-Trimethylbenzene
AB-53-NE-1S	91.05751	108054	< 10.	UG/KG	7/09/91	Vinyl acetate
AB-53-NE-1S	91.05751	75014	< 10.	UG/KG	7/09/91	Vinyl chloride
AB-53-NE-1S	91.05751	1330207	< 5.	UG/KG	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05751

none

Customer Sample Duplicate Results for Sample # 91.05751

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05751

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05752

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/07/91 Date Analyzed: 7/07/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-2S	91.05752	67641	< 20.		UG/KG	7/09/91		Acetone
AB-53-NE-2S	91.05752	107028	< 100.		UG/KG	7/09/91		Acrolein
AB-53-NE-2S	91.05752	107131	< 100.		UG/KG	7/09/91		Acrylonitrile
AB-53-NE-2S	91.05752	71432	< 5.		UG/KG	7/09/91		Benzene
AB-53-NE-2S	91.05752	108861	< 5.		UG/KG	7/09/91		Bromobenzene
AB-53-NE-2S	91.05752	74975	< 5.		UG/KG	7/09/91		Bromochloromethane
AB-53-NE-2S	91.05752	75274	< 5.		UG/KG	7/09/91		Bromodichloromethane
AB-53-NE-2S	91.05752	75252	< 5.		UG/KG	7/09/91		Bromoform
AB-53-NE-2S	91.05752	74839	< 10.		UG/KG	7/09/91		Bromomethane
AB-53-NE-2S	91.05752	78933	< 20.		UG/KG	7/09/91		2-Butanone
AB-53-NE-2S	91.05752	104518	< 5.		UG/KG	7/09/91		n-Butylbenzene
AB-53-NE-2S	91.05752	135988	< 5.		UG/KG	7/09/91		sec-Butylbenzene
AB-53-NE-2S	91.05752	98066	< 5.		UG/KG	7/09/91		tert-Butylbenzene
AB-53-NE-2S	91.05752	75150	< 5.		UG/KG	7/09/91		Carbon disulfide
AB-53-NE-2S	91.05752	56235	< 5.		UG/KG	7/09/91		Carbon tetrachloride
AB-53-NE-2S	91.05752	108907	< 5.		UG/KG	7/09/91		Chlorobenzene
AB-53-NE-2S	91.05752	124481	< 5.		UG/KG	7/09/91		Chlorodibromomethane
AB-53-NE-2S	91.05752	75003	< 10.		UG/KG	7/09/91		Chloroethane
AB-53-NE-2S	91.05752	110758	< 50.		UG/KG	7/09/91		2-Chloroethylvinyl ether
AB-53-NE-2S	91.05752	67663	< 5.		UG/KG	7/09/91		Chloroform
AB-53-NE-2S	91.05752	74873	< 10.		UG/KG	7/09/91		Chloromethane

AB-53-NE-2S	91.05752	95498	< 5.	UG/KG	7/09/91	o-Chlorotoluene
AB-53-NE-2S	91.05752	106434	< 5.	UG/KG	7/09/91	p-Chlorotoluene
AB-53-NE-2S	91.05752	96128	< 10.	UG/KG	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NE-2S	91.05752	106934	< 5.	UG/KG	7/09/91	1,2-Dibromoethane
AB-53-NE-2S	91.05752	74953	< 5.	UG/KG	7/09/91	Dibromomethane
AB-53-NE-2S	91.05752	95501	< 5.	UG/KG	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NE-2S	91.05752	541731	< 5.	UG/KG	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NE-2S	91.05752	106467	< 5.	UG/KG	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NE-2S	91.05752	75718	< 10.	UG/KG	7/09/91	Dichlorodifluoromethane
AB-53-NE-2S	91.05752	75343	< 5.	UG/KG	7/09/91	1,1-Dichloroethane
AB-53-NE-2S	91.05752	107062	< 5.	UG/KG	7/09/91	1,2-Dichloroethane
AB-53-NE-2S	91.05752	75354	< 5.	UG/KG	7/09/91	1,1-Dichloroethene
AB-53-NE-2S	91.05752	156605	< 5.	UG/KG	7/09/91	trans-1,2-Dichloroethene
AB-53-NE-2S	91.05752	156592	< 5.	UG/KG	7/09/91	cis-1,2-Dichloroethylene
AB-53-NE-2S	91.05752	78875	< 5.	UG/KG	7/09/91	1,2-Dichloropropane
AB-53-NE-2S	91.05752	142289	< 5.	UG/KG	7/09/91	1,3-Dichloropropane
AB-53-NE-2S	91.05752	594207	< 5.	UG/KG	7/09/91	2,2-Dichloropropane
AB-53-NE-2S	91.05752	563586	< 5.	UG/KG	7/09/91	1,1-Dichloropropene
AB-53-NE-2S	91.05752	10061015	< 5.	UG/KG	7/09/91	cis-1,3-Dichloropropene
AB-53-NE-2S	91.05752	10061026	< 5.	UG/KG	7/09/91	trans-1,3-Dichloropropene
AB-53-NE-2S	91.05752	100414	< 5.	UG/KG	7/09/91	Ethylbenzene
AB-53-NE-2S	91.05752	591786	< 20.	UG/KG	7/09/91	2-Hexanone
AB-53-NE-2S	91.05752	98828	< 5.	UG/KG	7/09/91	Isopropylbenzene
AB-53-NE-2S	91.05752	99876	< 5.	UG/KG	7/09/91	4-Isopropyltoluene
AB-53-NE-2S	91.05752	74884	< 5.	UG/KG	7/09/91	Methyl iodide
AB-53-NE-2S	91.05752	108101	< 20.	UG/KG	7/09/91	4-Methyl-2-pentanone
AB-53-NE-2S	91.05752	75092	< 5.	UG/KG	7/09/91	Methylene chloride
AB-53-NE-2S	91.05752	103651	< 5.	UG/KG	7/09/91	Propylbenzene
AB-53-NE-2S	91.05752	100425	< 5.	UG/KG	7/09/91	Styrene
AB-53-NE-2S	91.05752	630206	< 5.	UG/KG	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NE-2S	91.05752	79345	< 5.	UG/KG	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NE-2S	91.05752	127184	< 5.	UG/KG	7/09/91	Tetrachloroethylene
AB-53-NE-2S	91.05752	108883	< 5.	UG/KG	7/09/91	Toluene
AB-53-NE-2S	91.05752	76131	< 5.	UG/KG	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NE-2S	91.05752	71556	< 5.	UG/KG	7/09/91	1,1,1-Trichloroethane
AB-53-NE-2S	91.05752	79005	< 5.	UG/KG	7/09/91	1,1,2-Trichloroethane
AB-53-NE-2S	91.05752	79016	< 5.	UG/KG	7/09/91	Trichloroethene
AB-53-NE-2S	91.05752	75694	< 5.	UG/KG	7/09/91	Trichlorofluoromethane
AB-53-NE-2S	91.05752	96184	< 5.	UG/KG	7/09/91	1,2,3-Trichloropropane
AB-53-NE-2S	91.05752	95636	< 5.	UG/KG	7/09/91	1,2,4-Trimethylbenzene
AB-53-NE-2S	91.05752	108678	< 5.	UG/KG	7/09/91	1,3,5-Trimethylbenzene
AB-53-NE-2S	91.05752	108054	< 10.	UG/KG	7/09/91	Vinyl acetate
AB-53-NE-2S	91.05752	75014	< 10.	UG/KG	7/09/91	Vinyl chloride
AB-53-NE-2S	91.05752	1330207	< 5.	UG/KG	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05752

none

Customer Sample Duplicate Results for Sample # 91.05752

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05752

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05753

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/07/91 Date Analyzed: 7/07/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-3S	91.05753	67641	< 20.		UG/KG	7/09/91		Acetone
AB-53-NE-3S	91.05753	107028	< 100.		UG/KG	7/09/91		Acrolein
AB-53-NE-3S	91.05753	107131	< 100.		UG/KG	7/09/91		Acrylonitrile
AB-53-NE-3S	91.05753	71432	< 5.		UG/KG	7/09/91		Benzene
AB-53-NE-3S	91.05753	108861	< 5.		UG/KG	7/09/91		Bromobenzene
AB-53-NE-3S	91.05753	74975	< 5.		UG/KG	7/09/91		Bromochloromethane
AB-53-NE-3S	91.05753	75274	< 5.		UG/KG	7/09/91		Bromodichloromethane
AB-53-NE-3S	91.05753	75252	< 5.		UG/KG	7/09/91		Bromoform
AB-53-NE-3S	91.05753	74839	< 10.		UG/KG	7/09/91		Bromomethane
AB-53-NE-3S	91.05753	78933	< 20.		UG/KG	7/09/91		2-Butanone
AB-53-NE-3S	91.05753	104518	< 5.		UG/KG	7/09/91		n-Butylbenzene
AB-53-NE-3S	91.05753	135988	< 5.		UG/KG	7/09/91		sec-Butylbenzene
AB-53-NE-3S	91.05753	98066	< 5.		UG/KG	7/09/91		tert-Butylbenzene
AB-53-NE-3S	91.05753	75150	< 5.		UG/KG	7/09/91		Carbon disulfide
AB-53-NE-3S	91.05753	56235	< 5.		UG/KG	7/09/91		Carbon tetrachloride
AB-53-NE-3S	91.05753	108907	< 5.		UG/KG	7/09/91		Chlorobenzene
AB-53-NE-3S	91.05753	124481	< 5.		UG/KG	7/09/91		Chlorodibromomethane
AB-53-NE-3S	91.05753	75003	< 10.		UG/KG	7/09/91		Chloroethane
AB-53-NE-3S	91.05753	110758	< 50.		UG/KG	7/09/91		2-Chloroethylvinyl ether
AB-53-NE-3S	91.05753	67663	< 5.		UG/KG	7/09/91		Chloroform
AB-53-NE-3S	91.05753	74873	< 10.		UG/KG	7/09/91		Chloromethane

AB-53-NE-3S	91.05753	95498	< 5.	UG/KG	7/09/91	o-Chlorotoluene
AB-53-NE-3S	91.05753	106434	< 5.	UG/KG	7/09/91	p-Chlorotoluene
AB-53-NE-3S	91.05753	96128	< 10.	UG/KG	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NE-3S	91.05753	106934	< 5.	UG/KG	7/09/91	1,2-Dibromoethane
AB-53-NE-3S	91.05753	74953	< 5.	UG/KG	7/09/91	Dibromomethane
AB-53-NE-3S	91.05753	95501	< 5.	UG/KG	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NE-3S	91.05753	541731	< 5.	UG/KG	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NE-3S	91.05753	106467	< 5.	UG/KG	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NE-3S	91.05753	75718	< 10.	UG/KG	7/09/91	Dichlorodifluoromethane
AB-53-NE-3S	91.05753	75343	< 5.	UG/KG	7/09/91	1,1-Dichloroethane
AB-53-NE-3S	91.05753	107062	< 5.	UG/KG	7/09/91	1,2-Dichloroethane
AB-53-NE-3S	91.05753	75354	< 5.	UG/KG	7/09/91	1,1-Dichloroethene
AB-53-NE-3S	91.05753	156605	< 5.	UG/KG	7/09/91	trans-1,2-Dichloroethene
AB-53-NE-3S	91.05753	156592	< 5.	UG/KG	7/09/91	cis-1,2-Dichloroethylene
AB-53-NE-3S	91.05753	78875	< 5.	UG/KG	7/09/91	1,2-Dichloropropane
AB-53-NE-3S	91.05753	142289	< 5.	UG/KG	7/09/91	1,3-Dichloropropane
AB-53-NE-3S	91.05753	594207	< 5.	UG/KG	7/09/91	2,2-Dichloropropane
AB-53-NE-3S	91.05753	563586	< 5.	UG/KG	7/09/91	1,1-Dichloropropene
AB-53-NE-3S	91.05753	10061015	< 5.	UG/KG	7/09/91	cis-1,3-Dichloropropene
AB-53-NE-3S	91.05753	10061026	< 5.	UG/KG	7/09/91	trans-1,3-Dichloropropene
AB-53-NE-3S	91.05753	100414	< 5.	UG/KG	7/09/91	Ethylbenzene
AB-53-NE-3S	91.05753	591786	< 20.	UG/KG	7/09/91	2-Hexanone
AB-53-NE-3S	91.05753	98828	< 5.	UG/KG	7/09/91	Isopropylbenzene
AB-53-NE-3S	91.05753	99876	< 5.	UG/KG	7/09/91	4-Isopropyltoluene
AB-53-NE-3S	91.05753	74884	< 5.	UG/KG	7/09/91	Methyl iodide
AB-53-NE-3S	91.05753	108101	< 20.	UG/KG	7/09/91	4-Methyl-2-pentanone
AB-53-NE-3S	91.05753	75092	< 5.	UG/KG	7/09/91	Methylene chloride
AB-53-NE-3S	91.05753	103651	< 5.	UG/KG	7/09/91	Propylbenzene
AB-53-NE-3S	91.05753	100425	< 5.	UG/KG	7/09/91	Styrene
AB-53-NE-3S	91.05753	630206	< 5.	UG/KG	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NE-3S	91.05753	79345	< 5.	UG/KG	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NE-3S	91.05753	127184	< 5.	UG/KG	7/09/91	Tetrachloroethylene
AB-53-NE-3S	91.05753	108883	< 5.	UG/KG	7/09/91	Toluene
AB-53-NE-3S	91.05753	76131	< 5.	UG/KG	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NE-3S	91.05753	71556	< 5.	UG/KG	7/09/91	1,1,1-Trichloroethane
AB-53-NE-3S	91.05753	79005	< 5.	UG/KG	7/09/91	1,1,2-Trichloroethane
AB-53-NE-3S	91.05753	79016	< 5.	UG/KG	7/09/91	Trichloroethene
AB-53-NE-3S	91.05753	75694	< 5.	UG/KG	7/09/91	Trichlorofluoromethane
AB-53-NE-3S	91.05753	96184	< 5.	UG/KG	7/09/91	1,2,3-Trichloropropane
AB-53-NE-3S	91.05753	95636	< 5.	UG/KG	7/09/91	1,2,4-Trimethylbenzene
AB-53-NE-3S	91.05753	108678	< 5.	UG/KG	7/09/91	1,3,5-Trimethylbenzene
AB-53-NE-3S	91.05753	108054	< 10.	UG/KG	7/09/91	Vinyl acetate
AB-53-NE-3S	91.05753	75014	< 10.	UG/KG	7/09/91	Vinyl chloride
AB-53-NE-3S	91.05753	1330207	< 5.	UG/KG	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05753

none

Customer Sample Duplicate Results for Sample # 91.05753

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05753

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05754

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/06/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-SO-1W	91.05754	67641	< 20.		UG/L	7/09/91		Acetone
AB-53-SO-1W	91.05754	107028	< 100.		UG/L	7/09/91		Acrolein
AB-53-SO-1W	91.05754	107131	< 100.		UG/L	7/09/91		Acrylonitrile
AB-53-SO-1W	91.05754	71432	< 5.		UG/L	7/09/91		Benzene
AB-53-SO-1W	91.05754	108861	< 5.		UG/L	7/09/91		Bromobenzene
AB-53-SO-1W	91.05754	74975	< 5.		UG/L	7/09/91		Bromochloromethane
AB-53-SO-1W	91.05754	75274	< 5.		UG/L	7/09/91		Bromodichloromethane
AB-53-SO-1W	91.05754	75252	< 5.		UG/L	7/09/91		Bromoform
AB-53-SO-1W	91.05754	74839	< 10.		UG/L	7/09/91		Bromomethane
AB-53-SO-1W	91.05754	78933	< 20.		UG/L	7/09/91		2-Butanone
AB-53-SO-1W	91.05754	104518	< 5.		UG/L	7/09/91		n-Butylbenzene
AB-53-SO-1W	91.05754	135988	< 5.		UG/L	7/09/91		sec-Butylbenzene
AB-53-SO-1W	91.05754	98066	< 5.		UG/L	7/09/91		tert-Butylbenzene
AB-53-SO-1W	91.05754	75150	< 5.		UG/L	7/09/91		Carbon disulfide
AB-53-SO-1W	91.05754	56235	< 5.		UG/L	7/09/91		Carbon tetrachloride
AB-53-SO-1W	91.05754	108907	< 5.		UG/L	7/09/91		Chlorobenzene
AB-53-SO-1W	91.05754	124481	< 5.		UG/L	7/09/91		Chlorodibromomethane
AB-53-SO-1W	91.05754	75003	< 10.		UG/L	7/09/91		Chloroethane
AB-53-SO-1W	91.05754	110758	< 50.		UG/L	7/09/91		2-Chloroethylvinyl ether
AB-53-SO-1W	91.05754	67663	< 5.		UG/L	7/09/91		Chloroform
AB-53-SO-1W	91.05754	74873	< 10.		UG/L	7/09/91		Chloromethane

AB-53-SO-1W	91.05754	95498	< 5.	UG/L	7/09/91	o-Chlorotoluene
AB-53-SO-1W	91.05754	106434	< 5.	UG/L	7/09/91	p-Chlorotoluene
AB-53-SO-1W	91.05754	96128	< 10.	UG/L	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-SO-1W	91.05754	106934	< 5.	UG/L	7/09/91	1,2-Dibromoethane
AB-53-SO-1W	91.05754	74953	< 5.	UG/L	7/09/91	Dibromomethane
AB-53-SO-1W	91.05754	95501	< 5.	UG/L	7/09/91	o-Dichlorobenzene (1,2)
AB-53-SO-1W	91.05754	541731	< 5.	UG/L	7/09/91	m-Dichlorobenzene (1,3)
AB-53-SO-1W	91.05754	106467	< 5.	UG/L	7/09/91	p-Dichlorobenzene (1,4)
AB-53-SO-1W	91.05754	75718	< 10.	UG/L	7/09/91	Dichlorodifluoromethane
AB-53-SO-1W	91.05754	75343	< 5.	UG/L	7/09/91	1,1-Dichloroethane
AB-53-SO-1W	91.05754	107062	< 5.	UG/L	7/09/91	1,2-Dichloroethane
AB-53-SO-1W	91.05754	75354	< 5.	UG/L	7/09/91	1,1-Dichloroethene
AB-53-SO-1W	91.05754	156605	< 5.	UG/L	7/09/91	trans-1,2-Dichloroethene
AB-53-SO-1W	91.05754	156592	< 5.	UG/L	7/09/91	cis-1,2-Dichloroethylene
AB-53-SO-1W	91.05754	78875	< 5.	UG/L	7/09/91	1,2-Dichloropropane
AB-53-SO-1W	91.05754	142289	< 5.	UG/L	7/09/91	1,3-Dichloropropane
AB-53-SO-1W	91.05754	594207	< 5.	UG/L	7/09/91	2,2-Dichloropropane
AB-53-SO-1W	91.05754	563586	< 5.	UG/L	7/09/91	1,1-Dichloropropene
AB-53-SO-1W	91.05754	10061015	< 5.	UG/L	7/09/91	cis-1,3-Dichloropropene
AB-53-SO-1W	91.05754	10061026	< 5.	UG/L	7/09/91	trans-1,3-Dichloropropene
AB-53-SO-1W	91.05754	100414	< 5.	UG/L	7/09/91	Ethylbenzene
AB-53-SO-1W	91.05754	591786	< 20.	UG/L	7/09/91	2-Hexanone
AB-53-SO-1W	91.05754	98828	< 5.	UG/L	7/09/91	Isopropylbenzene
AB-53-SO-1W	91.05754	99876	< 5.	UG/L	7/09/91	4-Isopropyltoluene
AB-53-SO-1W	91.05754	74884	< 5.	UG/L	7/09/91	Methyl iodide
AB-53-SO-1W	91.05754	108101	< 20.	UG/L	7/09/91	4-Methyl-2-pentanone
AB-53-SO-1W	91.05754	75092	< 5.	UG/L	7/09/91	Methylene chloride
AB-53-SO-1W	91.05754	103651	< 5.	UG/L	7/09/91	Propylbenzene
AB-53-SO-1W	91.05754	100425	< 5.	UG/L	7/09/91	Styrene
AB-53-SO-1W	91.05754	630206	< 5.	UG/L	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-SO-1W	91.05754	79345	< 5.	UG/L	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-SO-1W	91.05754	127184	< 5.	UG/L	7/09/91	Tetrachloroethylene
AB-53-SO-1W	91.05754	108883	< 5.	UG/L	7/09/91	Toluene
AB-53-SO-1W	91.05754	76131	< 5.	UG/L	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-SO-1W	91.05754	71556	< 5.	UG/L	7/09/91	1,1,1-Trichloroethane
AB-53-SO-1W	91.05754	79005	< 5.	UG/L	7/09/91	1,1,2-Trichloroethane
AB-53-SO-1W	91.05754	79016	< 5.	UG/L	7/09/91	Trichloroethene
AB-53-SO-1W	91.05754	75694	< 5.	UG/L	7/09/91	Trichlorofluoromethane
AB-53-SO-1W	91.05754	96184	< 5.	UG/L	7/09/91	1,2,3-Trichloropropane
AB-53-SO-1W	91.05754	95636	< 5.	UG/L	7/09/91	1,2,4-Trimethylbenzene
AB-53-SO-1W	91.05754	108678	< 5.	UG/L	7/09/91	1,3,5-Trimethylbenzene
AB-53-SO-1W	91.05754	108054	< 10.	UG/L	7/09/91	Vinyl acetate
AB-53-SO-1W	91.05754	75014	< 10.	UG/L	7/09/91	Vinyl chloride
AB-53-SO-1W	91.05754	1330207	< 5.	UG/L	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05754

none

Customer Sample Duplicate Results for Sample # 91.05754

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05754

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05755

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/06/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-SO-2W	91.05755	67641	< 20.		UG/L	7/09/91		Acetone
AB-53-SO-2W	91.05755	107028	< 100.		UG/L	7/09/91		Acrolein
AB-53-SO-2W	91.05755	107131	< 100.		UG/L	7/09/91		Acrylonitrile
AB-53-SO-2W	91.05755	71432	< 5.		UG/L	7/09/91		Benzene
AB-53-SO-2W	91.05755	108861	< 5.		UG/L	7/09/91		Bromobenzene
AB-53-SO-2W	91.05755	74975	< 5.		UG/L	7/09/91		Bromochloromethane
AB-53-SO-2W	91.05755	75274	< 5.		UG/L	7/09/91		Bromodichloromethane
AB-53-SO-2W	91.05755	75252	< 5.		UG/L	7/09/91		Bromoform
AB-53-SO-2W	91.05755	74839	< 10.		UG/L	7/09/91		Bromomethane
AB-53-SO-2W	91.05755	78933	< 20.		UG/L	7/09/91		2-Butanone
AB-53-SO-2W	91.05755	104518	< 5.		UG/L	7/09/91		n-Butylbenzene
AB-53-SO-2W	91.05755	135988	< 5.		UG/L	7/09/91		sec-Butylbenzene
AB-53-SO-2W	91.05755	98066	< 5.		UG/L	7/09/91		tert-Butylbenzene
AB-53-SO-2W	91.05755	75150	< 5.		UG/L	7/09/91		Carbon disulfide
AB-53-SO-2W	91.05755	56235	< 5.		UG/L	7/09/91		Carbon tetrachloride
AB-53-SO-2W	91.05755	108907	< 5.		UG/L	7/09/91		Chlorobenzene
AB-53-SO-2W	91.05755	124481	< 5.		UG/L	7/09/91		Chlorodibromomethane
AB-53-SO-2W	91.05755	75003	< 10.		UG/L	7/09/91		Chloroethane
AB-53-SO-2W	91.05755	110758	< 50.		UG/L	7/09/91		2-Chloroethylvinyl ether
AB-53-SO-2W	91.05755	67663	< 5.		UG/L	7/09/91		Chloroform
AB-53-SO-2W	91.05755	74873	< 10.		UG/L	7/09/91		Chloromethane

AB-53-SO-2W	91.05755	95498	< 5.	UG/L	7/09/91	o-Chlorotoluene
AB-53-SO-2W	91.05755	106434	< 5.	UG/L	7/09/91	p-Chlorotoluene
AB-53-SO-2W	91.05755	96128	< 10.	UG/L	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-SO-2W	91.05755	106934	< 5.	UG/L	7/09/91	1,2-Dibromoethane
AB-53-SO-2W	91.05755	74953	< 5.	UG/L	7/09/91	Dibromomethane
AB-53-SO-2W	91.05755	95501	< 5.	UG/L	7/09/91	o-Dichlorobenzene (1,2)
AB-53-SO-2W	91.05755	541731	< 5.	UG/L	7/09/91	m-Dichlorobenzene (1,3)
AB-53-SO-2W	91.05755	106467	< 5.	UG/L	7/09/91	p-Dichlorobenzene (1,4)
AB-53-SO-2W	91.05755	75718	< 10.	UG/L	7/09/91	Dichlorodifluoromethane
AB-53-SO-2W	91.05755	75343	< 5.	UG/L	7/09/91	1,1-Dichloroethane
AB-53-SO-2W	91.05755	107062	< 5.	UG/L	7/09/91	1,2-Dichloroethane
AB-53-SO-2W	91.05755	75354	< 5.	UG/L	7/09/91	1,1-Dichloroethene
AB-53-SO-2W	91.05755	156605	< 5.	UG/L	7/09/91	trans-1,2-Dichloroethene
AB-53-SO-2W	91.05755	156592	< 5.	UG/L	7/09/91	cis-1,2-Dichloroethylene
AB-53-SO-2W	91.05755	78875	< 5.	UG/L	7/09/91	1,2-Dichloropropane
AB-53-SO-2W	91.05755	142289	< 5.	UG/L	7/09/91	1,3-Dichloropropane
AB-53-SO-2W	91.05755	594207	< 5.	UG/L	7/09/91	2,2-Dichloropropane
AB-53-SO-2W	91.05755	563586	< 5.	UG/L	7/09/91	1,1-Dichloropropene
AB-53-SO-2W	91.05755	10061015	< 5.	UG/L	7/09/91	cis-1,3-Dichloropropene
AB-53-SO-2W	91.05755	10061026	< 5.	UG/L	7/09/91	trans-1,3-Dichloropropene
AB-53-SO-2W	91.05755	100414	< 5.	UG/L	7/09/91	Ethylbenzene
AB-53-SO-2W	91.05755	591786	< 20.	UG/L	7/09/91	2-Hexanone
AB-53-SO-2W	91.05755	98828	< 5.	UG/L	7/09/91	Isopropylbenzene
AB-53-SO-2W	91.05755	99876	< 5.	UG/L	7/09/91	4-Isopropyltoluene
AB-53-SO-2W	91.05755	74884	< 5.	UG/L	7/09/91	Methyl iodide
AB-53-SO-2W	91.05755	108101	< 20.	UG/L	7/09/91	4-Methyl-2-pentanone
AB-53-SO-2W	91.05755	75092	< 5.	UG/L	7/09/91	Methylene chloride
AB-53-SO-2W	91.05755	103651	< 5.	UG/L	7/09/91	Propylbenzene
AB-53-SO-2W	91.05755	100425	< 5.	UG/L	7/09/91	Styrene
AB-53-SO-2W	91.05755	630206	< 5.	UG/L	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-SO-2W	91.05755	79345	< 5.	UG/L	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-SO-2W	91.05755	127184	< 5.	UG/L	7/09/91	Tetrachloroethylene
AB-53-SO-2W	91.05755	108883	< 5.	UG/L	7/09/91	Toluene
AB-53-SO-2W	91.05755	76131	< 5.	UG/L	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-SO-2W	91.05755	71556	< 5.	UG/L	7/09/91	1,1,1-Trichloroethane
AB-53-SO-2W	91.05755	79005	< 5.	UG/L	7/09/91	1,1,2-Trichloroethane
AB-53-SO-2W	91.05755	79016	< 5.	UG/L	7/09/91	Trichloroethene
AB-53-SO-2W	91.05755	75694	< 5.	UG/L	7/09/91	Trichlorofluoromethane
AB-53-SO-2W	91.05755	96184	< 5.	UG/L	7/09/91	1,2,3-Trichloropropane
AB-53-SO-2W	91.05755	95636	< 5.	UG/L	7/09/91	1,2,4-Trimethylbenzene
AB-53-SO-2W	91.05755	108678	< 5.	UG/L	7/09/91	1,3,5-Trimethylbenzene
AB-53-SO-2W	91.05755	108054	< 10.	UG/L	7/09/91	Vinyl acetate
AB-53-SO-2W	91.05755	75014	< 10.	UG/L	7/09/91	Vinyl chloride
AB-53-SO-2W	91.05755	1330207	< 5.	UG/L	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05755

none

Customer Sample Duplicate Results for Sample # 91.05755

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05755

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05756

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/06/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-SO-3W	91.05756	67641	< 20.		UG/L	7/09/91		Acetone
AB-53-SO-3W	91.05756	107028	< 100.		UG/L	7/09/91		Acrolein
AB-53-SO-3W	91.05756	107131	< 100.		UG/L	7/09/91		Acrylonitrile
AB-53-SO-3W	91.05756	71432	< 5.		UG/L	7/09/91		Benzene
AB-53-SO-3W	91.05756	108861	< 5.		UG/L	7/09/91		Bromobenzene
AB-53-SO-3W	91.05756	74975	< 5.		UG/L	7/09/91		Bromochloromethane
AB-53-SO-3W	91.05756	75274	< 5.		UG/L	7/09/91		Bromodichloromethane
AB-53-SO-3W	91.05756	75252	< 5.		UG/L	7/09/91		Bromoform
AB-53-SO-3W	91.05756	74839	< 10.		UG/L	7/09/91		Bromomethane
AB-53-SO-3W	91.05756	78933	< 20.		UG/L	7/09/91		2-Butanone
AB-53-SO-3W	91.05756	104518	< 5.		UG/L	7/09/91		n-Butylbenzene
AB-53-SO-3W	91.05756	135988	< 5.		UG/L	7/09/91		sec-Butylbenzene
AB-53-SO-3W	91.05756	98066	< 5.		UG/L	7/09/91		tert-Butylbenzene
AB-53-SO-3W	91.05756	75150	< 5.		UG/L	7/09/91		Carbon disulfide
AB-53-SO-3W	91.05756	56235	< 5.		UG/L	7/09/91		Carbon tetrachloride
AB-53-SO-3W	91.05756	108907	< 5.		UG/L	7/09/91		Chlorobenzene
AB-53-SO-3W	91.05756	124481	< 5.		UG/L	7/09/91		Chlorodibromomethane
AB-53-SO-3W	91.05756	75003	< 10.		UG/L	7/09/91		Chloroethane
AB-53-SO-3W	91.05756	110758	< 50.		UG/L	7/09/91		2-Chloroethylvinyl ether
AB-53-SO-3W	91.05756	67663	< 5.		UG/L	7/09/91		Chloroform
AB-53-SO-3W	91.05756	74873	< 10.		UG/L	7/09/91		Chloromethane

AB-53-SO-3W	91.05756	95498	< 5.	UG/L	7/09/91	o-Chlorotoluene
AB-53-SO-3W	91.05756	106434	< 5.	UG/L	7/09/91	p-Chlorotoluene
AB-53-SO-3W	91.05756	96128	< 10.	UG/L	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-SO-3W	91.05756	106934	< 5.	UG/L	7/09/91	1,2-Dibromoethane
AB-53-SO-3W	91.05756	74953	< 5.	UG/L	7/09/91	Dibromomethane
AB-53-SO-3W	91.05756	95501	< 5.	UG/L	7/09/91	o-Dichlorobenzene (1,2)
AB-53-SO-3W	91.05756	541731	< 5.	UG/L	7/09/91	m-Dichlorobenzene (1,3)
AB-53-SO-3W	91.05756	106467	< 5.	UG/L	7/09/91	p-Dichlorobenzene (1,4)
AB-53-SO-3W	91.05756	75718	< 10.	UG/L	7/09/91	Dichlorodifluoromethane
AB-53-SO-3W	91.05756	75343	< 5.	UG/L	7/09/91	1,1-Dichloroethane
AB-53-SO-3W	91.05756	107062	< 5.	UG/L	7/09/91	1,2-Dichloroethane
AB-53-SO-3W	91.05756	75354	< 5.	UG/L	7/09/91	1,1-Dichloroethene
AB-53-SO-3W	91.05756	156605	< 5.	UG/L	7/09/91	trans-1,2-Dichloroethene
AB-53-SO-3W	91.05756	156592	< 5.	UG/L	7/09/91	cis-1,2-Dichloroethylene
AB-53-SO-3W	91.05756	78875	< 5.	UG/L	7/09/91	1,2-Dichloropropane
AB-53-SO-3W	91.05756	142289	< 5.	UG/L	7/09/91	1,3-Dichloropropane
AB-53-SO-3W	91.05756	594207	< 5.	UG/L	7/09/91	2,2-Dichloropropane
AB-53-SO-3W	91.05756	563586	< 5.	UG/L	7/09/91	1,1-Dichloropropene
AB-53-SO-3W	91.05756	10061015	< 5.	UG/L	7/09/91	cis-1,3-Dichloropropene
AB-53-SO-3W	91.05756	10061026	< 5.	UG/L	7/09/91	trans-1,3-Dichloropropene
AB-53-SO-3W	91.05756	100414	< 5.	UG/L	7/09/91	Ethylbenzene
AB-53-SO-3W	91.05756	591786	< 20.	UG/L	7/09/91	2-Hexanone
AB-53-SO-3W	91.05756	98828	< 5.	UG/L	7/09/91	Isopropylbenzene
AB-53-SO-3W	91.05756	99876	< 5.	UG/L	7/09/91	4-Isopropyltoluene
AB-53-SO-3W	91.05756	74884	< 5.	UG/L	7/09/91	Methyl iodide
AB-53-SO-3W	91.05756	108101	< 20.	UG/L	7/09/91	4-Methyl-2-pentanone
AB-53-SO-3W	91.05756	75092	< 5.	UG/L	7/09/91	Methylene chloride
AB-53-SO-3W	91.05756	103651	< 5.	UG/L	7/09/91	Propylbenzene
AB-53-SO-3W	91.05756	100425	< 5.	UG/L	7/09/91	Styrene
AB-53-SO-3W	91.05756	630206	< 5.	UG/L	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-SO-3W	91.05756	79345	< 5.	UG/L	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-SO-3W	91.05756	127184	< 5.	UG/L	7/09/91	Tetrachloroethylene
AB-53-SO-3W	91.05756	108883	< 5.	UG/L	7/09/91	Toluene
AB-53-SO-3W	91.05756	76131	< 5.	UG/L	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-SO-3W	91.05756	71556	< 5.	UG/L	7/09/91	1,1,1-Trichloroethane
AB-53-SO-3W	91.05756	79005	< 5.	UG/L	7/09/91	1,1,2-Trichloroethane
AB-53-SO-3W	91.05756	79016	< 5.	UG/L	7/09/91	Trichloroethene
AB-53-SO-3W	91.05756	75694	< 5.	UG/L	7/09/91	Trichlorofluoromethane
AB-53-SO-3W	91.05756	96184	< 5.	UG/L	7/09/91	1,2,3-Trichloropropane
AB-53-SO-3W	91.05756	95636	< 5.	UG/L	7/09/91	1,2,4-Trimethylbenzene
AB-53-SO-3W	91.05756	108678	< 5.	UG/L	7/09/91	1,3,5-Trimethylbenzene
AB-53-SO-3W	91.05756	108054	< 10.	UG/L	7/09/91	Vinyl acetate
AB-53-SO-3W	91.05756	75014	< 10.	UG/L	7/09/91	Vinyl chloride
AB-53-SO-3W	91.05756	1330207	< 5.	UG/L	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05756

none

Customer Sample Duplicate Results for Sample # 91.05756

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05756

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05757

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/07/91 Date Analyzed: 7/07/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-SO-1S	91.05757	67641	< 20.		UG/KG	7/09/91		Acetone
AB-53-SO-1S	91.05757	107028	< 100.		UG/KG	7/09/91		Acrolein
AB-53-SO-1S	91.05757	107131	< 100.		UG/KG	7/09/91		Acrylonitrile
AB-53-SO-1S	91.05757	71432	< 5.		UG/KG	7/09/91		Benzene
AB-53-SO-1S	91.05757	108861	< 5.		UG/KG	7/09/91		Bromobenzene
AB-53-SO-1S	91.05757	74975	< 5.		UG/KG	7/09/91		Bromochloromethane
AB-53-SO-1S	91.05757	75274	< 5.		UG/KG	7/09/91		Bromodichloromethane
AB-53-SO-1S	91.05757	75252	< 5.		UG/KG	7/09/91		Bromoform
AB-53-SO-1S	91.05757	74839	< 10.		UG/KG	7/09/91		Bromomethane
AB-53-SO-1S	91.05757	78933	< 20.		UG/KG	7/09/91		2-Butanone
AB-53-SO-1S	91.05757	104518	< 5.		UG/KG	7/09/91		n-Butylbenzene
AB-53-SO-1S	91.05757	135988	< 5.		UG/KG	7/09/91		sec-Butylbenzene
AB-53-SO-1S	91.05757	98066	< 5.		UG/KG	7/09/91		tert-Butylbenzene
AB-53-SO-1S	91.05757	75150	< 5.		UG/KG	7/09/91		Carbon disulfide
AB-53-SO-1S	91.05757	56235	< 5.		UG/KG	7/09/91		Carbon tetrachloride
AB-53-SO-1S	91.05757	108907	< 5.		UG/KG	7/09/91		Chlorobenzene
AB-53-SO-1S	91.05757	124481	< 5.		UG/KG	7/09/91		Chlorodibromomethane
AB-53-SO-1S	91.05757	75003	< 10.		UG/KG	7/09/91		Chloroethane
AB-53-SO-1S	91.05757	110758	< 50.		UG/KG	7/09/91		2-Chloroethylvinyl ether
AB-53-SO-1S	91.05757	67663	< 5.		UG/KG	7/09/91		Chloroform
AB-53-SO-1S	91.05757	74873	< 10.		UG/KG	7/09/91		Chloromethane

AB-53-SO-1S	91.05757	95498	< 5.	UG/KG	7/09/91	o-Chlorotoluene
AB-53-SO-1S	91.05757	106434	< 5.	UG/KG	7/09/91	p-Chlorotoluene
AB-53-SO-1S	91.05757	96128	< 10.	UG/KG	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-SO-1S	91.05757	106934	< 5.	UG/KG	7/09/91	1,2-Dibromoethane
AB-53-SO-1S	91.05757	74953	< 5.	UG/KG	7/09/91	Dibromomethane
AB-53-SO-1S	91.05757	95501	< 5.	UG/KG	7/09/91	o-Dichlorobenzene (1,2)
AB-53-SO-1S	91.05757	541731	< 5.	UG/KG	7/09/91	m-Dichlorobenzene (1,3)
AB-53-SO-1S	91.05757	106467	< 5.	UG/KG	7/09/91	p-Dichlorobenzene (1,4)
AB-53-SO-1S	91.05757	75718	< 10.	UG/KG	7/09/91	Dichlorodifluoromethane
AB-53-SO-1S	91.05757	75343	< 5.	UG/KG	7/09/91	1,1-Dichloroethane
AB-53-SO-1S	91.05757	107062	< 5.	UG/KG	7/09/91	1,2-Dichloroethane
AB-53-SO-1S	91.05757	75354	< 5.	UG/KG	7/09/91	1,1-Dichloroethene
AB-53-SO-1S	91.05757	156605	< 5.	UG/KG	7/09/91	trans-1,2-Dichloroethene
AB-53-SO-1S	91.05757	156592	< 5.	UG/KG	7/09/91	cis-1,2-Dichloroethylene
AB-53-SO-1S	91.05757	78875	< 5.	UG/KG	7/09/91	1,2-Dichloropropane
AB-53-SO-1S	91.05757	142289	< 5.	UG/KG	7/09/91	1,3-Dichloropropane
AB-53-SO-1S	91.05757	594207	< 5.	UG/KG	7/09/91	2,2-Dichloropropane
AB-53-SO-1S	91.05757	563586	< 5.	UG/KG	7/09/91	1,1-Dichloropropene
AB-53-SO-1S	91.05757	10061015	< 5.	UG/KG	7/09/91	cis-1,3-Dichloropropene
AB-53-SO-1S	91.05757	10061026	< 5.	UG/KG	7/09/91	trans-1,3-Dichloropropene
AB-53-SO-1S	91.05757	100414	< 5.	UG/KG	7/09/91	Ethylbenzene
AB-53-SO-1S	91.05757	591786	< 20.	UG/KG	7/09/91	2-Hexanone
AB-53-SO-1S	91.05757	98828	< 5.	UG/KG	7/09/91	Isopropylbenzene
AB-53-SO-1S	91.05757	99876	< 5.	UG/KG	7/09/91	4-Isopropyltoluene
AB-53-SO-1S	91.05757	74884	< 5.	UG/KG	7/09/91	Methyl iodide
AB-53-SO-1S	91.05757	108101	< 20.	UG/KG	7/09/91	4-Methyl-2-pentanone
AB-53-SO-1S	91.05757	75092	< 5.	UG/KG	7/09/91	Methylene chloride
AB-53-SO-1S	91.05757	103651	< 5.	UG/KG	7/09/91	Propylbenzene
AB-53-SO-1S	91.05757	100425	< 5.	UG/KG	7/09/91	Styrene
AB-53-SO-1S	91.05757	630206	< 5.	UG/KG	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-SO-1S	91.05757	79345	< 5.	UG/KG	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-SO-1S	91.05757	127184	< 5.	UG/KG	7/09/91	Tetrachloroethylene
AB-53-SO-1S	91.05757	108883	< 5.	UG/KG	7/09/91	Toluene
AB-53-SO-1S	91.05757	76131	< 5.	UG/KG	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-SO-1S	91.05757	71556	< 5.	UG/KG	7/09/91	1,1,1-Trichloroethane
AB-53-SO-1S	91.05757	79005	< 5.	UG/KG	7/09/91	1,1,2-Trichloroethane
AB-53-SO-1S	91.05757	79016	< 5.	UG/KG	7/09/91	Trichloroethene
AB-53-SO-1S	91.05757	75694	< 5.	UG/KG	7/09/91	Trichlorofluoromethane
AB-53-SO-1S	91.05757	96184	< 5.	UG/KG	7/09/91	1,2,3-Trichloropropane
AB-53-SO-1S	91.05757	95636	< 5.	UG/KG	7/09/91	1,2,4-Trimethylbenzene
AB-53-SO-1S	91.05757	108678	< 5.	UG/KG	7/09/91	1,3,5-Trimethylbenzene
AB-53-SO-1S	91.05757	108054	< 10.	UG/KG	7/09/91	Vinyl acetate
AB-53-SO-1S	91.05757	75014	< 10.	UG/KG	7/09/91	Vinyl chloride
AB-53-SO-1S	91.05757	1330207	< 5.	UG/KG	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05757

none

Customer Sample Duplicate Results for Sample # 91.05757

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05757

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05758

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/07/91 Date Analyzed: 7/07/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-SO-2S	91.05758	67641	< 20.		UG/KG	7/09/91		Acetone
AB-53-SO-2S	91.05758	107028	< 100.		UG/KG	7/09/91		Acrolein
AB-53-SO-2S	91.05758	107131	< 100.		UG/KG	7/09/91		Acrylonitrile
AB-53-SO-2S	91.05758	71432	< 5.		UG/KG	7/09/91		Benzene
AB-53-SO-2S	91.05758	108861	< 5.		UG/KG	7/09/91		Bromobenzene
AB-53-SO-2S	91.05758	74975	< 5.		UG/KG	7/09/91		Bromochloromethane
AB-53-SO-2S	91.05758	75274	< 5.		UG/KG	7/09/91		Bromodichloromethane
AB-53-SO-2S	91.05758	75252	< 5.		UG/KG	7/09/91		Bromoform
AB-53-SO-2S	91.05758	74839	< 10.		UG/KG	7/09/91		Bromomethane
AB-53-SO-2S	91.05758	78933	< 20.		UG/KG	7/09/91		2-Butanone
AB-53-SO-2S	91.05758	104518	< 5.		UG/KG	7/09/91		n-Butylbenzene
AB-53-SO-2S	91.05758	135988	< 5.		UG/KG	7/09/91		sec-Butylbenzene
AB-53-SO-2S	91.05758	98066	< 5.		UG/KG	7/09/91		tert-Butylbenzene
AB-53-SO-2S	91.05758	75150	< 5.		UG/KG	7/09/91		Carbon disulfide
AB-53-SO-2S	91.05758	56235	< 5.		UG/KG	7/09/91		Carbon tetrachloride
AB-53-SO-2S	91.05758	108907	< 5.		UG/KG	7/09/91		Chlorobenzene
AB-53-SO-2S	91.05758	124481	< 5.		UG/KG	7/09/91		Chlorodibromomethane
AB-53-SO-2S	91.05758	75003	< 10.		UG/KG	7/09/91		Chloroethane
AB-53-SO-2S	91.05758	110758	< 50.		UG/KG	7/09/91		2-Chloroethylvinyl ether
AB-53-SO-2S	91.05758	67663	< 5.		UG/KG	7/09/91		Chloroform
AB-53-SO-2S	91.05758	74873	< 10.		UG/KG	7/09/91		Chloromethane

AB-53-SO-2S	91.05758	95498	< 5.		UG/KG	7/09/91	o-Chlorotoluene
AB-53-SO-2S	91.05758	106434	< 5.		UG/KG	7/09/91	p-Chlorotoluene
AB-53-SO-2S	91.05758	96128	< 10.		UG/KG	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-SO-2S	91.05758	106934	< 5.		UG/KG	7/09/91	1,2-Dibromoethane
AB-53-SO-2S	91.05758	74953	< 5.		UG/KG	7/09/91	Dibromomethane
AB-53-SO-2S	91.05758	95501	< 5.		UG/KG	7/09/91	o-Dichlorobenzene (1,2)
AB-53-SO-2S	91.05758	541731	< 5.		UG/KG	7/09/91	m-Dichlorobenzene (1,3)
AB-53-SO-2S	91.05758	106467	< 5.		UG/KG	7/09/91	p-Dichlorobenzene (1,4)
AB-53-SO-2S	91.05758	75718	< 10.		UG/KG	7/09/91	Dichlorodifluoromethane
AB-53-SO-2S	91.05758	75343	< 5.		UG/KG	7/09/91	1,1-Dichloroethane
AB-53-SO-2S	91.05758	107062	< 5.		UG/KG	7/09/91	1,2-Dichloroethane
AB-53-SO-2S	91.05758	75354	< 5.		UG/KG	7/09/91	1,1-Dichloroethene
AB-53-SO-2S	91.05758	156605	< 5.		UG/KG	7/09/91	trans-1,2-Dichloroethene
AB-53-SO-2S	91.05758	156592	< 5.		UG/KG	7/09/91	cis-1,2-Dichloroethylene
AB-53-SO-2S	91.05758	78875	< 5.		UG/KG	7/09/91	1,2-Dichloropropane
AB-53-SO-2S	91.05758	142289	< 5.		UG/KG	7/09/91	1,3-Dichloropropane
AB-53-SO-2S	91.05758	594207	< 5.		UG/KG	7/09/91	2,2-Dichloropropane
AB-53-SO-2S	91.05758	563586	< 5.		UG/KG	7/09/91	1,1-Dichloropropene
AB-53-SO-2S	91.05758	10061015	< 5.		UG/KG	7/09/91	cis-1,3-Dichloropropene
AB-53-SO-2S	91.05758	10061026	< 5.		UG/KG	7/09/91	trans-1,3-Dichloropropene
AB-53-SO-2S	91.05758	100414	< 5.		UG/KG	7/09/91	Ethylbenzene
AB-53-SO-2S	91.05758	591786	< 20.		UG/KG	7/09/91	2-Hexanone
AB-53-SO-2S	91.05758	98828	< 5.		UG/KG	7/09/91	Isopropylbenzene
AB-53-SO-2S	91.05758	99876	[illegible]	2.[illegible]	UG/KG	7/09/91	4-Isopropyltoluene
AB-53-SO-2S	91.05758	74884	< 5.		UG/KG	7/09/91	Methyl iodide
AB-53-SO-2S	91.05758	108101	< 20.		UG/KG	7/09/91	4-Methyl-2-pentanone
AB-53-SO-2S	91.05758	75092	< 5.		UG/KG	7/09/91	Methylene chloride
AB-53-SO-2S	91.05758	103651	< 5.		UG/KG	7/09/91	Propylbenzene
AB-53-SO-2S	91.05758	100425	< 5.		UG/KG	7/09/91	Styrene
AB-53-SO-2S	91.05758	630206	< 5.		UG/KG	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-SO-2S	91.05758	79345	< 5.		UG/KG	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-SO-2S	91.05758	127184	< 5.		UG/KG	7/09/91	Tetrachloroethylene
AB-53-SO-2S	91.05758	108883	[illegible]	4.2	UG/KG	7/09/91	Toluene
AB-53-SO-2S	91.05758	76131	< 5.		UG/KG	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-SO-2S	91.05758	71556	< 5.		UG/KG	7/09/91	1,1,1-Trichloroethane
AB-53-SO-2S	91.05758	79005	< 5.		UG/KG	7/09/91	1,1,2-Trichloroethane
AB-53-SO-2S	91.05758	79016	< 5.		UG/KG	7/09/91	Trichloroethene
AB-53-SO-2S	91.05758	75694	< 5.		UG/KG	7/09/91	Trichlorofluoromethane
AB-53-SO-2S	91.05758	96184	< 5.		UG/KG	7/09/91	1,2,3-Trichloropropane
AB-53-SO-2S	91.05758	95636	< 5.		UG/KG	7/09/91	1,2,4-Trimethylbenzene
AB-53-SO-2S	91.05758	108678	< 5.		UG/KG	7/09/91	1,3,5-Trimethylbenzene
AB-53-SO-2S	91.05758	108054	< 10.		UG/KG	7/09/91	Vinyl acetate
AB-53-SO-2S	91.05758	75014	< 10.		UG/KG	7/09/91	Vinyl chloride
AB-53-SO-2S	91.05758	1330207	< 5.		UG/KG	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05758

none

Customer Sample Duplicate Results for Sample # 91.05758

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05758

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05759

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/05/91 Date Analyzed: 7/05/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-SO-3S	91.05759	67641	< 20.		UG/KG	7/09/91		Acetone
AB-53-SO-3S	91.05759	107028	< 100.		UG/KG	7/09/91		Acrolein
AB-53-SO-3S	91.05759	107131	< 100.		UG/KG	7/09/91		Acrylonitrile
AB-53-SO-3S	91.05759	71432	< 5.		UG/KG	7/09/91		Benzene
AB-53-SO-3S	91.05759	108861	< 5.		UG/KG	7/09/91		Bromobenzene
AB-53-SO-3S	91.05759	74975	< 5.		UG/KG	7/09/91		Bromochloromethane
AB-53-SO-3S	91.05759	75274	< 5.		UG/KG	7/09/91		Bromodichloromethane
AB-53-SO-3S	91.05759	75252	< 5.		UG/KG	7/09/91		Bromoform
AB-53-SO-3S	91.05759	74839	< 10.		UG/KG	7/09/91		Bromomethane
AB-53-SO-3S	91.05759	78933	< 20.		UG/KG	7/09/91		2-Butanone
AB-53-SO-3S	91.05759	104518	< 5.		UG/KG	7/09/91		n-Butylbenzene
AB-53-SO-3S	91.05759	135988	< 5.		UG/KG	7/09/91		sec-Butylbenzene
AB-53-SO-3S	91.05759	98066	< 5.		UG/KG	7/09/91		tert-Butylbenzene
AB-53-SO-3S	91.05759	75150	< 5.		UG/KG	7/09/91		Carbon disulfide
AB-53-SO-3S	91.05759	56235	< 5.		UG/KG	7/09/91		Carbon tetrachloride
AB-53-SO-3S	91.05759	108907	< 5.		UG/KG	7/09/91		Chlorobenzene
AB-53-SO-3S	91.05759	124481	< 5.		UG/KG	7/09/91		Chlorodibromomethane
AB-53-SO-3S	91.05759	75003	< 10.		UG/KG	7/09/91		Chloroethane
AB-53-SO-3S	91.05759	110758	< 50.		UG/KG	7/09/91		2-Chloroethylvinyl ether
AB-53-SO-3S	91.05759	67663	< 5.		UG/KG	7/09/91		Chloroform
AB-53-SO-3S	91.05759	74873	< 10.		UG/KG	7/09/91		Chloromethane

AB-53-SO-3S	91.05759	95498	< 5.	UG/KG	7/09/91	o-Chlorotoluene
AB-53-SO-3S	91.05759	106434	< 5.	UG/KG	7/09/91	p-Chlorotoluene
AB-53-SO-3S	91.05759	96128	< 10.	UG/KG	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-SO-3S	91.05759	106934	< 5.	UG/KG	7/09/91	1,2-Dibromoethane
AB-53-SO-3S	91.05759	74953	< 5.	UG/KG	7/09/91	Dibromomethane
AB-53-SO-3S	91.05759	95501	< 5.	UG/KG	7/09/91	o-Dichlorobenzene (1,2)
AB-53-SO-3S	91.05759	541731	< 5.	UG/KG	7/09/91	m-Dichlorobenzene (1,3)
AB-53-SO-3S	91.05759	106467	< 5.	UG/KG	7/09/91	p-Dichlorobenzene (1,4)
AB-53-SO-3S	91.05759	75718	< 10.	UG/KG	7/09/91	Dichlorodifluoromethane
AB-53-SO-3S	91.05759	75343	< 5.	UG/KG	7/09/91	1,1-Dichloroethane
AB-53-SO-3S	91.05759	107062	< 5.	UG/KG	7/09/91	1,2-Dichloroethane
AB-53-SO-3S	91.05759	75354	< 5.	UG/KG	7/09/91	1,1-Dichloroethene
AB-53-SO-3S	91.05759	156605	< 5.	UG/KG	7/09/91	trans-1,2-Dichloroethene
AB-53-SO-3S	91.05759	156592	< 5.	UG/KG	7/09/91	cis-1,2-Dichloroethylene
AB-53-SO-3S	91.05759	78875	< 5.	UG/KG	7/09/91	1,2-Dichloropropane
AB-53-SO-3S	91.05759	142289	< 5.	UG/KG	7/09/91	1,3-Dichloropropane
AB-53-SO-3S	91.05759	594207	< 5.	UG/KG	7/09/91	2,2-Dichloropropane
AB-53-SO-3S	91.05759	563586	< 5.	UG/KG	7/09/91	1,1-Dichloropropene
AB-53-SO-3S	91.05759	10061015	< 5.	UG/KG	7/09/91	cis-1,3-Dichloropropene
AB-53-SO-3S	91.05759	10061026	< 5.	UG/KG	7/09/91	trans-1,3-Dichloropropene
AB-53-SO-3S	91.05759	100414	< 5.	UG/KG	7/09/91	Ethylbenzene
AB-53-SO-3S	91.05759	591786	< 20.	UG/KG	7/09/91	2-Hexanone
AB-53-SO-3S	91.05759	98828	< 5.	UG/KG	7/09/91	Isopropylbenzene
AB-53-SO-3S	91.05759	99876	< 5.	UG/KG	7/09/91	4-Isopropyltoluene
AB-53-SO-3S	91.05759	74884	< 5.	UG/KG	7/09/91	Methyl iodide
AB-53-SO-3S	91.05759	108101	< 20.	UG/KG	7/09/91	4-Methyl-2-pentanone
AB-53-SO-3S	91.05759	75092	< 5.	UG/KG	7/09/91	Methylene chloride
AB-53-SO-3S	91.05759	103651	< 5.	UG/KG	7/09/91	Propylbenzene
AB-53-SO-3S	91.05759	100425	< 5.	UG/KG	7/09/91	Styrene
AB-53-SO-3S	91.05759	630206	< 5.	UG/KG	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-SO-3S	91.05759	79345	< 5.	UG/KG	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-SO-3S	91.05759	127184	< 5.	UG/KG	7/09/91	Tetrachloroethylene
AB-53-SO-3S	91.05759	108883	< 5.	UG/KG	7/09/91	Toluene
AB-53-SO-3S	91.05759	76131	< 5.	UG/KG	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-SO-3S	91.05759	71556	< 5.	UG/KG	7/09/91	1,1,1-Trichloroethane
AB-53-SO-3S	91.05759	79005	< 5.	UG/KG	7/09/91	1,1,2-Trichloroethane
AB-53-SO-3S	91.05759	79016	< 5.	UG/KG	7/09/91	Trichloroethene
AB-53-SO-3S	91.05759	75694	< 5.	UG/KG	7/09/91	Trichlorofluoromethane
AB-53-SO-3S	91.05759	96184	< 5.	UG/KG	7/09/91	1,2,3-Trichloropropane
AB-53-SO-3S	91.05759	95636	< 5.	UG/KG	7/09/91	1,2,4-Trimethylbenzene
AB-53-SO-3S	91.05759	108678	< 5.	UG/KG	7/09/91	1,3,5-Trimethylbenzene
AB-53-SO-3S	91.05759	108054	< 10.	UG/KG	7/09/91	Vinyl acetate
AB-53-SO-3S	91.05759	75014	< 10.	UG/KG	7/09/91	Vinyl chloride
AB-53-SO-3S	91.05759	1330207	< 5.	UG/KG	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05759

none

Customer Sample Duplicate Results for Sample # 91.05759

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05759

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05762

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: Date Analyzed:

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53NW-TB	91.05762	67641	< 20.		UG/L	7/09/91		Acetone
AB-53NW-TB	91.05762	107028	< 100.		UG/L	7/09/91		Acrolein
AB-53NW-TB	91.05762	107131	< 100.		UG/L	7/09/91		Acrylonitrile
AB-53NW-TB	91.05762	71432	< 5.		UG/L	7/09/91		Benzene
AB-53NW-TB	91.05762	108861	< 5.		UG/L	7/09/91		Bromobenzene
AB-53NW-TB	91.05762	74975	< 5.		UG/L	7/09/91		Bromochloromethane
AB-53NW-TB	91.05762	75274	< 5.		UG/L	7/09/91		Bromodichloromethane
AB-53NW-TB	91.05762	75252	< 5.		UG/L	7/09/91		Bromoform
AB-53NW-TB	91.05762	74839	< 10.		UG/L	7/09/91		Bromomethane
AB-53NW-TB	91.05762	78933	< 20.		UG/L	7/09/91		2-Butanone
AB-53NW-TB	91.05762	104518	< 5.		UG/L	7/09/91		n-Butylbenzene
AB-53NW-TB	91.05762	135988	< 5.		UG/L	7/09/91		sec-Butylbenzene
AB-53NW-TB	91.05762	98066	< 5.		UG/L	7/09/91		tert-Butylbenzene
AB-53NW-TB	91.05762	75150	< 5.		UG/L	7/09/91		Carbon disulfide
AB-53NW-TB	91.05762	56235	< 5.		UG/L	7/09/91		Carbon tetrachloride
AB-53NW-TB	91.05762	108907	< 5.		UG/L	7/09/91		Chlorobenzene
AB-53NW-TB	91.05762	124481	< 5.		UG/L	7/09/91		Chlorodibromomethane
AB-53NW-TB	91.05762	75003	< 10.		UG/L	7/09/91		Chloroethane
AB-53NW-TB	91.05762	110758	< 50.		UG/L	7/09/91		2-Chloroethylvinyl ether
AB-53NW-TB	91.05762	67663	< 5.		UG/L	7/09/91		Chloroform
AB-53NW-TB	91.05762	74873	< 10.		UG/L	7/09/91		Chloromethane

AB-53NW-TB	91.05762	95498	< 5.	UG/L	7/09/91	o-Chlorotoluene
AB-53NW-TB	91.05762	106434	< 5.	UG/L	7/09/91	p-Chlorotoluene
AB-53NW-TB	91.05762	96128	< 10.	UG/L	7/09/91	1,2-Dibromo-3-chloropropane
AB-53NW-TB	91.05762	106934	< 5.	UG/L	7/09/91	1,2-Dibromoethane
AB-53NW-TB	91.05762	74953	< 5.	UG/L	7/09/91	Dibromomethane
AB-53NW-TB	91.05762	95501	< 5.	UG/L	7/09/91	o-Dichlorobenzene (1,2)
AB-53NW-TB	91.05762	541731	< 5.	UG/L	7/09/91	m-Dichlorobenzene (1,3)
AB-53NW-TB	91.05762	106467	< 5.	UG/L	7/09/91	p-Dichlorobenzene (1,4)
AB-53NW-TB	91.05762	75718	< 10.	UG/L	7/09/91	Dichlorodifluoromethane
AB-53NW-TB	91.05762	75343	< 5.	UG/L	7/09/91	1,1-Dichloroethane
AB-53NW-TB	91.05762	107062	< 5.	UG/L	7/09/91	1,2-Dichloroethane
AB-53NW-TB	91.05762	75354	< 5.	UG/L	7/09/91	1,1-Dichloroethene
AB-53NW-TB	91.05762	156605	< 5.	UG/L	7/09/91	trans-1,2-Dichloroethene
AB-53NW-TB	91.05762	156592	< 5.	UG/L	7/09/91	cis-1,2-Dichloroethylene
AB-53NW-TB	91.05762	78875	< 5.	UG/L	7/09/91	1,2-Dichloropropane
AB-53NW-TB	91.05762	142289	< 5.	UG/L	7/09/91	1,3-Dichloropropane
AB-53NW-TB	91.05762	594207	< 5.	UG/L	7/09/91	2,2-Dichloropropane
AB-53NW-TB	91.05762	563586	< 5.	UG/L	7/09/91	1,1-Dichloropropene
AB-53NW-TB	91.05762	10061015	< 5.	UG/L	7/09/91	cis-1,3-Dichloropropene
AB-53NW-TB	91.05762	10061026	< 5.	UG/L	7/09/91	trans-1,3-Dichloropropene
AB-53NW-TB	91.05762	100414	< 5.	UG/L	7/09/91	Ethylbenzene
AB-53NW-TB	91.05762	591786	< 20.	UG/L	7/09/91	2-Hexanone
AB-53NW-TB	91.05762	98828	< 5.	UG/L	7/09/91	Isopropylbenzene
AB-53NW-TB	91.05762	99876	< 5.	UG/L	7/09/91	4-Isopropyltoluene
AB-53NW-TB	91.05762	74884	< 5.	UG/L	7/09/91	Methyl iodide
AB-53NW-TB	91.05762	108101	< 20.	UG/L	7/09/91	4-Methyl-2-pentanone
AB-53NW-TB	91.05762	75092	< 5.	UG/L	7/09/91	Methylene chloride
AB-53NW-TB	91.05762	103651	< 5.	UG/L	7/09/91	Propylbenzene
AB-53NW-TB	91.05762	100425	< 5.	UG/L	7/09/91	Styrene
AB-53NW-TB	91.05762	630206	< 5.	UG/L	7/09/91	1,1,1,2-Tetrachloroethane
AB-53NW-TB	91.05762	79345	< 5.	UG/L	7/09/91	1,1,2,2-Tetrachloroethane
AB-53NW-TB	91.05762	127184	< 5.	UG/L	7/09/91	Tetrachloroethylene
AB-53NW-TB	91.05762	108883	< 5.	UG/L	7/09/91	Toluene
AB-53NW-TB	91.05762	76131	< 5.	UG/L	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53NW-TB	91.05762	71556	< 5.	UG/L	7/09/91	1,1,1-Trichloroethane
AB-53NW-TB	91.05762	79005	< 5.	UG/L	7/09/91	1,1,2-Trichloroethane
AB-53NW-TB	91.05762	79016	< 5.	UG/L	7/09/91	Trichloroethene
AB-53NW-TB	91.05762	75694	< 5.	UG/L	7/09/91	Trichlorofluoromethane
AB-53NW-TB	91.05762	96184	< 5.	UG/L	7/09/91	1,2,3-Trichloropropane
AB-53NW-TB	91.05762	95636	< 5.	UG/L	7/09/91	1,2,4-Trimethylbenzene
AB-53NW-TB	91.05762	108678	< 5.	UG/L	7/09/91	1,3,5-Trimethylbenzene
AB-53NW-TB	91.05762	108054	< 10.	UG/L	7/09/91	Vinyl acetate
AB-53NW-TB	91.05762	75014	< 10.	UG/L	7/09/91	Vinyl chloride
AB-53NW-TB	91.05762	1330207	< 5.	UG/L	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05762

none

Customer Sample Duplicate Results for Sample # 91.05762

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05762

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05763

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: Date Analyzed:

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53NE-TB	91.05763	67641	< 20.		UG/L	7/09/91		Acetone
AB-53NE-TB	91.05763	107028	< 100.		UG/L	7/09/91		Acrolein
AB-53NE-TB	91.05763	107131	< 100.		UG/L	7/09/91		Acrylonitrile
AB-53NE-TB	91.05763	71432	< 5.		UG/L	7/09/91		Benzene
AB-53NE-TB	91.05763	108861	< 5.		UG/L	7/09/91		Bromobenzene
AB-53NE-TB	91.05763	74975	< 5.		UG/L	7/09/91		Bromochloromethane
AB-53NE-TB	91.05763	75274	< 5.		UG/L	7/09/91		Bromodichloromethane
AB-53NE-TB	91.05763	75252	< 5.		UG/L	7/09/91		Bromoform
AB-53NE-TB	91.05763	74839	< 10.		UG/L	7/09/91		Bromomethane
AB-53NE-TB	91.05763	78933	< 20.		UG/L	7/09/91		2-Butanone
AB-53NE-TB	91.05763	104518	< 5.		UG/L	7/09/91		n-Butylbenzene
AB-53NE-TB	91.05763	135988	< 5.		UG/L	7/09/91		sec-Butylbenzene
AB-53NE-TB	91.05763	98066	< 5.		UG/L	7/09/91		tert-Butylbenzene
AB-53NE-TB	91.05763	75150	< 5.		UG/L	7/09/91		Carbon disulfide
AB-53NE-TB	91.05763	56235	< 5.		UG/L	7/09/91		Carbon tetrachloride
AB-53NE-TB	91.05763	108907	< 5.		UG/L	7/09/91		Chlorobenzene
AB-53NE-TB	91.05763	124481	< 5.		UG/L	7/09/91		Chlorodibromomethane
AB-53NE-TB	91.05763	75003	< 10.		UG/L	7/09/91		Chloroethane
AB-53NE-TB	91.05763	110758	< 50.		UG/L	7/09/91		2-Chloroethylvinyl ether
AB-53NE-TB	91.05763	67663	< 5.		UG/L	7/09/91		Chloroform
AB-53NE-TB	91.05763	74873	< 10.		UG/L	7/09/91		Chloromethane

AB-53NE-TB	91.05763	95498	< 5.	UG/L	7/09/91	o-Chlorotoluene
AB-53NE-TB	91.05763	106434	< 5.	UG/L	7/09/91	p-Chlorotoluene
AB-53NE-TB	91.05763	96128	< 10.	UG/L	7/09/91	1,2-Dibromo-3-chloropropane
AB-53NE-TB	91.05763	106934	< 5.	UG/L	7/09/91	1,2-Dibromoethane
AB-53NE-TB	91.05763	74953	< 5.	UG/L	7/09/91	Dibromomethane
AB-53NE-TB	91.05763	95501	< 5.	UG/L	7/09/91	o-Dichlorobenzene (1,2)
AB-53NE-TB	91.05763	541731	< 5.	UG/L	7/09/91	m-Dichlorobenzene (1,3)
AB-53NE-TB	91.05763	106467	< 5.	UG/L	7/09/91	p-Dichlorobenzene (1,4)
AB-53NE-TB	91.05763	75718	< 10.	UG/L	7/09/91	Dichlorodifluoromethane
AB-53NE-TB	91.05763	75343	< 5.	UG/L	7/09/91	1,1-Dichloroethane
AB-53NE-TB	91.05763	107062	< 5.	UG/L	7/09/91	1,2-Dichloroethane
AB-53NE-TB	91.05763	75354	< 5.	UG/L	7/09/91	1,1-Dichloroethene
AB-53NE-TB	91.05763	156605	< 5.	UG/L	7/09/91	trans-1,2-Dichloroethene
AB-53NE-TB	91.05763	156592	< 5.	UG/L	7/09/91	cis-1,2-Dichloroethylene
AB-53NE-TB	91.05763	78875	< 5.	UG/L	7/09/91	1,2-Dichloropropane
AB-53NE-TB	91.05763	142289	< 5.	UG/L	7/09/91	1,3-Dichloropropane
AB-53NE-TB	91.05763	594207	< 5.	UG/L	7/09/91	2,2-Dichloropropane
AB-53NE-TB	91.05763	563586	< 5.	UG/L	7/09/91	1,1-Dichloropropene
AB-53NE-TB	91.05763	10061015	< 5.	UG/L	7/09/91	cis-1,3-Dichloropropene
AB-53NE-TB	91.05763	10061026	< 5.	UG/L	7/09/91	trans-1,3-Dichloropropene
AB-53NE-TB	91.05763	100414	< 5.	UG/L	7/09/91	Ethylbenzene
AB-53NE-TB	91.05763	591786	< 20.	UG/L	7/09/91	2-Hexanone
AB-53NE-TB	91.05763	98828	< 5.	UG/L	7/09/91	Isopropylbenzene
AB-53NE-TB	91.05763	99876	< 5.	UG/L	7/09/91	4-Isopropyltoluene
AB-53NE-TB	91.05763	74884	< 5.	UG/L	7/09/91	Methyl iodide
AB-53NE-TB	91.05763	108101	< 20.	UG/L	7/09/91	4-Methyl-2-pentanone
AB-53NE-TB	91.05763	75092	< 5.	UG/L	7/09/91	Methylene chloride
AB-53NE-TB	91.05763	103651	< 5.	UG/L	7/09/91	Propylbenzene
AB-53NE-TB	91.05763	100425	< 5.	UG/L	7/09/91	Styrene
AB-53NE-TB	91.05763	630206	< 5.	UG/L	7/09/91	1,1,1,2-Tetrachloroethane
AB-53NE-TB	91.05763	79345	< 5.	UG/L	7/09/91	1,1,2,2-Tetrachloroethane
AB-53NE-TB	91.05763	127184	< 5.	UG/L	7/09/91	Tetrachloroethylene
AB-53NE-TB	91.05763	108883	< 5.	UG/L	7/09/91	Toluene
AB-53NE-TB	91.05763	76131	< 5.	UG/L	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53NE-TB	91.05763	71556	< 5.	UG/L	7/09/91	1,1,1-Trichloroethane
AB-53NE-TB	91.05763	79005	< 5.	UG/L	7/09/91	1,1,2-Trichloroethane
AB-53NE-TB	91.05763	79016	< 5.	UG/L	7/09/91	Trichloroethene
AB-53NE-TB	91.05763	75694	< 5.	UG/L	7/09/91	Trichlorofluoromethane
AB-53NE-TB	91.05763	96184	< 5.	UG/L	7/09/91	1,2,3-Trichloropropane
AB-53NE-TB	91.05763	95636	< 5.	UG/L	7/09/91	1,2,4-Trimethylbenzene
AB-53NE-TB	91.05763	108678	< 5.	UG/L	7/09/91	1,3,5-Trimethylbenzene
AB-53NE-TB	91.05763	108054	< 10.	UG/L	7/09/91	Vinyl acetate
AB-53NE-TB	91.05763	75014	< 10.	UG/L	7/09/91	Vinyl chloride
AB-53NE-TB	91.05763	1330207	< 5.	UG/L	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05763

none

Customer Sample Duplicate Results for Sample # 91.05763

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05763

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05764

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: Date Analyzed:

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53SO-TB	91.05764	67641	< 20.		UG/L	7/09/91		Acetone
AB-53SO-TB	91.05764	107028	< 100.		UG/L	7/09/91		Acrolein
AB-53SO-TB	91.05764	107131	< 100.		UG/L	7/09/91		Acrylonitrile
AB-53SO-TB	91.05764	71432	< 5.		UG/L	7/09/91		Benzene
AB-53SO-TB	91.05764	108861	< 5.		UG/L	7/09/91		Bromobenzene
AB-53SO-TB	91.05764	74975	< 5.		UG/L	7/09/91		Bromochloromethane
AB-53SO-TB	91.05764	75274	< 5.		UG/L	7/09/91		Bromodichloromethane
AB-53SO-TB	91.05764	75252	< 5.		UG/L	7/09/91		Bromoform
AB-53SO-TB	91.05764	74839	< 10.		UG/L	7/09/91		Bromomethane
AB-53SO-TB	91.05764	78933	< 20.		UG/L	7/09/91		2-Butanone
AB-53SO-TB	91.05764	104518	< 5.		UG/L	7/09/91		n-Butylbenzene
AB-53SO-TB	91.05764	135988	< 5.		UG/L	7/09/91		sec-Butylbenzene
AB-53SO-TB	91.05764	98066	< 5.		UG/L	7/09/91		tert-Butylbenzene
AB-53SO-TB	91.05764	75150	< 5.		UG/L	7/09/91		Carbon disulfide
AB-53SO-TB	91.05764	56235	< 5.		UG/L	7/09/91		Carbon tetrachloride
AB-53SO-TB	91.05764	108907	< 5.		UG/L	7/09/91		Chlorobenzene
AB-53SO-TB	91.05764	124481	< 5.		UG/L	7/09/91		Chlorodibromomethane
AB-53SO-TB	91.05764	75003	< 10.		UG/L	7/09/91		Chloroethane
AB-53SO-TB	91.05764	110758	< 50.		UG/L	7/09/91		2-Chloroethylvinyl ether
AB-53SO-TB	91.05764	67663	< 5.		UG/L	7/09/91		Chloroform
AB-53SO-TB	91.05764	74873	< 10.		UG/L	7/09/91		Chloromethane

AB-53SO-TB	91.05764	95498	< 5.	UG/L	7/09/91	o-Chlorotoluene
AB-53SO-TB	91.05764	106434	< 5.	UG/L	7/09/91	p-Chlorotoluene
AB-53SO-TB	91.05764	96128	< 10.	UG/L	7/09/91	1,2-Dibromo-3-chloropropane
AB-53SO-TB	91.05764	106934	< 5.	UG/L	7/09/91	1,2-Dibromoethane
AB-53SO-TB	91.05764	74953	< 5.	UG/L	7/09/91	Dibromomethane
AB-53SO-TB	91.05764	95501	< 5.	UG/L	7/09/91	o-Dichlorobenzene (1,2)
AB-53SO-TB	91.05764	541731	< 5.	UG/L	7/09/91	m-Dichlorobenzene (1,3)
AB-53SO-TB	91.05764	106467	< 5.	UG/L	7/09/91	p-Dichlorobenzene (1,4)
AB-53SO-TB	91.05764	75718	< 10.	UG/L	7/09/91	Dichlorodifluoromethane
AB-53SO-TB	91.05764	75343	< 5.	UG/L	7/09/91	1,1-Dichloroethane
AB-53SO-TB	91.05764	107062	< 5.	UG/L	7/09/91	1,2-Dichloroethane
AB-53SO-TB	91.05764	75354	< 5.	UG/L	7/09/91	1,1-Dichloroethene
AB-53SO-TB	91.05764	156605	< 5.	UG/L	7/09/91	trans-1,2-Dichloroethene
AB-53SO-TB	91.05764	156592	< 5.	UG/L	7/09/91	cis-1,2-Dichloroethylene
AB-53SO-TB	91.05764	78875	< 5.	UG/L	7/09/91	1,2-Dichloropropane
AB-53SO-TB	91.05764	142289	< 5.	UG/L	7/09/91	1,3-Dichloropropane
AB-53SO-TB	91.05764	594207	< 5.	UG/L	7/09/91	2,2-Dichloropropane
AB-53SO-TB	91.05764	563586	< 5.	UG/L	7/09/91	1,1-Dichloropropene
AB-53SO-TB	91.05764	10061015	< 5.	UG/L	7/09/91	cis-1,3-Dichloropropene
AB-53SO-TB	91.05764	10061026	< 5.	UG/L	7/09/91	trans-1,3-Dichloropropene
AB-53SO-TB	91.05764	100414	< 5.	UG/L	7/09/91	Ethylbenzene
AB-53SO-TB	91.05764	591786	< 20.	UG/L	7/09/91	2-Hexanone
AB-53SO-TB	91.05764	98828	< 5.	UG/L	7/09/91	Isopropylbenzene
AB-53SO-TB	91.05764	99876	< 5.	UG/L	7/09/91	4-Isopropyltoluene
AB-53SO-TB	91.05764	74884	< 5.	UG/L	7/09/91	Methyl iodide
AB-53SO-TB	91.05764	108101	< 20.	UG/L	7/09/91	4-Methyl-2-pentanone
AB-53SO-TB	91.05764	75092	< 5.	UG/L	7/09/91	Methylene chloride
AB-53SO-TB	91.05764	103651	< 5.	UG/L	7/09/91	Propylbenzene
AB-53SO-TB	91.05764	100425	< 5.	UG/L	7/09/91	Styrene
AB-53SO-TB	91.05764	630206	< 5.	UG/L	7/09/91	1,1,1,2-Tetrachloroethane
AB-53SO-TB	91.05764	79345	< 5.	UG/L	7/09/91	1,1,2,2-Tetrachloroethane
AB-53SO-TB	91.05764	127184	< 5.	UG/L	7/09/91	Tetrachloroethylene
AB-53SO-TB	91.05764	108883	< 5.	UG/L	7/09/91	Toluene
AB-53SO-TB	91.05764	76131	< 5.	UG/L	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53SO-TB	91.05764	71556	< 5.	UG/L	7/09/91	1,1,1-Trichloroethane
AB-53SO-TB	91.05764	79005	< 5.	UG/L	7/09/91	1,1,2-Trichloroethane
AB-53SO-TB	91.05764	79016	< 5.	UG/L	7/09/91	Trichloroethene
AB-53SO-TB	91.05764	75694	< 5.	UG/L	7/09/91	Trichlorofluoromethane
AB-53SO-TB	91.05764	96184	< 5.	UG/L	7/09/91	1,2,3-Trichloropropane
AB-53SO-TB	91.05764	95636	< 5.	UG/L	7/09/91	1,2,4-Trimethylbenzene
AB-53SO-TB	91.05764	108678	< 5.	UG/L	7/09/91	1,3,5-Trimethylbenzene
AB-53SO-TB	91.05764	108054	< 10.	UG/L	7/09/91	Vinyl acetate
AB-53SO-TB	91.05764	75014	< 10.	UG/L	7/09/91	Vinyl chloride
AB-53SO-TB	91.05764	1330207	< 5.	UG/L	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05764

none

Customer Sample Duplicate Results for Sample # 91.05764

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05764

none

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********** HSE-9 QUALITY ASSURANCE REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

SUMMARY OF CONTROL STATUS OF OPEN (NON-BLIND) QA SAMPLES RUN WITH THIS BATCH

There were no open (non-blind) Quality Control materials run with the samples reported above for one of the following reasons:

____ Only qualitative data requested

____ Only Blind QC samples run with this batch.

____ No QC samples run with this sample batch.

____ No QC samples for this constituent and matrix type available within HSE-9

SUMMARY OF CONTROL STATUS OF BLANK QC SAMPLES RUN WITH THIS BATCH

Blank Results

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	RESULT	UNCERTAINTY	UNITS	CERTIFIED VALUE	CERTIFIED VALUE UNCERTAINTY	COMPLETION DATE	COMMENT	COMPOUN
00.20226	91.05766	67641	< 20.		UG/L	0.0		7/09/91	UNDER CONTROL	Acetone
00.20226	91.05766	107028	< 100.		UG/L	0.0		7/09/91	UNDER CONTROL	Acrolein
00.20226	91.05766	107131	< 100.		UG/L	0.0		7/09/91	UNDER CONTROL	Acrylonitrile
00.20226	91.05766	71432	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Benzene
00.20226	91.05766	108861	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Bromobenzene
00.20226	91.05766	74975	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Bromochloromethane
00.20226	91.05766	75274	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Bromodichloromethane
00.20226	91.05766	75252	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Bromoform
00.20226	91.05766	74839	< 10.		UG/L	0.0		7/09/91	UNDER CONTROL	Bromomethane
00.20226	91.05766	78933	< 20.		UG/L	0.0		7/09/91	UNDER CONTROL	2-Butanone
00.20226	91.05766	104518	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	n-Butylbenzene
00.20226	91.05766	135988	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	sec-Butylbenzene
00.20226	91.05766	98066	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	tert-Butylbenzene
00.20226	91.05766	75150	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Carbon disulfide
00.20226	91.05766	56235	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Carbon tetrachloride
00.20226	91.05766	108907	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Chlorobenzene
00.20226	91.05766	124481	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Chlorodibromomethane
00.20226	91.05766	75003	< 10.		UG/L	0.0		7/09/91	UNDER CONTROL	Chloroethane
00.20226	91.05766	110758	< 50.		UG/L	0.0		7/09/91	UNDER CONTROL	2-Chloroethylvinyl ether
00.20226	91.05766	67663	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Chloroform
00.20226	91.05766	74873	< 10.		UG/L	0.0		7/09/91	UNDER CONTROL	Chloromethane
00.20226	91.05766	95498	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	o-Chlorotoluene
00.20226	91.05766	106434	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	p-Chlorotoluene
00.20226	91.05766	96128	< 10.		UG/L	0.0		7/09/91	UNDER CONTROL	1,2-Dibromo-3-chloropropane
00.20226	91.05766	106934	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	1,2-Dibromoethane
00.20226	91.05766	74953	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Dibromomethane
00.20226	91.05766	95501	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	o-Dichlorobenzene (1,2)
00.20226	91.05766	541731	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	m-Dichlorobenzene (1,3)
00.20226	91.05766	106467	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	p-Dichlorobenzene (1,4)
00.20226	91.05766	75718	< 10.		UG/L	0.0		7/09/91	UNDER CONTROL	Dichlorodifluoromethane
00.20226	91.05766	75343	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	1,1-Dichloroethane
00.20226	91.05766	107062	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	1,2-Dichloroethane

00.20226	91.05766	75354	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,1-Dichloroethene
00.20226	91.05766	156605	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	trans-1,2-Dichloroethene
00.20226	91.05766	156592	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	cis-1,2-Dichloroethylene
00.20226	91.05766	78875	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,2-Dichloropropane
00.20226	91.05766	142289	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,3-Dichloropropane
00.20226	91.05766	594207	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	2,2-Dichloropropane
00.20226	91.05766	563586	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,1-Dichloropropene
00.20226	91.05766	10061015	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	cis-1,3-Dichloropropene
00.20226	91.05766	10061026	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	trans-1,3-Dichloropropene
00.20226	91.05766	100414	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Ethylbenzene
00.20226	91.05766	591786	< 20.	UG/L	0.0	7/09/91	UNDER CONTROL	2-Hexanone
00.20226	91.05766	98828	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Isopropylbenzene
00.20226	91.05766	99876	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	4-Isopropyltoluene
00.20226	91.05766	74884	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Methyl iodide
00.20226	91.05766	108101	< 20.	UG/L	0.0	7/09/91	UNDER CONTROL	4-Methyl-2-pentanone
00.20226	91.05766	75092	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Methylene chloride
00.20226	91.05766	103651	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Propylbenzene
00.20226	91.05766	100425	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Styrene
00.20226	91.05766	630206	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,1,1,2-Tetrachloroethane
00.20226	91.05766	79345	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,1,2,2-Tetrachloroethane
00.20226	91.05766	127184	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Tetrachloroethylene
00.20226	91.05766	108883	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Toluene
00.20226	91.05766	76131	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,1,2-Trichloro-1,2,2-trifluoroet
00.20226	91.05766	71556	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,1,1-Trichloroethane
00.20226	91.05766	79005	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,1,2-Trichloroethane
00.20226	91.05766	79016	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Trichloroethene
00.20226	91.05766	75694	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Trichlorofluoromethane
00.20226	91.05766	96184	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,2,3-Trichloropropane
00.20226	91.05766	95636	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,2,4-Trimethylbenzene
00.20226	91.05766	108678	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,3,5-Trimethylbenzene
00.20226	91.05766	108054	< 10.	UG/L	0.0	7/09/91	UNDER CONTROL	Vinyl acetate
00.20226	91.05766	75014	< 10.	UG/L	0.0	7/09/91	UNDER CONTROL	Vinyl chloride
00.20226	91.05766	1330207	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Mixed-Xylenes (o ± m ± p)
00.20226	91.05767	67641	< 20.	UG/L	0.0	7/09/91	UNDER CONTROL	Acetone
00.20226	91.05767	107028	< 100.	UG/L	0.0	7/09/91	UNDER CONTROL	Acrolein
00.20226	91.05767	107131	< 100.	UG/L	0.0	7/09/91	UNDER CONTROL	Acrylonitrile
00.20226	91.05767	71432	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Benzene
00.20226	91.05767	108861	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Bromobenzene
00.20226	91.05767	74975	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Bromochloromethane
00.20226	91.05767	75274	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Bromodichloromethane
00.20226	91.05767	75252	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Bromoform
00.20226	91.05767	74839	< 10.	UG/L	0.0	7/09/91	UNDER CONTROL	Bromomethane
00.20226	91.05767	78933	< 20.	UG/L	0.0	7/09/91	UNDER CONTROL	2-Butanone
00.20226	91.05767	104518	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	n-Butylbenzene
00.20226	91.05767	135988	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	sec-Butylbenzene

00.20226	91.05767	98066	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	tert-Butylbenzene
00.20226	91.05767	75150	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Carbon disulfide
00.20226	91.05767	56235	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Carbon tetrachloride
00.20226	91.05767	108907	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Chlorobenzene
00.20226	91.05767	124481	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Chlorodibromomethane
00.20226	91.05767	75003	< 10.	UG/L	0.0	7/09/91	UNDER CONTROL	Chloroethane
00.20226	91.05767	110758	< 50.	UG/L	0.0	7/09/91	UNDER CONTROL	2-Chloroethylvinyl ether
00.20226	91.05767	67663	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Chloroform
00.20226	91.05767	74873	< 10.	UG/L	0.0	7/09/91	UNDER CONTROL	Chloromethane
00.20226	91.05767	95498	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	o-Chlorotoluene
00.20226	91.05767	106434	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	p-Chlorotoluene
00.20226	91.05767	96128	< 10.	UG/L	0.0	7/09/91	UNDER CONTROL	1,2-Dibromo-3-chloropropane
00.20226	91.05767	106934	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,2-Dibromoethane
00.20226	91.05767	74953	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Dibromomethane
00.20226	91.05767	95501	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	o-Dichlorobenzene (1,2)
00.20226	91.05767	541731	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	m-Dichlorobenzene (1,3)
00.20226	91.05767	106467	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	p-Dichlorobenzene (1,4)
00.20226	91.05767	75718	< 10.	UG/L	0.0	7/09/91	UNDER CONTROL	Dichlorodifluoromethane
00.20226	91.05767	75343	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,1-Dichloroethane
00.20226	91.05767	107062	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,2-Dichloroethane
00.20226	91.05767	75354	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,1-Dichloroethene
00.20226	91.05767	156605	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	trans-1,2-Dichloroethene
00.20226	91.05767	156592	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	cis-1,2-Dichloroethylene
00.20226	91.05767	78875	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,2-Dichloropropane
00.20226	91.05767	142289	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,3-Dichloropropane
00.20226	91.05767	594207	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	2,2-Dichloropropane
00.20226	91.05767	563586	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,1-Dichloropropene
00.20226	91.05767	10061015	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	cis-1,3-Dichloropropene
00.20226	91.05767	10061026	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	trans-1,3-Dichloropropene
00.20226	91.05767	100414	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Ethylbenzene
00.20226	91.05767	591786	< 20.	UG/L	0.0	7/09/91	UNDER CONTROL	2-Hexanone
00.20226	91.05767	98828	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Isopropylbenzene
00.20226	91.05767	99876	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	4-Isopropyltoluene
00.20226	91.05767	74884	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Methyl iodide
00.20226	91.05767	108101	< 20.	UG/L	0.0	7/09/91	UNDER CONTROL	4-Methyl-2-pentanone
00.20226	91.05767	75092	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Methylene chloride
00.20226	91.05767	103651	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Propylbenzene
00.20226	91.05767	100425	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Styrene
00.20226	91.05767	630206	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,1,1,2-Tetrachloroethane
00.20226	91.05767	79345	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,1,2,2-Tetrachloroethane
00.20226	91.05767	127184	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Tetrachloroethylene
00.20226	91.05767	108883	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Toluene
00.20226	91.05767	76131	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,1,2-Trichloro-1,2,2-trifluoroet
00.20226	91.05767	71556	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,1,1-Trichloroethane
00.20226	91.05767	79005	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,1,2-Trichloroethane

00.20226	91.05767	79016	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Trichloroethene
00.20226	91.05767	75694	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Trichlorofluoromethane
00.20226	91.05767	96184	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,2,3-Trichloropropane
00.20226	91.05767	95636	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,2,4-Trimethylbenzene
00.20226	91.05767	108678	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	1,3,5-Trimethylbenzene
00.20226	91.05767	108054	< 10.	UG/L	0.0	7/09/91	UNDER CONTROL	Vinyl acetate
00.20226	91.05767	75014	< 10.	UG/L	0.0	7/09/91	UNDER CONTROL	Vinyl chloride
00.20226	91.05767	1330207	< 5.	UG/L	0.0	7/09/91	UNDER CONTROL	Mixed-Xylenes (o ± m ± p)
00.20227	91.05771	67641	< 20.	UG/KG	0.0	7/09/91	UNDER CONTROL	Acetone
00.20227	91.05771	107028	< 100.	UG/KG	0.0	7/09/91	UNDER CONTROL	Acrolein
00.20227	91.05771	107131	< 100.	UG/KG	0.0	7/09/91	UNDER CONTROL	Acrylonitrile
00.20227	91.05771	71432	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Benzene
00.20227	91.05771	108861	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Bromobenzene
00.20227	91.05771	74975	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Bromochloromethane
00.20227	91.05771	75274	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Bromodichloromethane
00.20227	91.05771	75252	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Bromoform
00.20227	91.05771	74839	< 10.	UG/KG	0.0	7/09/91	UNDER CONTROL	Bromomethane
00.20227	91.05771	78933	< 20.	UG/KG	0.0	7/09/91	UNDER CONTROL	2-Butanone
00.20227	91.05771	104518	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	n-Butylbenzene
00.20227	91.05771	135988	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	sec-Butylbenzene
00.20227	91.05771	98066	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	tert-Butylbenzene
00.20227	91.05771	75150	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Carbon disulfide
00.20227	91.05771	56235	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Carbon tetrachloride
00.20227	91.05771	108907	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Chlorobenzene
00.20227	91.05771	124481	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Chlorodibromomethane
00.20227	91.05771	75003	< 10.	UG/KG	0.0	7/09/91	UNDER CONTROL	Chloroethane
00.20227	91.05771	110758	< 50.	UG/KG	0.0	7/09/91	UNDER CONTROL	2-Chloroethylvinyl ether
00.20227	91.05771	67663	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Chloroform
00.20227	91.05771	74873	< 10.	UG/KG	0.0	7/09/91	UNDER CONTROL	Chloromethane
00.20227	91.05771	95498	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	o-Chlorotoluene
00.20227	91.05771	106434	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	p-Chlorotoluene
00.20227	91.05771	96128	< 10.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,2-Dibromo-3-chloropropane
00.20227	91.05771	106934	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,2-Dibromoethane
00.20227	91.05771	74953	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Dibromomethane
00.20227	91.05771	95501	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	o-Dichlorobenzene (1,2)
00.20227	91.05771	541731	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	m-Dichlorobenzene (1,3)
00.20227	91.05771	106467	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	p-Dichlorobenzene (1,4)
00.20227	91.05771	75718	< 10.	UG/KG	0.0	7/09/91	UNDER CONTROL	Dichlorodifluoromethane
00.20227	91.05771	75343	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1-Dichloroethane
00.20227	91.05771	107062	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,2-Dichloroethane
00.20227	91.05771	75354	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1-Dichloroethene
00.20227	91.05771	156605	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	trans-1,2-Dichloroethene
00.20227	91.05771	156592	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	cis-1,2-Dichloroethylene
00.20227	91.05771	78875	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,2-Dichloropropane
00.20227	91.05771	142289	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,3-Dichloropropane

00.20227	91.05771	594207	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	2,2-Dichloropropane
00.20227	91.05771	563586	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1-Dichloropropene
00.20227	91.05771	10061015	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	cis-1,3-Dichloropropene
00.20227	91.05771	10061026	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	trans-1,3-Dichloropropene
00.20227	91.05771	100414	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Ethylbenzene
00.20227	91.05771	591786	< 20.	UG/KG	0.0	7/09/91	UNDER CONTROL	2-Hexanone
00.20227	91.05771	98828	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Isopropylbenzene
00.20227	91.05771	99876	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	4-Isopropyltoluene
00.20227	91.05771	74884	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Methyl iodide
00.20227	91.05771	108101	< 20.	UG/KG	0.0	7/09/91	UNDER CONTROL	4-Methyl-2-pentanone
00.20227	91.05771	75092	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Methylene chloride
00.20227	91.05771	103651	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Propylbenzene
00.20227	91.05771	100425	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Styrene
00.20227	91.05771	630206	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1,1,2-Tetrachloroethane
00.20227	91.05771	79345	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1,2,2-Tetrachloroethane
00.20227	91.05771	127184	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Tetrachloroethylene
00.20227	91.05771	108883	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Toluene
00.20227	91.05771	76131	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1,2-Trichloro-1,2,2-trifluoroet
00.20227	91.05771	71556	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1,1-Trichloroethane
00.20227	91.05771	79005	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1,2-Trichloroethane
00.20227	91.05771	79016	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Trichloroethene
00.20227	91.05771	75694	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Trichlorofluoromethane
00.20227	91.05771	96184	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,2,3-Trichloropropane
00.20227	91.05771	95636	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,2,4-Trimethylbenzene
00.20227	91.05771	108678	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,3,5-Trimethylbenzene
00.20227	91.05771	108054	< 10.	UG/KG	0.0	7/09/91	UNDER CONTROL	Vinyl acetate
00.20227	91.05771	75014	< 10.	UG/KG	0.0	7/09/91	UNDER CONTROL	Vinyl chloride
00.20227	91.05771	1330207	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Mixed-Xylenes (o ± m ± p)
00.20227	91.05772	67641	< 20.	UG/KG	0.0	7/09/91	UNDER CONTROL	Acetone
00.20227	91.05772	107028	< 100.	UG/KG	0.0	7/09/91	UNDER CONTROL	Acrolein
00.20227	91.05772	107131	< 100.	UG/KG	0.0	7/09/91	UNDER CONTROL	Acrylonitrile
00.20227	91.05772	71432	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Benzene
00.20227	91.05772	108861	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Bromobenzene
00.20227	91.05772	74975	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Bromochloromethane
00.20227	91.05772	75274	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Bromodichloromethane
00.20227	91.05772	75252	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Bromoform
00.20227	91.05772	74839	< 10.	UG/KG	0.0	7/09/91	UNDER CONTROL	Bromomethane
00.20227	91.05772	78933	< 20.	UG/KG	0.0	7/09/91	UNDER CONTROL	2-Butanone
00.20227	91.05772	104518	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	n-Butylbenzene
00.20227	91.05772	135988	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	sec-Butylbenzene
00.20227	91.05772	98066	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	tert-Butylbenzene
00.20227	91.05772	75150	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Carbon disulfide
00.20227	91.05772	56235	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Carbon tetrachloride
00.20227	91.05772	108907	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Chlorobenzene
00.20227	91.05772	124481	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Chlorodibromomethane

00.20227	91.05772	75003	< 10.	UG/KG	0.0	7/09/91	UNDER CONTROL	Chloroethane
00.20227	91.05772	110758	< 50.	UG/KG	0.0	7/09/91	UNDER CONTROL	2-Chloroethylvinyl ether
00.20227	91.05772	67663	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Chloroform
00.20227	91.05772	74873	< 10.	UG/KG	0.0	7/09/91	UNDER CONTROL	Chloromethane
00.20227	91.05772	95498	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	o-Chlorotoluene
00.20227	91.05772	106434	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	p-Chlorotoluene
00.20227	91.05772	96128	< 10.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,2-Dibromo-3-chloropropane
00.20227	91.05772	106934	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,2-Dibromoethane
00.20227	91.05772	74953	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Dibromomethane
00.20227	91.05772	95501	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	o-Dichlorobenzene (1,2)
00.20227	91.05772	541731	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	m-Dichlorobenzene (1,3)
00.20227	91.05772	106467	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	p-Dichlorobenzene (1,4)
00.20227	91.05772	75718	< 10.	UG/KG	0.0	7/09/91	UNDER CONTROL	Dichlorodifluoromethane
00.20227	91.05772	75343	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1-Dichloroethane
00.20227	91.05772	107062	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,2-Dichloroethane
00.20227	91.05772	75354	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1-Dichloroethene
00.20227	91.05772	156605	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	trans-1,2-Dichloroethene
00.20227	91.05772	156592	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	cis-1,2-Dichloroethylene
00.20227	91.05772	78875	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,2-Dichloropropane
00.20227	91.05772	142289	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,3-Dichloropropane
00.20227	91.05772	594207	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	2,2-Dichloropropane
00.20227	91.05772	563586	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1-Dichloropropene
00.20227	91.05772	10061015	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	cis-1,3-Dichloropropene
00.20227	91.05772	10061026	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	trans-1,3-Dichloropropene
00.20227	91.05772	100414	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Ethylbenzene
00.20227	91.05772	591786	< 20.	UG/KG	0.0	7/09/91	UNDER CONTROL	2-Hexanone
00.20227	91.05772	98828	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Isopropylbenzene
00.20227	91.05772	99876	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	4-Isopropyltoluene
00.20227	91.05772	74884	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Methyl iodide
00.20227	91.05772	108101	< 20.	UG/KG	0.0	7/09/91	UNDER CONTROL	4-Methyl-2-pentanone
00.20227	91.05772	75092	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Methylene chloride
00.20227	91.05772	103651	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Propylbenzene
00.20227	91.05772	100425	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Styrene
00.20227	91.05772	630206	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1,1,2-Tetrachloroethane
00.20227	91.05772	79345	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1,2,2-Tetrachloroethane
00.20227	91.05772	127184	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Tetrachloroethylene
00.20227	91.05772	108883	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Toluene
00.20227	91.05772	76131	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1,2-Trichloro-1,2,2-trifluoroet
00.20227	91.05772	71556	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1,1-Trichloroethane
00.20227	91.05772	79005	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,1,2-Trichloroethane
00.20227	91.05772	79016	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Trichloroethene
00.20227	91.05772	75694	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Trichlorofluoromethane
00.20227	91.05772	96184	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,2,3-Trichloropropane
00.20227	91.05772	95636	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,2,4-Trimethylbenzene
00.20227	91.05772	108678	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	1,3,5-Trim ylbenzene

00.20227	91.05772	108054	< 10.	UG/KG	0.0	7/09/91	UNDER CONTROL	Vinyl acetate
00.20227	91.05772	75014	< 10.	UG/KG	0.0	7/09/91	UNDER CONTROL	Vinyl chloride
00.20227	91.05772	1330207	< 5.	UG/KG	0.0	7/09/91	UNDER CONTROL	Mixed-Xylenes (o ± m ± p)

Blank Spike Results

none

Blank Spike Duplicate Results

none

SUMMARY OF CONTROL STATUS OF BLIND QA SAMPLES RUN WITH THIS BATCH

Blind QC Results, Sample # 91.05765

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/06/91 Date Analyzed: 7/06/91

SAMPLE NUM	ANALYSIS	RESULT	UNCERTAINTY	UNITS	CERTIFIED VALUE	CERTIFIED VALUE UNCERTAINTY	COMPLETION DATE	COMMENT	COMPOUND-NAME
91.05765	67641	74.	22.2	UG/L	80.	8.	7/09/91	UNDER CONTROL	Acetone
91.05765	107028	< 100.		UG/L	0.0		7/09/91	UNDER CONTROL	Acrolein
91.05765	107131	< 100.		UG/L	0.0		7/09/91	UNDER CONTROL	Acrylonitrile
91.05765	71432	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Benzene
91.05765	108861	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Bromobenzene
91.05765	74975	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Bromochloromethane
91.05765	75274	140.	42.	UG/L	82.	8.	7/09/91	UNDER CONTROL	Bromodichloromethane
91.05765	75252	97.	29.1	UG/L	86.	9.	7/09/91	UNDER CONTROL	Bromoform
91.05765	74839	< 10.		UG/L	0.0		7/09/91	UNDER CONTROL	Bromomethane
91.05765	78933	< 20.		UG/L	82.	8.	7/09/91	WARNING 2-3 SIG	2-Butanone
91.05765	104518	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	n-Butylbenzene
91.05765	135988	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	sec-Butylbenzene
91.05765	98066	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	tert-Butylbenzene
91.05765	75150	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Carbon disulfide
91.05765	56235	96.	28.8	UG/L	85.	8.	7/09/91	UNDER CONTROL	Carbon tetrachloride
91.05765	108907	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Chlorobenzene
91.05765	124481	94.	28.2	UG/L	86.	9.	7/09/91	UNDER CONTROL	Chlorodibromomethane
91.05765	75003	< 10.		UG/L	0.0		7/09/91	UNDER CONTROL	Chloroethane
91.05765	110758	< 50.		UG/L	0.0		7/09/91	UNDER CONTROL	2-Chloroethylvinyl ether
91.05765	67663	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Chloroform

91.05765	74873	< 10.		UG/L	0.0		7/09/91	UNDER CONTROL	Chloromethane
91.05765	95498	49.	14.7	UG/L	79.	8.	7/09/91	UNDER CONTROL	o-Chlorotoluene
91.05765	106434	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	p-Chlorotoluene
91.05765	96128	< 10.		UG/L	0.0		7/09/91	UNDER CONTROL	1,2-Dibromo-3-chloropropane
91.05765	106934	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	1,2-Dibromoethane
91.05765	74953	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Dibromomethane
91.05765	95501	55.	16.5	UG/L	82.	8.	7/09/91	UNDER CONTROL	o-Dichlorobenzene (1,2)
91.05765	541731	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	m-Dichlorobenzene (1,3)
91.05765	106467	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	p-Dichlorobenzene (1,4)
91.05765	75718	< 10.		UG/L	0.0		7/09/91	UNDER CONTROL	Dichlorodifluoromethane
91.05765	75343	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	1,1-Dichloroethane
91.05765	107062	210.	63.	UG/L	105.	10.	7/09/91	UNDER CONTROL	1,2-Dichloroethane
91.05765	75354	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	1,1-Dichloroethene
91.05765	156605	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	trans-1,2-Dichloroethene
91.05765	156592	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	cis-1,2-Dichloroethylene
91.05765	78875	100.	30.	UG/L	85.	8.	7/09/91	UNDER CONTROL	1,2-Dichloropropane
91.05765	142289	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	1,3-Dichloropropane
91.05765	594207	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	2,2-Dichloropropane
91.05765	563586	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	1,1-Dichloropropene
91.05765	10061015	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	cis-1,3-Dichloropropene
91.05765	10061026	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	trans-1,3-Dichloropropene
91.05765	100414	54.	16.2	UG/L	84.	8.	7/09/91	UNDER CONTROL	Ethylbenzene
91.05765	591786	< 20.		UG/L	76.	8.	7/09/91	WARNING 2-3 SIG	2-Hexanone
91.05765	98828	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Isopropylbenzene
91.05765	99876	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	[redacted]
91.05765	74884	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Methyl iodide
91.05765	108101	62.	18.6	UG/L	83.	8.	7/09/91	UNDER CONTROL	4-Methyl-2-pentanone
91.05765	75092	130.	39.	UG/L	90.	9.	7/09/91	UNDER CONTROL	Methylene chloride
91.05765	103651	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Propylbenzene
91.05765	100425	80.	24.	UG/L	96.	10.	7/09/91	UNDER CONTROL	Styrene
91.05765	630206	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	1,1,1,2-Tetrachloroethane
91.05765	79345	89.	26.7	UG/L	90.	9.	7/09/91	UNDER CONTROL	1,1,2,2-Tetrachloroethane
91.05765	127184	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Tetrachloroethylene
91.05765	108883	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	[redacted]
91.05765	76131	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	1,1,2-Trichloro-1,2,2-trifluoroethane
91.05765	71556	96.	28.8	UG/L	82.	8.	7/09/91	UNDER CONTROL	1,1,1-Trichloroethane
91.05765	79005	92.	27.6	UG/L	83.	8.	7/09/91	UNDER CONTROL	1,1,2-Trichloroethane
91.05765	79016	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Trichloroethene
91.05765	75694	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Trichlorofluoromethane
91.05765	96184	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	1,2,3-Trichloropropane
91.05765	95636	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	1,2,4-Trimethylbenzene
91.05765	108678	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	1,3,5-Trimethylbenzene
91.05765	108054	< 10.		UG/L	0.0		7/09/91	UNDER CONTROL	Vinyl acetate
91.05765	75014	< 10.		UG/L	0.0		7/09/91	UNDER CONTROL	Vinyl chloride
91.05765	1330207	< 5.		UG/L	0.0		7/09/91	UNDER CONTROL	Mixed-Xylenes (o ± n)

Blind QC Results, Sample # 91.05770

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/05/91 Date Analyzed: 7/05/91

91.05770	67641	170.	51.	UG/KG	149.	15.	7/09/91	UNDER CONTROL	Acetone
91.05770	107028	< 100.		UG/KG	0.0		7/09/91	UNDER CONTROL	Acrolein
91.05770	107131	< 100.		UG/KG	0.0		7/09/91	UNDER CONTROL	Acrylonitrile
91.05770	71432	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Benzene
91.05770	108861	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Bromobenzene
91.05770	74975	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Bromochloromethane
91.05770	75274	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Bromodichloromethane
91.05770	75252	220.	66.	UG/KG	134.	13.	7/09/91	UNDER CONTROL	Bromoform
91.05770	74839	< 10.		UG/KG	0.0		7/09/91	UNDER CONTROL	Bromomethane
91.05770	78933	150.	45.	UG/KG	154.	15.	7/09/91	UNDER CONTROL	2-Butanone
91.05770	104518	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	n-Butylbenzene
91.05770	135988	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	sec-Butylbenzene
91.05770	98066	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	tert-Butylbenzene
91.05770	75150	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Carbon disulfide
91.05770	56235	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Carbon tetrachloride
91.05770	108907	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Chlorobenzene
91.05770	124481	150.	45.	UG/KG	160.	16.	7/09/91	UNDER CONTROL	Chlorodibromomethane
91.05770	75003	< 10.		UG/KG	0.0		7/09/91	UNDER CONTROL	Chloroethane
91.05770	110758	< 50.		UG/KG	0.0		7/09/91	UNDER CONTROL	2-Chloroethylvinyl ether
91.05770	67663	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Chloroform
91.05770	74873	< 10.		UG/KG	0.0		7/09/91	UNDER CONTROL	Chloromethane
91.05770	95498	38.	11.4	UG/KG	123.	12.	7/09/91	OUT OF CONTROL	o-Chlorotoluene
91.05770	106434	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	p-Chlorotoluene
91.05770	96128	< 10.		UG/KG	0.0		7/09/91	UNDER CONTROL	1,2-Dibromo-3-chloropropane
91.05770	106934	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	1,2-Dibromoethane
91.05770	74953	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Dibromomethane
91.05770	95501	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	o-Dichlorobenzene (1,2)
91.05770	541731	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	m-Dichlorobenzene (1,3)
91.05770	106467	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	p-Dichlorobenzene (1,4)
91.05770	75718	< 10.		UG/KG	0.0		7/09/91	UNDER CONTROL	Dichlorodifluoromethane
91.05770	75343	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	1,1-Dichloroethane
91.05770	107062	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	1,2-Dichloroethane
91.05770	75354	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	1,1-Dichloroethene
91.05770	156605	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	trans-1,2-Dichloroethene
91.05770	156592	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	cis-1,2-Dichloroethylene
91.05770	78875	39.	11.7	UG/KG	132.	13.	7/09/91	OUT OF CONTROL	1,2-Dichloropropane
91.05770	142289	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	1,3-Dichloropropane
91.05770	594207	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	2,2-Dichloropropane
91.05770	563586	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	1,1-Dichloropropene
91.05770	10061015	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	cis-1,3-Dichloropropene
91.05[illegible]	10061026	< 5.		UG/KG	0[illegible]		7/09/91	UNDER CONTROL	trans-1,3-Dichlor[illegible]opene

91.05770	100414	23.	6.9	UG/KG	130.	13.	7/09/91	OUT OF CONTROL	Ethylbenzene
91.05770	591786	< 20.		UG/KG	118.	12.	7/09/91	OUT OF CONTROL	2-Hexanone
91.05770	98828	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Isopropylbenzene
91.05770	99876	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	4-Isopropyltoluene
91.05770	74884	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Methyl iodide
91.05770	108101	170.	51.	UG/KG	155.	16.	7/09/91	UNDER CONTROL	4-Methyl-2-pentanone
91.05770	75092	43.	12.9	UG/KG	167.	17.	7/09/91	OUT OF CONTROL	Methylene chloride
91.05770	103651	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Propylbenzene
91.05770	100425	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Styrene
91.05770	630206	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	1,1,1,2-Tetrachloroethane
91.05770	79345	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	1,1,2,2-Tetrachloroethane
91.05770	127184	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Tetrachloroethylene
91.05770	108883	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Toluene
91.05770	76131	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	1,1,2-Trichloro-1,2,2-trifluoroethane
91.05770	71556	10.	3.	UG/KG	154.	15.	7/09/91	OUT OF CONTROL	1,1,1-Trichloroethane
91.05770	79005	120.	36.	UG/KG	129.	13.	7/09/91	UNDER CONTROL	1,1,2-Trichloroethane
91.05770	79016	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Trichloroethene
91.05770	75694	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Trichlorofluoromethane
91.05770	96184	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	1,2,3-Trichloropropane
91.05770	95636	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	1,2,4-Trimethylbenzene
91.05770	108678	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	1,3,5-Trimethylbenzene
91.05770	108054	< 10.		UG/KG	0.0		7/09/91	UNDER CONTROL	Vinyl acetate
91.05770	75014	< 10.		UG/KG	0.0		7/09/91	UNDER CONTROL	Vinyl chloride
91.05770	1330207	< 5.		UG/KG	0.0		7/09/91	UNDER CONTROL	Mixed-Xylenes (o ± m ± p)

SURROGATE RESULTS FOR EPA VOLATILES

Surrogate 1 = 1,2-Dichloroethane d4 (CAS # = 17060070)
Surrogate 2 = Toluene d8 (CAS # = 2037265)
Surrogate 3 = 4-Bromofluorobenzene (CAS # = 460004)

SAMPLE NUMBER	UNITS	Surrogate 1	Surrogate 2	Surrogate 3	COMPLETION DATE
91.05740	%	78.6	103.2	80.8	9-Jul-1991
91.05741	%	87.8	105.	82.4	9-Jul-1991
91.05741	%	90.6	107.	82.8	9-Jul-1991
91.05741	%	259.	115.6	90.	9-Jul-1991
91.05742	%	102.6	110.8	91.	9-Jul-1991
91.05743	%	203.2	111.	139.6	9-Jul-1991
91.05743	%	83.4	94.	214.2	9-Jul-1991
91.05743	%	104.6	97.6	127.8	9-Jul-1991
91.05744	%	112.8	105.	122.4	9-Jul-1991
91.05745	%	160.4	111.6	106.6	9-Jul-1991
91.05746	%	122.	104.8	116.	9-Jul-1991

91.05747	%	82.8	105.8	85.	9-Jul-1991
91.05748	%	107.6	104.	85.4	9-Jul-1991
91.05749	%	99.2	105.8	86.2	9-Jul-1991
91.05750	%	110.2	107.	88.2	9-Jul-1991
91.05751	%	117.4	100.4	155.2	9-Jul-1991
91.05752	%	104.	101.	133.8	9-Jul-1991
91.05753	%	96.6	96.8	131.2	9-Jul-1991
91.05754	%	126.	107.4	92.6	9-Jul-1991
91.05755	%	93.8	106.4	88.6	9-Jul-1991
91.05756	%	90.6	106.	93.4	9-Jul-1991
91.05757	%	124.	94.	139.2	9-Jul-1991
91.05758	%	118.2	95.4	130.8	9-Jul-1991
91.05759	%	171.6	96.6	160.6	9-Jul-1991
91.05762	%	86.	103.6	92.2	9-Jul-1991
91.05763	%	216.2	113.	92.6	9-Jul-1991
91.05764	%	151.6	108.	96.	9-Jul-1991
91.05765	%	219.8	116.8	91.6	9-Jul-1991
91.05766	%	79.6	103.2	83.2	9-Jul-1991
91.05767	%	87.8	107.4	83.6	9-Jul-1991
91.05770	%	365.4	117.8	106.4	9-Jul-1991
91.05771	%	109.2	109.	100.6	9-Jul-1991
91.05772	%	123.2	104.	95.2	9-Jul-1991

EPA Limits:

Water	%	76 - 114	88 - 110	86 - 115
Soil	%	70 - 121	81 - 117	74 - 121

REPORT NUMBER: 10790

Analyst	Reviewer	Section Leader	QA Officer
L. Bigthorns for RB	L. Bigthorns	S.D. Nielson for CKL	mag
7/10/91	7/10/91	7/10/91	7/10/91
Date	Date	Date	Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in 'Quality Assurance for Health and Environmental Chemistry: 1986,' LA-11114-MS, pp. 3-4.

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LOS ALAMOS NATIONAL LABORATORY
HEALTH, SAFETY AND ENVIRONMENT DIVISION
HSE-9
SURROGATE RECOVERIES FOR VOLATILES
IN WATER TYPE MATRICES

REQUEST #: 11673

NUMBER OF SAMPLES: 18
MATRIX W
ANALYST: TRB
Date: 07/08/91

SURROGATE RECOVERIES

SURROGATE
RECOVERIES IN PERCENT (%)

	SAMPLE NUMBERS	TYPE	d4-1,2-dichloro-ethene	toluene-(d8)	4-bromo-fluoro-benzene
1	B91.05766	BLANK	94	96	103
2	S91.05740	SAMPLE	79	103	81 *
3	S91.05741	SAMPLE	259 *	116 *	90
4	S91.05742	SAMPLE	103	111 *	91
5	S91.05747	SAMPLE	83	106	85 *
6	S91.05748	SAMPLE	108	104	85 *
7	S91.05749	SAMPLE	99	106	86
8	S91.05750	SAMPLE	110	107	88
9	S91.05754	SAMPLE	126 *	107	93
10	S91.05755	SAMPLE	94	106	89
11	S91.05756	SAMPLE	91	106	93
12	S91.05762	SAMPLE	86	104	92
13	S91.05763	SAMPLE	216 *	113 *	93
14	S91.05764	SAMPLE	152 *	108	96
15	B91.05767	BLANK	88	107	84 *
16	M91.05741	MATRIX SPIK	88	105	82 *
17	D91.05741	MATRIX SP-D	91	107	83 *
18	S91.05765	SAMPLE	220 *	117 *	92
19					
20					
21					
22					

Average % Surrogate Recovery...	115	106	89
Defined Lower QC Limits (%)....	76	89	86
Defined Upper QC Limits (%)....	114	110	115
Observed Lower QC Limits (%)...	79	96	81
Observed Upper QC Limits (%)...	259	116	103

"*" If % Surrogate Recovery is Followed by a "*", it is out of QC Limits.

Reviewed By: 7/9/91

B91.05772

LOS ALAMOS NATIONAL LABORATORY
HEALTH, SAFETY AND ENVIRONMENT DIVISION
HSE-9
SURROGATE RECOVERIES FOR VOLATILES
SOIL

REQUEST #: 11673

NUMBER OF SAMPLES: 15
MATRIX: S
ANALYST: TRB
Date: 07/08/91

SURROGATE RECOVERIES

SURROGATE
RECOVERIES IN PERCENT (%)

	SAMPLE NUMBERS	TYPE	d4-1,2-dichloro-ethane	toluene-(d8)	4-bromo-fluoro-benzene
1	B91.05771	BLANK	109	109	101
2	B91.05744	SAMPLE	113	105	122 *
3	B91.05745	SAMPLE	160 *	112	107
4	B91.05[illegible]	SAMPLE	122 *	105	116
5	B91.05751	SAMPLE	[illegible]	100	155 *
6	B91.05752	SAMPLE	173 *	97	161 *
7	B91.05753	SAMPLE	113 *	115 *	[illegible]
8	B91.05754	MATRIX SPIKE	103 *	[illegible]	[illegible] *
9	B91.05754	MATRIX SPIKE DUPLICATE	93	[illegible]	[illegible] *
10	B91.05755	BLANK	135 *	104	97
11	B91.05743	SAMPLE	75	93	[illegible] *
12	B91.05756	SAMPLE	104	[illegible]	[illegible] *
13	B91.05757	SAMPLE	97	97	131 *
14	B91.05757	SAMPLE	124 *	94	135 *
15	B91.05758	SAMPLE	113	95	131 *
16					
17					
18					
19					
20					
21					
22					

Average % Surrogate Recovery...	157	105	135
Defined Lower QC Limits (%)...	70	81	74
Defined Upper QC Limits (%)...	121	117	121
Observed Lower QC Limits (%)...	93	94	95
Observed Upper QC Limits (%)...	265	118	5[illegible]

"*" If % Surrogate Recovery is Followed by a "*", it is out of QC Limits

Reviewed By: 7/9/91

LOS ALAMOS NATIONAL LABORATORY
HEALTH, SAFETY AND ENVIRONMENT DIVISION
HSE-9
MATRIX SPIKE RECOVERIES FOR VOLATILES

			DRY WT/VOL (G or ML)	DILUTION FACTOR	AMOUNT SPIKED	LOQ (UG/KG OR UG/
REQUEST #:	11673					
NUMBER OF SAMPLES:	18					
SPIKE ID: (STARTS M OR E)	M91.05741	SPIKE	5	1	50	5
SPIKE DUP ID: (STARTS D OR F)	D91.05741	SPIKE-DUP	5	1	50	5
RAW DATA WITH:	---					
ANALYST:	TRB					

	SPIKE REC.	SPIKE-DUP REC.	SPIKE % REC.	SPIKE-DUP % REC.	RPD	LOW. REC. LIM.	UPP. REC. LIM.	RPD LIM.
1,1-Dichlorethene	43	45	86%	90%	5%	61	145	14
Benzene	52	51	104%	102%	2%	76	127	11
Trichlorethene	50	49	100%	98%	2%	71	120	14
Toluene	50	48	100%	96%	4%	76	125	13
Chlorobenzene	51	48	102%	96%	6%	75	130	13

"*" If % Matrix Recovery is Followed by a "*", it is out of QC Limits.

Reviewed By: 7/9/91

LOS ALAMOS NATIONAL LABORATORY
HEALTH, SAFETY AND ENVIRONMENT DIVISION
HSE-9
MATRIX SPIKE RECOVERIES FOR VOLATILES

		DRY WT/VOL (G or ML)		DILUTION FACTOR	AMOUNT SPIKED	LOD (UG/KG OR UG/
REQUEST #:	11673					
NUMBER OF SAMPLES:	15					
SPIKE ID: (STARTS M OR E)	M91.05743	SPIKE	5.68	1	44	5
SPIKE DUP ID: (STARTS D OR F)	D91.05743	SPIKE-DUP	5.39	1	47	5
RAW DATA WITH:	---					
ANALYST:	---					

	SPIKE REC.	SPIKE-DUP REC.	SPIKE % REC.	SPIKE DUP % REC.	RPD	LOW. REC. LIM.	UPP. REC. LIM.	RPD LIM.
1-Dichloroethene	88	88	68%	80%	8+%	59	172	22
Benzene	88	85	88%	74%	14%	66	142	31
Trichloroethene	87	41	88%	87%	15%	62	137	24
Toluene	68	100	148%+	213%+	43%+	59	139	21
Chlorobenzene	48	94	74%	98%	1%	60	133	21

+/ If % Matrix Recovery is Followed by a "+", it is 0.1 if it limits.

Date: 07/9/91

VM 7/9/91

JMT 7-8-91

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05740

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/06/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-1W	91.05740	67641	< 20.		UG/L	7/09/91		Acetone
AB-53-NW-1W	91.05740	107028	< 100.		UG/L	7/09/91		Acrolein
AB-53-NW-1W	91.05740	107131	< 100.		UG/L	7/09/91		Acrylonitrile
AB-53-NW-1W	91.05740	71432	< 5.		UG/L	7/09/91		Benzene
AB-53-NW-1W	91.05740	108861	< 5.		UG/L	7/09/91		Bromobenzene
AB-53-NW-1W	91.05740	74975	< 5.		UG/L	7/09/91		Bromochloromethane
AB-53-NW-1W	91.05740	75274	< 5.		UG/L	7/09/91		Bromodichloromethane
AB-53-NW-1W	91.05740	75252	< 5.		UG/L	7/09/91		Bromoform
AB-53-NW-1W	91.05740	74839	< 10.		UG/L	7/09/91		Bromomethane
AB-53-NW-1W	91.05740	78933	< 20.		UG/L	7/09/91		2-Butanone
AB-53-NW-1W	91.05740	104518	< 5.		UG/L	7/09/91		n-Butylbenzene
AB-53-NW-1W	91.05740	135988	< 5.		UG/L	7/09/91		sec-Butylbenzene
AB-53-NW-1W	91.05740	98066	< 5.		UG/L	7/09/91		tert-Butylbenzene
AB-53-NW-1W	91.05740	75150	< 5.		UG/L	7/09/91		Carbon disulfide
AB-53-NW-1W	91.05740	56235	< 5.		UG/L	7/09/91		Carbon tetrachloride
AB-53-NW-1W	91.05740	108907	< 5.		UG/L	7/09/91		Chlorobenzene
AB-53-NW-1W	91.05740	124481	< 5.		UG/L	7/09/91		Chlorodibromomethane
AB-53-NW-1W	91.05740	75003	< 10.		UG/L	7/09/91		Chloroethane
AB-53-NW-1W	91.05740	110758	< 50.		UG/L	7/09/91		2-Chloroethylvinyl ether
AB-53-NW-1W	91.05740	67663	< 5.		UG/L	7/09/91		Chloroform
AB-53-NW-1W	91.05740	74873	< 10.		UG/L	7/09/91		Chloromethane

AB-53-NW-1W	91.05740	95498	< 5.	UG/L	7/09/91	o-Chlorotoluene
AB-53-NW-1W	91.05740	106434	< 5.	UG/L	7/09/91	p-Chlorotoluene
AB-53-NW-1W	91.05740	96128	< 10.	UG/L	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NW-1W	91.05740	106934	< 5.	UG/L	7/09/91	1,2-Dibromoethane
AB-53-NW-1W	91.05740	74953	< 5.	UG/L	7/09/91	Dibromomethane
AB-53-NW-1W	91.05740	95501	< 5.	UG/L	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NW-1W	91.05740	541731	< 5.	UG/L	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NW-1W	91.05740	106467	< 5.	UG/L	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NW-1W	91.05740	75718	< 10.	UG/L	7/09/91	Dichlorodifluoromethane
AB-53-NW-1W	91.05740	75343	< 5.	UG/L	7/09/91	1,1-Dichloroethane
AB-53-NW-1W	91.05740	107062	< 5.	UG/L	7/09/91	1,2-Dichloroethane
AB-53-NW-1W	91.05740	75354	< 5.	UG/L	7/09/91	1,1-Dichloroethene
AB-53-NW-1W	91.05740	156605	< 5.	UG/L	7/09/91	trans-1,2-Dichloroethene
AB-53-NW-1W	91.05740	156592	< 5.	UG/L	7/09/91	cis-1,2-Dichloroethylene
AB-53-NW-1W	91.05740	78875	< 5.	UG/L	7/09/91	1,2-Dichloropropane
AB-53-NW-1W	91.05740	142289	< 5.	UG/L	7/09/91	1,3-Dichloropropane
AB-53-NW-1W	91.05740	594207	< 5.	UG/L	7/09/91	2,2-Dichloropropane
AB-53-NW-1W	91.05740	563586	< 5.	UG/L	7/09/91	1,1-Dichloropropene
AB-53-NW-1W	91.05740	10061015	< 5.	UG/L	7/09/91	cis-1,3-Dichloropropene
AB-53-NW-1W	91.05740	10061026	< 5.	UG/L	7/09/91	trans-1,3-Dichloropropene
AB-53-NW-1W	91.05740	100414	< 5.	UG/L	7/09/91	Ethylbenzene
AB-53-NW-1W	91.05740	591786	< 20.	UG/L	7/09/91	2-Hexanone
AB-53-NW-1W	91.05740	98828	< 5.	UG/L	7/09/91	Isopropylbenzene
AB-53-NW-1W	91.05740	99876	< 5.	UG/L	7/09/91	4-Isopropyltoluene
AB-53-NW-1W	91.05740	74884	< 5.	UG/L	7/09/91	Methyl iodide
AB-53-NW-1W	91.05740	108101	< 20.	UG/L	7/09/91	4-Methyl-2-pentanone
AB-53-NW-1W	91.05740	75092	< 5.	UG/L	7/09/91	Methylene chloride
AB-53-NW-1W	91.05740	103651	< 5.	UG/L	7/09/91	Propylbenzene
AB-53-NW-1W	91.05740	100425	< 5.	UG/L	7/09/91	Styrene
AB-53-NW-1W	91.05740	630206	< 5.	UG/L	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NW-1W	91.05740	79345	< 5.	UG/L	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NW-1W	91.05740	127184	< 5.	UG/L	7/09/91	Tetrachloroethylene
AB-53-NW-1W	91.05740	108883	< 5.	UG/L	7/09/91	Toluene
AB-53-NW-1W	91.05740	76131	< 5.	UG/L	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NW-1W	91.05740	71556	< 5.	UG/L	7/09/91	1,1,1-Trichloroethane
AB-53-NW-1W	91.05740	79005	< 5.	UG/L	7/09/91	1,1,2-Trichloroethane
AB-53-NW-1W	91.05740	79016	< 5.	UG/L	7/09/91	Trichloroethene
AB-53-NW-1W	91.05740	75694	< 5.	UG/L	7/09/91	Trichlorofluoromethane
AB-53-NW-1W	91.05740	96184	< 5.	UG/L	7/09/91	1,2,3-Trichloropropane
AB-53-NW-1W	91.05740	95636	< 5.	UG/L	7/09/91	1,2,4-Trimethylbenzene
AB-53-NW-1W	91.05740	108678	< 5.	UG/L	7/09/91	1,3,5-Trimethylbenzene
AB-53-NW-1W	91.05740	108054	< 10.	UG/L	7/09/91	Vinyl acetate
AB-53-NW-1W	91.05740	75014	< 10.	UG/L	7/09/91	Vinyl chloride
AB-53-NW-1W	91.05740	1330207	< 5.	UG/L	7/09/91	Mixed-Xylenes (o ± m ± p)

Tentatively Identified Compounds in Customer Sample # 91.05740

none

Customer Sample Duplicate Results for Sample # 91.05740

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05740

none

REPORT NUMBER: 10790

********** HSE-9 ANALYTICAL REPORT **********

Prepared by: LAT on 10-Jul-1991

EPA VOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Toney Begay PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05741

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/06/91 Date Analyzed: 7/06/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-2W	91.05741	67641	< 20.		UG/L	7/09/91		Acetone
AB-53-NW-2W	91.05741	107028	< 100.		UG/L	7/09/91		Acrolein
AB-53-NW-2W	91.05741	107131	< 100.		UG/L	7/09/91		Acrylonitrile
AB-53-NW-2W	91.05741	71432	< 5.		UG/L	7/09/91		Benzene
AB-53-NW-2W	91.05741	108861	< 5.		UG/L	7/09/91		Bromobenzene
AB-53-NW-2W	91.05741	74975	< 5.		UG/L	7/09/91		Bromochloromethane
AB-53-NW-2W	91.05741	75274	< 5.		UG/L	7/09/91		Bromodichloromethane
AB-53-NW-2W	91.05741	75252	< 5.		UG/L	7/09/91		Bromoform
AB-53-NW-2W	91.05741	74839	< 10.		UG/L	7/09/91		Bromomethane
AB-53-NW-2W	91.05741	78933	< 20.		UG/L	7/09/91		2-Butanone
AB-53-NW-2W	91.05741	104518	< 5.		UG/L	7/09/91		n-Butylbenzene
AB-53-NW-2W	91.05741	135988	< 5.		UG/L	7/09/91		sec-Butylbenzene
AB-53-NW-2W	91.05741	98066	< 5.		UG/L	7/09/91		tert-Butylbenzene
AB-53-NW-2W	91.05741	75150	< 5.		UG/L	7/09/91		Carbon disulfide
AB-53-NW-2W	91.05741	56235	< 5.		UG/L	7/09/91		Carbon tetrachloride
AB-53-NW-2W	91.05741	108907	< 5.		UG/L	7/09/91		Chlorobenzene
AB-53-NW-2W	91.05741	124481	< 5.		UG/L	7/09/91		Chlorodibromomethane
AB-53-NW-2W	91.05741	75003	< 10.		UG/L	7/09/91		Chloroethane
AB-53-NW-2W	91.05741	110758	< 50.		UG/L	7/09/91		2-Chloroethylvinyl ether
AB-53-NW-2W	91.05741	67663	< 5.		UG/L	7/09/91		Chloroform
AB-53-NW-2W	91.05741	74873	< 10.		UG/L	7/09/91		Chloromethane

AB-53-NW-2W	91.05741	95498	< 5.	UG/L	7/09/91	o-Chlorotoluene
AB-53-NW-2W	91.05741	106434	< 5.	UG/L	7/09/91	p-Chlorotoluene
AB-53-NW-2W	91.05741	96128	< 10.	UG/L	7/09/91	1,2-Dibromo-3-chloropropane
AB-53-NW-2W	91.05741	106934	< 5.	UG/L	7/09/91	1,2-Dibromoethane
AB-53-NW-2W	91.05741	74953	< 5.	UG/L	7/09/91	Dibromomethane
AB-53-NW-2W	91.05741	95501	< 5.	UG/L	7/09/91	o-Dichlorobenzene (1,2)
AB-53-NW-2W	91.05741	541731	< 5.	UG/L	7/09/91	m-Dichlorobenzene (1,3)
AB-53-NW-2W	91.05741	106467	< 5.	UG/L	7/09/91	p-Dichlorobenzene (1,4)
AB-53-NW-2W	91.05741	75718	< 10.	UG/L	7/09/91	Dichlorodifluoromethane
AB-53-NW-2W	91.05741	75343	< 5.	UG/L	7/09/91	1,1-Dichloroethane
AB-53-NW-2W	91.05741	107062	< 5.	UG/L	7/09/91	1,2-Dichloroethane
AB-53-NW-2W	91.05741	75354	< 5.	UG/L	7/09/91	1,1-Dichloroethene
AB-53-NW-2W	91.05741	156605	< 5.	UG/L	7/09/91	trans-1,2-Dichloroethene
AB-53-NW-2W	91.05741	156592	< 5.	UG/L	7/09/91	cis-1,2-Dichloroethylene
AB-53-NW-2W	91.05741	78875	< 5.	UG/L	7/09/91	1,2-Dichloropropane
AB-53-NW-2W	91.05741	142289	< 5.	UG/L	7/09/91	1,3-Dichloropropane
AB-53-NW-2W	91.05741	594207	< 5.	UG/L	7/09/91	2,2-Dichloropropane
AB-53-NW-2W	91.05741	563586	< 5.	UG/L	7/09/91	1,1-Dichloropropene
AB-53-NW-2W	91.05741	10061015	< 5.	UG/L	7/09/91	cis-1,3-Dichloropropene
AB-53-NW-2W	91.05741	10061026	< 5.	UG/L	7/09/91	trans-1,3-Dichloropropene
AB-53-NW-2W	91.05741	100414	< 5.	UG/L	7/09/91	Ethylbenzene
AB-53-NW-2W	91.05741	591786	< 20.	UG/L	7/09/91	2-Hexanone
AB-53-NW-2W	91.05741	98828	< 5.	UG/L	7/09/91	Isopropylbenzene
AB-53-NW-2W	91.05741	99876	< 5.	UG/L	7/09/91	4-Isopropyltoluene
AB-53-NW-2W	91.05741	74884	< 5.	UG/L	7/09/91	Methyl iodide
AB-53-NW-2W	91.05741	108101	< 20.	UG/L	7/09/91	4-Methyl-2-pentanone
AB-53-NW-2W	91.05741	75092	< 5.	UG/L	7/09/91	Methylene chloride
AB-53-NW-2W	91.05741	103651	< 5.	UG/L	7/09/91	Propylbenzene
AB-53-NW-2W	91.05741	100425	< 5.	UG/L	7/09/91	Styrene
AB-53-NW-2W	91.05741	630206	< 5.	UG/L	7/09/91	1,1,1,2-Tetrachloroethane
AB-53-NW-2W	91.05741	79345	< 5.	UG/L	7/09/91	1,1,2,2-Tetrachloroethane
AB-53-NW-2W	91.05741	127184	< 5.	UG/L	7/09/91	Tetrachloroethylene
AB-53-NW-2W	91.05741	108883	< 5.	UG/L	7/09/91	Toluene
AB-53-NW-2W	91.05741	76131	< 5.	UG/L	7/09/91	1,1,2-Trichloro-1,2,2-trifluoroethane
AB-53-NW-2W	91.05741	71556	< 5.	UG/L	7/09/91	1,1,1-Trichloroethane
AB-53-NW-2W	91.05741	79005	< 5.	UG/L	7/09/91	1,1,2-Trichloroethane
AB-53-NW-2W	91.05741	79016	< 5.	UG/L	7/09/91	Trichloroethene
AB-53-NW-2W	91.05741	75694	< 5.	UG/L	7/09/91	Trichlorofluoromethane
AB-53-NW-2W	91.05741	96184	< 5.	UG/L	7/09/91	1,2,3-Trichloropropane
AB-53-NW-2W	91.05741	95636	< 5.	UG/L	7/09/91	1,2,4-Trimethylbenzene
AB-53-NW-2W	91.05741	108678	< 5.	UG/L	7/09/91	1,3,5-Trimethylbenzene
AB-53-NW-2W	91.05741	108054	< 10.	UG/L	7/09/91	Vinyl acetate
AB-53-NW-2W	91.05741	75014	< 10.	UG/L	7/09/91	Vinyl chloride
AB-53-NW-2W	91.05741	1330207	< 5.	UG/L	7/09/91	Mixed-Xylenes (o ± m ± p)

To: Alice Barr
Thru: Chris Leibman
From: Laura Tsiagkouris

Enclosed is the final report for the sludge samples of request 11673. As Matthew Monagle has previously indicated, the samples submitted contained a number of Tentatively Identified Compounds (TIC's) at a significant level. Typically, TIC's are not reported on the final report unless specified by the client. If a detailed listing of the TIC's detected are required, please call me at 5-4993.

HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman SBM for CL
From: Matthew Monagle

Request Number: 11673
Matrix: Sludge
Summary Date: 08 July 1991

Sample ID	Target Compounds Found	Amount (ug/kg)	Level of Quantitation (ug/kg)	TIC's
Blank (03-Jul.-1991)	Di-n-butyl-phthalate	600	330	Yes
91.05743	Di-n-butyl-phthalate Benzidine Bis-2-ethyl-hexylphthalate	1400 3900 1200	640	Yes
91.05744	Benzidine Bis-2-ethyl-hexylphthalate	1900 1100	490	Yes
91.05745	Di-n-butyl-phthalate	1400	640	Yes
91.05746	NONE		650	Yes
91.05751	NONE		480	Yes
91.05752	NONE		630	Yes
91.05753	NONE		650	Yes
91.05757	Di-n-butyl-phthalate	1400	660	Yes
91.05758	NONE		660	Yes
91.05759	NONE		490	Yes

c:\wp51\m2\qnt11673

HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman SPM for CL
From: Matthew Monagle

Request Number: 11673
Matrix: Soil
Summary Date: 08 July 1991

Summary:

Ten sludge samples were received by Sandra Cisneros Flores (HSE-9) on 02 July 1991 at TA-50. After radioactivity screening, the samples, along with a quality control blind, matrix spikes and a method blank were extracted by continuous extraction methods on 03 July 1991. Surrogate compounds were added to the matrix to determine the efficiency of the extraction. Analysis was performed on 05, 06 and 07 July 1991 at TA-35 by capillary gas chromatography/mass spectrometry using methods consistent with EPA method SW-846.

The sludge samples were extremely wet; therefore, a reduced amount of sample was used in order to use more drying agent. This accounts for the higher reporting limits. In addition, due to the nature of the samples no percent moisture was performed on these samples and all the results are reported as wet weight.

Reportable quantities of three target compounds were found in the sludge samples submitted. Bis-(2-ethylhexyl) phthalate and di-n-octylphthalate are both common plasticizers frequently found in environmental samples. Di-n-octylphthalate was found in the blank at reportable levels. Therefore, it is possible that the di-n-octylphthalate in the sample is due to laboratory contamination.

Benzidine is a target compound that is difficult to chromatograph. Therefore, the presence of this target compound was verified through standard addition. A known amount of benzidine was added to one of the samples and the sample re-analyzed. This re-analysis confirmed the presence of benzidine. Additionally, the benzidine was quantitated using a one point calibration based on an 80 ppm standard due to decomposition of the benzidine in the 50 ppm standard.

In response to historical data I specifically looked for benzyl alcohol, 2-methylphenol, and 4-methylphenol. None of these compounds were found at reportable levels in any of the samples submitted.

Significant quantities of tentatively identified compounds including saturated hydrocarbons and polynuclear aromatic hydrocarbons were found in all the samples submitted. Two tentatively identified compounds were found in the blank.

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7/10/91

TO: ALICE BARR
THRU: CHRIS LEIBMAN
FROM: TONEY BEGAY
REQUEST: 11673.

The following samples were analyzed for Volatile Organic Components (VOC'S) using SW 846 Purge and Trap (P/T) GC/MS method 8260 of analysis:

91.05740	91.05741	91.05742	91.05743	91.05744
91.05745	91.05746	91.05747	91.05748	91.05749
91.05750	91.05751	91.05752	91.05753	91.05754
91.05755	91.05756	91.05757	91.05758	91.05759
91.05762	91.05763	91.05764		

The matrices of these samples were sludge and wastewater. They were relatively radioactive. The samples were received in 40mL capacity vials.

Approximately 5 gram aliquot of the sludge samples was weighed out and 5 mL of ISM/PSS spiked water was added to the sample and analyzed. 5mL aliquot of the wastewater samples were spiked with ISM/PSS mix and analyzed.

Since the method blank samples were not blank subtracted, a copy of the results have been included in the report. **The 7 and 14 day holding time for the appropriate matrices <u>were</u> satisfied.**

<u>RESULTS</u>:

SAMPLE	COMPOUND	CONC.	LOQ
91.05743	TOLUENE	68.0 ug/kg	5 ug/kg
91.05744	TOLUENE	42.0 ug/kg	5 ug/kg
91.05746	TOLUENE	25.0 ug/kg	5 ug/kg
91.05758	TOLUENE	14.0 ug/kg	5 ug/kg
	p-ISOPROPYLTOLUENE	8.7 ug/kg	5 ug/kg

QC SUMMARY:

Sample 91.05743 was used for the sludge matrix spike recovery determinations. All the matrix spike compound recoveries were within the control limits except for toluene, which was above. This is a result of toluene being present in the sample. Unfortunately, the sample had a bad purge and had to be analyzed another day. This resulted in a higher toluene concentration value and therefore, a definitive matrix spike recovery could not be done.

Sample 91.05741 was used for the wastewater matrix spike recovery determinations. All the matrix spike compound recoveries were within the control limits.

There were alot of samples that had surrogate recoveries out of control. The following are the recoveries and their relation to the control limits:

SAMPLE	1,2-DCE(d4)	TOLUENE(d8)	4-BFB
91.05740			BELOW
91.05741	ABOVE	ABOVE	
91.05742		ABOVE	
91.05743			ABOVE
91.05744			ABOVE
91.05745	ABOVE		
91.05746	ABOVE		
91.05747			BELOW
91.05748			BELOW
91.05751			ABOVE
91.05752			ABOVE
91.05753			ABOVE
91.05754	ABOVE		
91.05757	ABOVE		ABOVE
91.05758			ABOVE
91.05759	ABOVE		ABOVE
91.05763	ABOVE	ABOVE	
91.05764	ABOVE		

semi-vols from report 11673

Send them our 8310 - spike results [illegible] w/ [illegible] on [illegible]

AB-53-NW-W benzidine 3900 ppb
" " 25 " 1900

~~91.05773 Acenaphthene 2.3 ~~19~~ ppm 2-3 sig~~
91.05773 Benzoic Acid ~~.85~~ 3.8 OD Cont
~~* " DNT ~~1.14~~ ppm~~
~~* N-Nitrosodiphenylamine/ ~~TIC2~~ 3.4 ppm~~

*Not included in summary

are plant QA samples spiked?

~~Appendix 1673~~

HSE-9 Analytical Report

? Some metals data w/o method
other results w/o targets

1/30/91 Summary

Benzoic acid
TIC's [illegible] compounds
Sign [illegible]

Aug [illegible] A.R.

91.06433 18 ppb Nitrosodiphenylamine

8/2/91 AR

91.05768 benzo(a) [illegible] 24 ppb

91.05765 4-chloro-3-methylphenol 140

" fluoranthene 130

4-Nitrophenol 140

Summary may not pertain to affected [illegible]

Why only 8240 & 28?

Toluene

ADDENDUM TO SEMIVOLATILE ORGANIC ANALYSIS 11673

To: Alice Barr
Thru: Chris Leibman
From: Matthew Monagle

Request Number: 11673
Matrix: Sludge, water
Date: 11 September 1991

Upon receiving notification of discrepancies in the preliminary report and the final reports, I reviewed the data for these two requests further. It appears that the error is in the preliminary report and is due solely to a typing error on my part. Please note that the final reports generated by the QADM section still reflect the correct concentrations in the samples. Attached you will find the modified preliminary reports that reflect these values. I sincerely regret the error and hope it did not cause you too much inconvenience. If you have any further questions feel free to call me at 7-6871.

HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman
From: Matthew Monagle

Request Number: 11673
Matrix: Sludge
Summary Date: 08 July 1991
Modified: 11 September 1991

Sample ID	Target Compounds Found	Amount (ug/kg)	Level of Quantitation (ug/kg)	TIC's
Blank (03-Jul.-1991)	Di-n-butyl-phthalate	600	330	Yes
91.05743	Di-n-butyl-phthalate Benzidine Bis-2-ethyl-hexylphthalate	1400 3900 1200	640	Yes
91.05744	Benzidine Bis-2-ethyl-hexylphthalate	1900 1100	490	Yes
91.05745	Di-n-butyl-phthalate	1400	640	Yes
91.05746	NONE		650	Yes
91.05751	NONE		480	Yes
91.05752	NONE		630	Yes
91.05753	NONE		650	Yes
91.05757	Di-n-butyl-phthalate	1400	660	Yes
91.05758	NONE		660	Yes
91.05759	NONE		490	Yes

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HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman
From: Matthew Monagle

Request Number: 11673
Matrix: Soil
Summary Date: 08 July 1991

Summary:

Ten sludge samples were received by Sandra Cisneros Flores (HSE-9) on 02 July 1991 at TA-50. After radioactivity screening, the samples, along with a quality control blind, matrix spikes and a method blank were extracted by continuous extraction methods on 03 July 1991. Surrogate compounds were added to the matrix to determine the efficiency of the extraction. Analysis was performed on 05, 06 and 07 July 1991 at TA-35 by capillary gas chromatography/mass spectrometry using methods consistent with EPA method SW-846.

The sludge samples were extremely wet; therefore, a reduced amount of sample was used in order to use more drying agent. This accounts for the higher reporting limits. In addition, due to the nature of the samples no percent moisture was performed on these samples and all the results are reported as wet weight.

Reportable quantities of three target compounds were found in the sludge samples submitted. Bis-(2-ethylhexyl) phthalate and di-n-butylphthalate are both common plasticizers frequently found in environmental samples. Di-n-butylphthalate was found in the blank at reportable levels. Therefore, it is possible that the di-n-butylphthalate in the sample is due to laboratory contamination.

Benzidine is a target compound that is difficult to chromatograph. Therefore, the presence of this target compound was verified through standard addition. A known amount of benzidine was added to one of the samples and the sample re-analyzed. This re-analysis confirmed the presence of benzidine. Additionally, the benzidine was quantitated using a one point calibration based on an 80 ppm standard due to decomposition of the benzidine in the 50 ppm standard.

In response to historical data I specifically looked for benzyl alcohol, 2-methylphenol, and 4-methylphenol. None of these compounds were found at reportable levels in any of the samples submitted.

Significant quantities of tentatively identified compounds including saturated hydrocarbons and polynuclear aromatic hydrocarbons were found in all the samples submitted. Two tentatively identified compounds were found in the blank.

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HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman
From: Matthew Monagle

Request Number: 11673
Matrix: Soil
Summary Date: 08 July 1991

Surrogate and Matrix Spike Recoveries:

All surrogate recoveries were within EPA guidelines. Matrix spike recoveries and relative percent deviations for some compounds were outside the EPA guidelines. This could be a problem with the extraction or matrices. This is not believed to affect the data in any way.

Problems encountered:

No other problems were encountered with the analysis of these samples.

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HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman
From: Matthew Monagle

Request Number: 11673
Matrix: Waters
Summary Date: 02 August 1991
Modified: 11 September 1991

Sample ID	Target Compounds Found	Amount (ug/L)	Level of Quantitation (ug/L)	TIC's
Blank (04-Jul.-1991)	Bis 2-ethylhexyl-phthalate	22	10	Yes
91.05740	Benzoic Acid	15	10	Yes
91.05741	NONE		10	Yes
91.05742	NONE		10	Yes
91.05747	NONE		10	Yes
91.05748	NONE		10	Yes
91.05749	NONE		10	Yes
91.05750	NONE		10	Yes
91.05754	NONE		10	Yes
91.05755	NONE		10	Yes
91.05756	NONE		10	Yes

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HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman
From: Matthew Monagle

Request Number: 11673
Matrix: Waters
Summary Date: 02 August 1991

Summary:

Ten water samples were received by Sandra Cisneros Flores (HSE-9) on 02 July 1991 at TA-50. The samples, along with a quality control blind, matrix spikes and a method blank were extracted by continuous liquid-liquid extraction on 04 July 1991. Surrogate compounds were added to the matrix to determine the efficiency of the extraction. Analysis was performed on 10 and 20 July 1991 at TA-35 by capillary gas chromatography/mass spectrometry using methods consistent with EPA method SW-846.

Reportable quantities of one target compound was found in one of the water samples submitted. Benzoic acid was found in 91.05740. Additionally, bis-(2-ethylhexyl)phthalate, a common plasticizer found in environmental samples, was found in the blank at reportable levels.

Significant amounts of tentatively identified compounds, were found in all the samples submitted. A complete listing of these compounds may be obtained by calling Luara Tsiagkouris at 7-5889.

Surrogate and Matrix Spike Recoveries:

Surrogate recoveries for many of the samples were <u>not</u> within the EPA guidelines. There were several samples that had very low terphenyl d-14 recoveries. As per our phone conversation, some of these samples were re-sampled. However, upon further analysis, two of the samples (91.05747 and 91.05755) had low base neutral recoveries and were not re-sampled. You may wish to re-sample these samples. However, it is my opinion that, due to consistent low recoveries of the base neutral surrogates on these samples as well as the re-submitted samples, this is actually a matrix effect and not due to the analytical process. Matrix spike recoveries for some acid components were high while the base neutrals were low which agrees well with the surrogate recoveries. The relative percent deviation on these matrix spikes is very low.

All holding times <u>were</u> met

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HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS$
SUMMARY OF ANALYTICAL RESULTSH
To: Alice Barr$
From: Matthew MonagleH
Request Number: 11728, 11673$
Matrix: Water
Summary Date: 20 July 1991

All the samples in the re-sampling performed on the TA-53$ ponds are clean. Additionally, all the surrogates are legal although it is interesting to note that the surrogate that gave me trouble the first time is low again this time. Low, but legal. I would attribute this to some kind of matrix effect although I am not sure what that would be as that surrogate is a very stable compound. A sample by sample preliminary report for both 11728 and 11673 is attached for your use. This data is preliminary but I don't think it will change at all through the final report. There are tic's in these samples. While I would not say the samples are loaded with tentatively identified non-target compounds, there are tentatively identified aromatic compounds in these samples. Finally, I hope to get a final on 11728 early this week (I am turning it over to Martin for data work up and review) and 11673 should be to you early the week of the 29th. Matthew

HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman
From: Matthew Monagle

Request Number: 11673
Matrix: Waters
Summary Date: 02 August 1991

Sample ID	Target Compounds Found	Amount (ug/L)	Level of Quantitation (ug/L)	TIC's
Blank (04-Jul.-1991)	Bis 2-ethylhexyl-phthalate	22	10	Yes
91.05740	Benzoic Acid	18	10	Yes
91.05741	NONE		10	Yes
91.05742	NONE		10	Yes
91.05747	NONE		10	Yes
91.05748	NONE		10	Yes
91.05749	NONE		10	Yes
91.05750	NONE		10	Yes
91.05754	NONE		10	Yes
91.05755	NONE		10	Yes
91.05756	NONE		10	Yes

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HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman
From: Matthew Monagle

Request Number: 11673
Matrix: Waters
Summary Date: 02 August 1991

Summary:

Ten water samples were received by Sandra Cisneros Flores (HSE-9) on 02 July 1991 at TA-50. The samples, along with a quality control blind, matrix spikes and a method blank were extracted by continuous liquid-liquid extraction on 04 July 1991. Surrogate compounds were added to the matrix to determine the efficiency of the extraction. Analysis was performed on 10 and 20 July 1991 at TA-35 by capillary gas chromatography/mass spectrometry using methods consistent with EPA method SW-846.

Reportable quantities of one target compound was found in one of the water samples submitted. Benzoic acid was found in 91.05740. Additionally, bis-(2-ethylhexyl)phthalate, a common plasticizer found in environmental samples, was found in the blank at reportable levels.

Significant amounts of tentatively identified compounds, were found in all the samples submitted. A complete listing of these compounds may be obtained by calling Lara Tsiagkouris at 7-5889.

Surrogate and Matrix Spike Recoveries:

Surrogate recoveries for many of the samples were <u>not</u> within the EPA guidelines. There were several samples that had very low terphenyl d-14 recoveries. As per our phone conversation, some of these samples were re-sampled. However, upon further analysis, two of the samples (91.05747 and 91.05755) had low base neutral recoveries and were not re-sampled. You may wish to re-sample these samples. However, it is my opinion that, due to consistent low recoveries of the base neutral surrogates on these samples as well as the re-submitted samples, this is actually a matrix effect and not due to the analytical process. Matrix spike recoveries for some acid components were high while the base neutrals were low which agrees well with the surrogate recoveries. The relative percent deviation on these matrix spikes is very low.

All holding times <u>were</u> met

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8/13/91

HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman CB for CL 8/23/91
From: Matthew Monagle

Request Number: 11728
Matrix: Waters
Summary Date: 08 August 1991

Sample ID	Target Compounds Found	Amount (ug/L)	Level of Quantitation (ug/L)	TIC's
Blank (16-Jul.-1991)	NONE		10	Yes
91.06429	NONE		10	Yes
91.06430	NONE		10	Yes
91.06431	NONE		10	Yes
91.06432	NONE		10	Yes

Summary:

Four water samples were received by Sandra Cisneros Flores (HSE-9) on 15 July 1991 at TA-50. The samples, along with a quality control blind and a method blank were extracted by continuous liquid-liquid extraction on 16 July 1991. Surrogate compounds were added to the matrix to determine the efficiency of the extraction. Analysis was performed on 19 and 20 July 1991 at TA-35 by capillary gas chromatography/mass spectrometry using methods consistent with EPA method SW-846.

No target compounds were found above the reporting limit in these samples. No target compounds were found in the blank above the reporting limit.

Significant amounts of tentatively identified compounds were found in all the samples submitted. A complete listing of these compounds may be obtained by calling Lyara Tsiagkouris at 7-5889.

All holding times for these samples <u>were</u> met.

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8/16/91

HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman
From: Matthew Monagle

Request Number: 11728
Matrix: Waters
Summary Date: 08 August 1991

Surrogate and Matrix Spike Recoveries:

Surrogate recoveries for all the submitted samples were within the EPA guidelines. All of the samples had low terphenyl d-14 recoveries which is consistent with the previous analysis, 11673. It is my opinion that, due to consistent low recoveries of the terphenyl on these samples as well as the original request, this is actually a matrix effect and not due to the analytical process. The matrix spikes for this set of samples were batched from 11673.

Problems encountered:

All samples were received with a pH of 1-2 as per our pre-sampling agreement. Because of this, the acid fraction was extracted first. No other problems were encountered with these samples.

MM

c:\wp51\m2\qnt11728

8/16/91

LOS ALAMOS NATIONAL LABORATORY
HEALTH, SAFETY AND ENVIRONMENT DIVISION
HSE-9
MATRIX SPIKE RECOVERIES FOR SEMI-VOLATILES

		DRY WT/VOL (G or L)		AMOUNT SPIKED (50 OR 100 ug/ml) IN UG/KG or UG/L		
REQUEST #:	11728					
NUMBER OF SAMPLES:	8			ACIDS	BASES	LOQ (UG/KG)
SPIKE ID: (STARTS M OR E)	M91.05740	SPIKE	0.88	114	57	11
SPIKE DUP ID: (STARTS D OR F)	D91.05740	SPIKE-DUP	0.92	109	54	10
RAW DATA WITH:	11673					
ANALYST:	MM					

	SPIKE REC.	SPIKE-DUP REC.	SPIKE % REC.	SPIKE-DUP % REC.	RPD	LOW. REC. LIM.	UPP. REC. LIM.	RPD LIM.
PHENOL	85	89	75%	82%	7%	12	89	42
2-CHLOROPHENOL	91	88	80%	81%	1%	27	123	40
1,4-DICHLOROBENZENE	46	42	81%	77%	5%	36	97	28
N-NITROSO-DI-N-PROPYLAMINE	46	40	81%	74%	10%	41	116	38
1,2,4-TRICLOROBENZENE	45	45	79%	83%	4%	39	98	23
4-CHLORO-3-METHYLPHENOL	120	98	106%*	90%	16%	23	97	42
ACENAPHTHENE	41	36	72%	66%	9%	46	118	31
4-NITROPHENOL	130	110	114%*	101%*	12%	10	80	50
2,4-DINITROTOLUENE	69	59	121%*	109%*	11%	24	96	38
PENTACHLOROPHENOL	110	120	97%	110%*	13%	9	103	50
PYRENE	23	26	40%	48%	17%	26	127	31

"*" If % Matrix Recovery is Followed by a "*", it is out of QC Limits.

Reviewed By: 8/23/91 8/23/91

LOS ALAMOS NATIONAL LABORATORY
HEALTH, SAFETY AND ENVIRONMENT DIVISION
HSE-9
SURROGATE RECOVERIES FOR SEMI-VOLATILES
IN WATER

REQUEST #: 11728

NUMBER OF SAMPLES: 8
MATRIX W
ANALYST: MM
Date: 08/02/91

SURROGATE RECOVERIES

SURROGATE
RECOVERIES IN PERCENT (%)

	SAMPLE NUMBERS	TYPE	2-FLUORO-PHENOL	PHENOL (D6)	NITRO-BENZENE (D5)	2-FLUORO-BIPHENYL	2,4,6-TRIBROMO-PHENOL	TERPHENYL (D14)
1	S91.06434	BLANK	52	105 *	99	96	98	118
2	M91.05740	MATRIX SPIK	65	79	88	80	111	22 *
3	D91.05740	MATRIX SP-D	65	83	89	75	116	24 *
4	S91.06429	SAMPLE	48	67	46	61	69	15 *
5	S91.06430	SAMPLE	93	130 *	111	94	116	30 *
6	S91.06431	SAMPLE	69	87	39	30	73	25 *
7	S91.06432	SAMPLE	74	115 *	90	36	104	35 *
8	S91.06433	SAMPLE	11 *	12	12 *	12 *	11	16 *
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

Average % Surrogate Recovery...	65	84	78	73	89	34
Defined Lower QC Limits (%)....	81	10	38	43	10	33
Defined Upper QC Limits (%)....	100	94	114	116	126	141
Observed Lower QC Limits (%)...	11	12	12	13	11	15
Observed Upper QC Limits (%)...	93	130	111	96	118	118

"*" If % Surrogate Recovery is Followed by a "*", it is out of QC Limits.

Reviewed By:

8/23/91

8/23/91

REPORT NUMBER: 11232

********** EM-9 ANALYTICAL REPORT **********

Prepared by: LAT on 13-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11728 MATRIX: W ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05740

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME

Tentatively Identified Compounds in Customer Sample # 91.05740

none

Customer Sample Duplicate Results for Sample # 91.05740

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05740

none

Matrix Spike Results for Sample # 91.05740

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	AMOUNT SPIKED	AMOUNT RECOVERED	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-1W	91.05740	83329	56.82	41.	UG/L	8/13/91		Acenaphthene
AB-53-NW-1W	91.05740	59507	113.64	120.	UG/L	8/13/91		4-Chloro-3-methylphenol
AB-53-NW-1W	91.05740	95578	113.64	91.	UG/L	8/13/91		o-Chlorophenol
AB-53-NW-1W	91.05740	106467	56.82	46.	UG/L	8/13/91		p-Dichlorobenzene (1,4)
AB-53-NW-1W	91.05740	121142	56.82	69.	UG/L	8/13/91		2,4-Dinitrotoluene

AB-53-NW-1W	91.05740	100027	113.64	130.	UG/L	8/13/91		4-Nitrophenol
AB-53-NW-1W	91.05740	621647	56.82	46.	UG/L	8/13/91		N-Nitrosodi-n-propylamine
AB-53-NW-1W	91.05740	87865	113.64	110.	UG/L	8/13/91		Pentachlorophenol
AB-53-NW-1W	91.05740	108952	113.64	85.	UG/L	8/13/91		Phenol
AB-53-NW-1W	91.05740	129000	56.82	23.	UG/L	8/13/91		Pyrene
AB-53-NW-1W	91.05740	120821	56.82	45.	UG/L	8/13/91		1,2,4-Trichlorobenzene

Matrix Spike Duplicate Results for Sample # 91.05740

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	AMOUNT SPIKED	AMOUNT RECOVERED	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-1W	91.05740	83329	54.35	36.	UG/L	8/13/91		Acenaphthene
AB-53-NW-1W	91.05740	59507	108.7	98.	UG/L	8/13/91		4-Chloro-3-methylphenol
AB-53-NW-1W	91.05740	95578	108.7	88.	UG/L	8/13/91		o-Chlorophenol
AB-53-NW-1W	91.05740	106467	54.35	42.	UG/L	8/13/91		p-Dichlorobenzene (1,4)
AB-53-NW-1W	91.05740	121142	54.35	59.	UG/L	8/13/91		2,4-Dinitrotoluene
AB-53-NW-1W	91.05740	100027	108.7	110.	UG/L	8/13/91		4-Nitrophenol
AB-53-NW-1W	91.05740	621647	54.35	40.	UG/L	8/13/91		N-Nitrosodi-n-propylamine
AB-53-NW-1W	91.05740	87865	108.7	120.	UG/L	8/13/91		Pentachlorophenol
AB-53-NW-1W	91.05740	108952	108.7	89.	UG/L	8/13/91		Phenol
AB-53-NW-1W	91.05740	129000	54.35	26.	UG/L	8/13/91		Pyrene
AB-53-NW-1W	91.05740	120821	54.35	45.	UG/L	8/13/91		1,2,4-Trichlorobenzene

REPORT NUMBER: 11232

********** EM-9 ANALYTICAL REPORT **********

Prepared by: LAT on 13-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11728 MATRIX: W ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.06429

Date Collected: 7/15/91 Date Received: 7/15/91 Date Extracted: 7/16/91 Date Analyzed: 7/19/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
NW #1	91.06429	83329	< 10.		UG/L	8/13/91		Acenaphthene
NW #1	91.06429	208968	< 10.		UG/L	8/13/91		Acenaphthylene
NW #1	91.06429	62533	< 10.		UG/L	8/13/91		Aniline
NW #1	91.06429	120127	< 10.		UG/L	8/13/91		Anthracene
NW #1	91.06429	103333	< 10.		UG/L	8/13/91		Azobenzene
NW #1	91.06429	92875	< 10.		UG/L	8/13/91		m-Benzidine
NW #1	91.06429	56553	< 10.		UG/L	8/13/91		Benzo[a]anthracene
NW #1	91.06429	50328	< 10.		UG/L	8/13/91		Benzo[a]pyrene
NW #1	91.06429	205992	< 10.		UG/L	8/13/91		Benzo[b]fluoranthene
NW #1	91.06429	191242	< 10.		UG/L	8/13/91		Benzo[g,h,i]perylene
NW #1	91.06429	207089	< 10.		UG/L	8/13/91		Benzo[k]fluoranthene
NW #1	91.06429	65850	< 10.		UG/L	8/13/91		Benzoic acid
NW #1	91.06429	100516	< 10.		UG/L	8/13/91		Benzyl alcohol
NW #1	91.06429	111911	< 10.		UG/L	8/13/91		Bis(2-chloroethoxy)methane
NW #1	91.06429	111444	< 10.		UG/L	8/13/91		Bis(2-chloroethyl)ether
NW #1	91.06429	108601	< 10.		UG/L	8/13/91		Bis(2-chloroisopropyl)ether
NW #1	91.06429	117817	< 10.		UG/L	8/13/91		Bis(2-ethylhexyl)phthalate
NW #1	91.06429	101553	< 10.		UG/L	8/13/91		4-Bromophenylphenyl ether
NW #1	91.06429	85687	< 10.		UG/L	8/13/91		Butylbenzyl phthalate
NW #1	91.06429	59507	< 10.		UG/L	8/13/91		4-Chloro-3-methylphenol
NW #1	91.06429	106478	< 10.		UG/L	8/13/91		4-Chloroaniline

NW #1	91.06429	91587	< 10.	UG/L	8/13/91	2-Chloronaphthalene
NW #1	91.06429	95578	< 10.	UG/L	8/13/91	o-Chlorophenol
NW #1	91.06429	7005723	< 10.	UG/L	8/13/91	4-Chlorophenylphenyl ether
NW #1	91.06429	218019	< 10.	UG/L	8/13/91	Chrysene
NW #1	91.06429	84742	< 10.	UG/L	8/13/91	Di-n-butyl phthalate
NW #1	91.06429	117840	< 10.	UG/L	8/13/91	Di-n-octyl phthalate
NW #1	91.06429	53703	< 10.	UG/L	8/13/91	Dibenzo[a,h]anthracene
NW #1	91.06429	132649	< 10.	UG/L	8/13/91	Dibenzofuran
NW #1	91.06429	95501	< 10.	UG/L	8/13/91	o-Dichlorobenzene (1,2)
NW #1	91.06429	541731	< 10.	UG/L	8/13/91	m-Dichlorobenzene (1,3)
NW #1	91.06429	106467	< 10.	UG/L	8/13/91	p-Dichlorobenzene (1,4)
NW #1	91.06429	91941	< 10.	UG/L	8/13/91	3,3'-Dichlorobenzidine
NW #1	91.06429	120832	< 10.	UG/L	8/13/91	2,4-Dichlorophenol
NW #1	91.06429	84662	< 10.	UG/L	8/13/91	Diethyl phthalate
NW #1	91.06429	131113	< 10.	UG/L	8/13/91	Dimethyl phthalate
NW #1	91.06429	105679	< 10.	UG/L	8/13/91	2,4-Dimethylphenol
NW #1	91.06429	51285	< 10.	UG/L	8/13/91	2,4-Dinitrophenol
NW #1	91.06429	121142	< 10.	UG/L	8/13/91	2,4-Dinitrotoluene
NW #1	91.06429	606202	< 10.	UG/L	8/13/91	2,6-Dinitrotoluene
NW #1	91.06429	206440	< 10.	UG/L	8/13/91	Fluoranthene
NW #1	91.06429	86737	< 10.	UG/L	8/13/91	Fluorene
NW #1	91.06429	118741	< 10.	UG/L	8/13/91	Hexachlorobenzene
NW #1	91.06429	87683	< 10.	UG/L	8/13/91	Hexachlorobutadiene
NW #1	91.06429	77474	< 10.	UG/L	8/13/91	Hexachlorocyclopentadiene
NW #1	91.06429	67721	< 10.	UG/L	8/13/91	Hexachloroethane
NW #1	91.06429	193395	< 10.	UG/L	8/13/91	Indeno[1,2,3-cd]pyrene
NW #1	91.06429	78591	< 10.	UG/L	8/13/91	Isophorone
NW #1	91.06429	534521	< 10.	UG/L	8/13/91	2-Methyl-4,6-dinitrophenol
NW #1	91.06429	91576	< 10.	UG/L	8/13/91	2-Methylnaphthalene
NW #1	91.06429	95487	< 10.	UG/L	8/13/91	2-Methylphenol
NW #1	91.06429	106445	< 10.	UG/L	8/13/91	4-Methylphenol
NW #1	91.06429	91203	< 10.	UG/L	8/13/91	Naphthalene
NW #1	91.06429	88744	< 10.	UG/L	8/13/91	2-Nitroaniline
NW #1	91.06429	99092	< 10.	UG/L	8/13/91	3-Nitroaniline
NW #1	91.06429	100016	< 10.	UG/L	8/13/91	4-Nitroaniline
NW #1	91.06429	98953	< 10.	UG/L	8/13/91	Nitrobenzene
NW #1	91.06429	88755	< 10.	UG/L	8/13/91	2-Nitrophenol
NW #1	91.06429	100027	< 10.	UG/L	8/13/91	4-Nitrophenol
NW #1	91.06429	621647	< 10.	UG/L	8/13/91	N-Nitrosodi-n-propylamine
NW #1	91.06429	62759	< 10.	UG/L	8/13/91	N-Nitrosodimethylamine
NW #1	91.06429	86306	< 10.	UG/L	8/13/91	N-Nitrosodiphenylamine
NW #1	91.06429	87865	< 10.	UG/L	8/13/91	Pentachlorophenol
NW #1	91.06429	85018	< 10.	UG/L	8/13/91	Phenanthrene
NW #1	91.06429	108952	< 10.	UG/L	8/13/91	Phenol
NW #1	91.06429	129000	< 10.	UG/L	8/13/91	Pyrene

NW #1	91.06429	120821	< 10.	UG/L	8/13/91	1,2,4-Trichlorobenzene
NW #1	91.06429	95954	< 10.	UG/L	8/13/91	2,4,5-Trichlorophenol
NW #1	91.06429	88062	< 10.	UG/L	8/13/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.06429

none

Customer Sample Duplicate Results for Sample # 91.06429

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.06429

none

REPORT NUMBER: 11232

********** EM-9 ANALYTICAL REPORT **********

Prepared by: LAT on 13-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11728 MATRIX: W ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.06430

Date Collected: 7/15/91 Date Received: 7/15/91 Date Extracted: 7/16/91 Date Analyzed: 7/20/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
NW #2	91.06430	83329	< 10.		UG/L	8/13/91		Acenaphthene
NW #2	91.06430	208968	< 10.		UG/L	8/13/91		Acenaphthylene
NW #2	91.06430	62533	< 10.		UG/L	8/13/91		Aniline
NW #2	91.06430	120127	< 10.		UG/L	8/13/91		Anthracene
NW #2	91.06430	103333	< 10.		UG/L	8/13/91		Azobenzene
NW #2	91.06430	92875	< 10.		UG/L	8/13/91		m-Benzidine
NW #2	91.06430	56553	< 10.		UG/L	8/13/91		Benzo[a]anthracene
NW #2	91.06430	50328	< 10.		UG/L	8/13/91		Benzo[a]pyrene
NW #2	91.06430	205992	< 10.		UG/L	8/13/91		Benzo[b]fluoranthene
NW #2	91.06430	191242	< 10.		UG/L	8/13/91		Benzo[g,h,i]perylene
NW #2	91.06430	207089	< 10.		UG/L	8/13/91		Benzo[k]fluoranthene
NW #2	91.06430	65850	< 10.		UG/L	8/13/91		Benzoic acid
NW #2	91.06430	100516	< 10.		UG/L	8/13/91		Benzyl alcohol
NW #2	91.06430	111911	< 10.		UG/L	8/13/91		Bis(2-chloroethoxy)methane
NW #2	91.06430	111444	< 10.		UG/L	8/13/91		Bis(2-chloroethyl)ether
NW #2	91.06430	108601	< 10.		UG/L	8/13/91		Bis(2-chloroisopropyl)ether
NW #2	91.06430	117817	< 10.		UG/L	8/13/91		Bis(2-ethylhexyl)phthalate
NW #2	91.06430	101553	< 10.		UG/L	8/13/91		4-Bromophenylphenyl ether
NW #2	91.06430	85687	< 10.		UG/L	8/13/91		Butylbenzyl phthalate
NW #2	91.06430	59507	< 10.		UG/L	8/13/91		4-Chloro-3-methylphenol
NW #2	91.06430	106478	< 10.		UG/L	8/13/91		4-Chloroaniline

NW #2	91.06430	91587	< 10.	UG/L	8/13/91	2-Chloronaphthalene
NW #2	91.06430	95578	< 10.	UG/L	8/13/91	o-Chlorophenol
NW #2	91.06430	7005723	< 10.	UG/L	8/13/91	4-Chlorophenylphenyl ether
NW #2	91.06430	218019	< 10.	UG/L	8/13/91	Chrysene
NW #2	91.06430	84742	< 10.	UG/L	8/13/91	Di-n-butyl phthalate
NW #2	91.06430	117840	< 10.	UG/L	8/13/91	Di-n-octyl phthalate
NW #2	91.06430	53703	< 10.	UG/L	8/13/91	Dibenzo[a,h]anthracene
NW #2	91.06430	132649	< 10.	UG/L	8/13/91	Dibenzofuran
NW #2	91.06430	95501	< 10.	UG/L	8/13/91	o-Dichlorobenzene (1,2)
NW #2	91.06430	541731	< 10.	UG/L	8/13/91	m-Dichlorobenzene (1,3)
NW #2	91.06430	106467	< 10.	UG/L	8/13/91	p-Dichlorobenzene (1,4)
NW #2	91.06430	91941	< 10.	UG/L	8/13/91	3,3'-Dichlorobenzidine
NW #2	91.06430	120832	< 10.	UG/L	8/13/91	2,4-Dichlorophenol
NW #2	91.06430	84662	< 10.	UG/L	8/13/91	Diethyl phthalate
NW #2	91.06430	131113	< 10.	UG/L	8/13/91	Dimethyl phthalate
NW #2	91.06430	105679	< 10.	UG/L	8/13/91	2,4-Dimethylphenol
NW #2	91.06430	51285	< 10.	UG/L	8/13/91	2,4-Dinitrophenol
NW #2	91.06430	121142	< 10.	UG/L	8/13/91	2,4-Dinitrotoluene
NW #2	91.06430	606202	< 10.	UG/L	8/13/91	2,6-Dinitrotoluene
NW #2	91.06430	206440	< 10.	UG/L	8/13/91	Fluoranthene
NW #2	91.06430	86737	< 10.	UG/L	8/13/91	Fluorene
NW #2	91.06430	118741	< 10.	UG/L	8/13/91	Hexachlorobenzene
NW #2	91.06430	87683	< 10.	UG/L	8/13/91	Hexachlorobutadiene
NW #2	91.06430	77474	< 10.	UG/L	8/13/91	Hexachlorocyclopentadiene
NW #2	91.06430	67721	< 10.	UG/L	8/13/91	Hexachloroethane
NW #2	91.06430	193395	< 10.	UG/L	8/13/91	Indeno[1,2,3-cd]pyrene
NW #2	91.06430	78591	< 10.	UG/L	8/13/91	Isophorone
NW #2	91.06430	534521	< 10.	UG/L	8/13/91	2-Methyl-4,6-dinitrophenol
NW #2	91.06430	91576	< 10.	UG/L	8/13/91	2-Methylnaphthalene
NW #2	91.06430	95487	< 10.	UG/L	8/13/91	2-Methylphenol
NW #2	91.06430	106445	< 10.	UG/L	8/13/91	4-Methylphenol
NW #2	91.06430	91203	< 10.	UG/L	8/13/91	Naphthalene
NW #2	91.06430	88744	< 10.	UG/L	8/13/91	2-Nitroaniline
NW #2	91.06430	99092	< 10.	UG/L	8/13/91	3-Nitroaniline
NW #2	91.06430	100016	< 10.	UG/L	8/13/91	4-Nitroaniline
NW #2	91.06430	98953	< 10.	UG/L	8/13/91	Nitrobenzene
NW #2	91.06430	88755	< 10.	UG/L	8/13/91	2-Nitrophenol
NW #2	91.06430	100027	< 10.	UG/L	8/13/91	4-Nitrophenol
NW #2	91.06430	621647	< 10.	UG/L	8/13/91	N-Nitrosodi-n-propylamine
NW #2	91.06430	62759	< 10.	UG/L	8/13/91	N-Nitrosodimethylamine
NW #2	91.06430	86306	< 10.	UG/L	8/13/91	N-Nitrosodiphenylamine
NW #2	91.06430	87865	< 10.	UG/L	8/13/91	Pentachlorophenol
NW #2	91.06430	85018	< 10.	UG/L	8/13/91	Phenanthrene
NW #2	91.06430	108952	< 10.	UG/L	8/13/91	Phenol
NW #2	91.06430	129000	< 10.	UG/L	8/13/91	Pyrene

NW #2	91.06430	120821	< 10.	UG/L	8/13/91	1,2,4-Trichlorobenzene
NW #2	91.06430	95954	< 10.	UG/L	8/13/91	2,4,5-Trichlorophenol
NW #2	91.06430	88062	< 10.	UG/L	8/13/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.06430

none

Customer Sample Duplicate Results for Sample # 91.06430

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.06430

none

REPORT NUMBER: 11232

********** EM-9 ANALYTICAL REPORT **********

Prepared by: LAT on 13-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11728 MATRIX: W ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.06431

Date Collected: 7/15/91 Date Received: 7/15/91 Date Extracted: 7/16/91 Date Analyzed: 7/20/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
NW #3	91.06431	83329	< 10.		UG/L	8/13/91		Acenaphthene
NW #3	91.06431	208968	< 10.		UG/L	8/13/91		Acenaphthylene
NW #3	91.06431	62533	< 10.		UG/L	8/13/91		Aniline
NW #3	91.06431	120127	< 10.		UG/L	8/13/91		Anthracene
NW #3	91.06431	103333	< 10.		UG/L	8/13/91		Azobenzene
NW #3	91.06431	92875	< 10.		UG/L	8/13/91		m-Benzidine
NW #3	91.06431	56553	< 10.		UG/L	8/13/91		Benzo[a]anthracene
NW #3	91.06431	50328	< 10.		UG/L	8/13/91		Benzo[a]pyrene
NW #3	91.06431	205992	< 10.		UG/L	8/13/91		Benzo[b]fluoranthene
NW #3	91.06431	191242	< 10.		UG/L	8/13/91		Benzo[g,h,i]perylene
NW #3	91.06431	207089	< 10.		UG/L	8/13/91		Benzo[k]fluoranthene
NW #3	91.06431	65850	< 10.		UG/L	8/13/91		Benzoic acid
NW #3	91.06431	100516	< 10.		UG/L	8/13/91		Benzyl alcohol
NW #3	91.06431	111911	< 10.		UG/L	8/13/91		Bis(2-chloroethoxy)methane
NW #3	91.06431	111444	< 10.		UG/L	8/13/91		Bis(2-chloroethyl)ether
NW #3	91.06431	108601	< 10.		UG/L	8/13/91		Bis(2-chloroisopropyl)ether
NW #3	91.06431	117817	< 10.		UG/L	8/13/91		Bis(2-ethylhexyl)phthalate
NW #3	91.06431	101553	< 10.		UG/L	8/13/91		4-Bromophenylphenyl ether
NW #3	91.06431	85687	< 10.		UG/L	8/13/91		Butylbenzyl phthalate
NW #3	91.06431	59507	< 10.		UG/L	8/13/91		4-Chloro-3-methylphenol
NW #3	91.06431	106478	< 10.		UG/L	8/13/91		4-Chloroaniline

NW #3	91.06431	91587	< 10.	UG/L	8/13/91	2-Chloronaphthalene
NW #3	91.06431	95578	< 10.	UG/L	8/13/91	o-Chlorophenol
NW #3	91.06431	7005723	< 10.	UG/L	8/13/91	4-Chlorophenylphenyl ether
NW #3	91.06431	218019	< 10.	UG/L	8/13/91	Chrysene
NW #3	91.06431	84742	< 10.	UG/L	8/13/91	Di-n-butyl phthalate
NW #3	91.06431	117840	< 10.	UG/L	8/13/91	Di-n-octyl phthalate
NW #3	91.06431	53703	< 10.	UG/L	8/13/91	Dibenzo[a,h]anthracene
NW #3	91.06431	132649	< 10.	UG/L	8/13/91	Dibenzofuran
NW #3	91.06431	95501	< 10.	UG/L	8/13/91	o-Dichlorobenzene (1,2)
NW #3	91.06431	541731	< 10.	UG/L	8/13/91	m-Dichlorobenzene (1,3)
NW #3	91.06431	106467	< 10.	UG/L	8/13/91	p-Dichlorobenzene (1,4)
NW #3	91.06431	91941	< 10.	UG/L	8/13/91	3,3'-Dichlorobenzidine
NW #3	91.06431	120832	< 10.	UG/L	8/13/91	2,4-Dichlorophenol
NW #3	91.06431	84662	< 10.	UG/L	8/13/91	Diethyl phthalate
NW #3	91.06431	131113	< 10.	UG/L	8/13/91	Dimethyl phthalate
NW #3	91.06431	105679	< 10.	UG/L	8/13/91	2,4-Dimethylphenol
NW #3	91.06431	51285	< 10.	UG/L	8/13/91	2,4-Dinitrophenol
NW #3	91.06431	121142	< 10.	UG/L	8/13/91	2,4-Dinitrotoluene
NW #3	91.06431	606202	< 10.	UG/L	8/13/91	2,6-Dinitrotoluene
NW #3	91.06431	206440	< 10.	UG/L	8/13/91	Fluoranthene
NW #3	91.06431	86737	< 10.	UG/L	8/13/91	Fluorene
NW #3	91.06431	118741	< 10.	UG/L	8/13/91	Hexachlorobenzene
NW #3	91.06431	87683	< 10.	UG/L	8/13/91	Hexachlorobutadiene
NW #3	91.06431	77474	< 10.	UG/L	8/13/91	Hexachlorocyclopentadiene
NW #3	91.06431	67721	< 10.	UG/L	8/13/91	Hexachloroethane
NW #3	91.06431	193395	< 10.	UG/L	8/13/91	Indeno[1,2,3-cd]pyrene
NW #3	91.06431	78591	< 10.	UG/L	8/13/91	Isophorone
NW #3	91.06431	534521	< 10.	UG/L	8/13/91	2-Methyl-4,6-dinitrophenol
NW #3	91.06431	91576	< 10.	UG/L	8/13/91	2-Methylnaphthalene
NW #3	91.06431	95487	< 10.	UG/L	8/13/91	2-Methylphenol
NW #3	91.06431	106445	< 10.	UG/L	8/13/91	4-Methylphenol
NW #3	91.06431	91203	< 10.	UG/L	8/13/91	Naphthalene
NW #3	91.06431	88744	< 10.	UG/L	8/13/91	2-Nitroaniline
NW #3	91.06431	99092	< 10.	UG/L	8/13/91	3-Nitroaniline
NW #3	91.06431	100016	< 10.	UG/L	8/13/91	4-Nitroaniline
NW #3	91.06431	98953	< 10.	UG/L	8/13/91	Nitrobenzene
NW #3	91.06431	88755	< 10.	UG/L	8/13/91	2-Nitrophenol
NW #3	91.06431	100027	< 10.	UG/L	8/13/91	4-Nitrophenol
NW #3	91.06431	621647	< 10.	UG/L	8/13/91	N-Nitrosodi-n-propylamine
NW #3	91.06431	62759	< 10.	UG/L	8/13/91	N-Nitrosodimethylamine
NW #3	91.06431	86306	< 10.	UG/L	8/13/91	N-Nitrosodiphenylamine
NW #3	91.06431	87865	< 10.	UG/L	8/13/91	Pentachlorophenol
NW #3	91.06431	85018	< 10.	UG/L	8/13/91	Phenanthrene
NW #3	91.06431	108952	< 10.	UG/L	8/13/91	Phenol
NW #3	91.06431	129000	< 10.	UG/L	8/13/91	Pyrene

NW #3	91.06431	120821	< 10.	UG/L	8/13/91	1,2,4-Trichlorobenzene
NW #3	91.06431	95954	< 10.	UG/L	8/13/91	2,4,5-Trichlorophenol
NW #3	91.06431	88062	< 10.	UG/L	8/13/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.06431

none

Customer Sample Duplicate Results for Sample # 91.06431

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.06431

none

REPORT ' ER: 11232

********** EM-9 ANALYTICAL REPORT **********

Prepared by: LAT on 13-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11728 MATRIX: W ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.06432

Date Collected: 7/15/91 Date Received: 7/15/91 Date Extracted: 7/16/91 Date Analyzed: 7/20/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
SO. RAD #3	91.06432	83329	< 10.		UG/L	8/13/91		Acenaphthene
SO. RAD #3	91.06432	208968	< 10.		UG/L	8/13/91		Acenaphthylene
SO. RAD #3	91.06432	62533	< 10.		UG/L	8/13/91		Aniline
SO. RAD #3	91.06432	120127	< 10.		UG/L	8/13/91		Anthracene
SO. RAD #3	91.06432	103333	< 10.		UG/L	8/13/91		Azobenzene
SO. RAD #3	91.06432	92875	< 10.		UG/L	8/13/91		m-Benzidine
SO. RAD #3	91.06432	56553	< 10.		UG/L	8/13/91		Benzo[a]anthracene
SO. RAD #3	91.06432	50328	< 10.		UG/L	8/13/91		Benzo[a]pyrene
SO. RAD #3	91.06432	205992	< 10.		UG/L	8/13/91		Benzo[b]fluoranthene
SO. RAD #3	91.06432	191242	< 10.		UG/L	8/13/91		Benzo[g,h,i]perylene
SO. RAD #3	91.06432	207089	< 10.		UG/L	8/13/91		Benzo[k]fluoranthene
SO. RAD #3	91.06432	65850	< 10.		UG/L	8/13/91		Benzoic acid
SO. RAD #3	91.06432	100516	< 10.		UG/L	8/13/91		Benzyl alcohol
SO. RAD #3	91.06432	111911	< 10.		UG/L	8/13/91		Bis(2-chloroethoxy)methane
SO. RAD #3	91.06432	111444	< 10.		UG/L	8/13/91		Bis(2-chloroethyl)ether
SO. RAD #3	91.06432	108601	< 10.		UG/L	8/13/91		Bis(2-chloroisopropyl)ether
SO. RAD #3	91.06432	117817	< 10.		UG/L	8/13/91		Bis(2-ethylhexyl)phthalate
SO. RAD #3	91.06432	101553	< 10.		UG/L	8/13/91		4-Bromophenylphenyl ether
SO. RAD #3	91.06432	85687	< 10.		UG/L	8/13/91		Butylbenzyl phthalate
SO. RAD #3	91.06432	59507	< 10.		UG/L	8/13/91		4-Chloro-3-methylphenol
SO. RAD #3	91.06432	106478	< 10.		UG/L	8/13/91		4-Chloroaniline

SO. RAD #3	91.06432	91587	< 10.	UG/L	8/13/91	2-Chloronaphthalene
SO. RAD #3	91.06432	95578	< 10.	UG/L	8/13/91	o-Chlorophenol
SO. RAD #3	91.06432	7005723	< 10.	UG/L	8/13/91	4-Chlorophenylphenyl ether
SO. RAD #3	91.06432	218019	< 10.	UG/L	8/13/91	Chrysene
SO. RAD #3	91.06432	84742	< 10.	UG/L	8/13/91	Di-n-butyl phthalate
SO. RAD #3	91.06432	117840	< 10.	UG/L	8/13/91	Di-n-octyl phthalate
SO. RAD #3	91.06432	53703	< 10.	UG/L	8/13/91	Dibenzo[a,h]anthracene
SO. RAD #3	91.06432	132649	< 10.	UG/L	8/13/91	Dibenzofuran
SO. RAD #3	91.06432	95501	< 10.	UG/L	8/13/91	o-Dichlorobenzene (1,2)
SO. RAD #3	91.06432	541731	< 10.	UG/L	8/13/91	m-Dichlorobenzene (1,3)
SO. RAD #3	91.06432	106467	< 10.	UG/L	8/13/91	p-Dichlorobenzene (1,4)
SO. RAD #3	91.06432	91941	< 10.	UG/L	8/13/91	3,3'-Dichlorobenzidine
SO. RAD #3	91.06432	120832	< 10.	UG/L	8/13/91	2,4-Dichlorophenol
SO. RAD #3	91.06432	84662	< 10.	UG/L	8/13/91	Diethyl phthalate
SO. RAD #3	91.06432	131113	< 10.	UG/L	8/13/91	Dimethyl phthalate
SO. RAD #3	91.06432	105679	< 10.	UG/L	8/13/91	2,4-Dimethylphenol
SO. RAD #3	91.06432	51285	< 10.	UG/L	8/13/91	2,4-Dinitrophenol
SO. RAD #3	91.06432	121142	< 10.	UG/L	8/13/91	2,4-Dinitrotoluene
SO. RAD #3	91.06432	606202	< 10.	UG/L	8/13/91	2,6-Dinitrotoluene
SO. RAD #3	91.06432	206440	< 10.	UG/L	8/13/91	Fluoranthene
SO. RAD #3	91.06432	86737	< 10.	UG/L	8/13/91	Fluorene
SO. RAD #3	91.06432	118741	< 10.	UG/L	8/13/91	Hexachlorobenzene
SO. RAD #3	91.06432	87683	< 10.	UG/L	8/13/91	Hexachlorobutadiene
SO. RAD #3	91.06432	77474	< 10.	UG/L	8/13/91	Hexachlorocyclopentadiene
SO. RAD #3	91.06432	67721	< 10.	UG/L	8/13/91	Hexachloroethane
SO. RAD #3	91.06432	193395	< 10.	UG/L	8/13/91	Indeno[1,2,3-cd]pyrene
SO. RAD #3	91.06432	78591	< 10.	UG/L	8/13/91	Isophorone
SO. RAD #3	91.06432	534521	< 10.	UG/L	8/13/91	2-Methyl-4,6-dinitrophenol
SO. RAD #3	91.06432	91576	< 10.	UG/L	8/13/91	2-Methylnaphthalene
SO. RAD #3	91.06432	95487	< 10.	UG/L	8/13/91	2-Methylphenol
SO. RAD #3	91.06432	106445	< 10.	UG/L	8/13/91	4-Methylphenol
SO. RAD #3	91.06432	91203	< 10.	UG/L	8/13/91	Naphthalene
SO. RAD #3	91.06432	88744	< 10.	UG/L	8/13/91	2-Nitroaniline
SO. RAD #3	91.06432	99092	< 10.	UG/L	8/13/91	3-Nitroaniline
SO. RAD #3	91.06432	100016	< 10.	UG/L	8/13/91	4-Nitroaniline
SO. RAD #3	91.06432	98953	< 10.	UG/L	8/13/91	Nitrobenzene
SO. RAD #3	91.06432	88755	< 10.	UG/L	8/13/91	2-Nitrophenol
SO. RAD #3	91.06432	100027	< 10.	UG/L	8/13/91	4-Nitrophenol
SO. RAD #3	91.06432	621647	< 10.	UG/L	8/13/91	N-Nitrosodi-n-propylamine
SO. RAD #3	91.06432	62759	< 10.	UG/L	8/13/91	N-Nitrosodimethylamine
SO. RAD #3	91.06432	86306	< 10.	UG/L	8/13/91	N-Nitrosodiphenylamine
SO. RAD #3	91.06432	87865	< 10.	UG/L	8/13/91	Pentachlorophenol
SO. RAD #3	91.06432	85018	< 10.	UG/L	8/13/91	Phenanthrene
SO. RAD #3	91.06432	108952	< 10.	UG/L	8/13/91	Phenol
SO. RAD #3	91.06432	129000	< 10.	UG/L	8/13/91	Pyrene

SO. RAD #3	91.06432	120821	< 10.	UG/L	8/13/91	1,2,4-Trichlorobenzene
SO. RAD #3	91.06432	95954	< 10.	UG/L	8/13/91	2,4,5-Trichlorophenol
SO. RAD #3	91.06432	88062	< 10.	UG/L	8/13/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.06432

none

Customer Sample Duplicate Results for Sample # 91.06432

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.06432

none

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********** EM-9 QUALITY ASSURANCE REPORT **********

Prepared by: LAT on 13-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11728 MATRIX: W ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

SUMMARY OF CONTROL STATUS OF OPEN (NON-BLIND) QA SAMPLES RUN WITH THIS BATCH

There were no open (non-blind) Quality Control materials run with the samples reported above for one of the following reasons:

____ Only qualitative data requested

____ Only Blind QC samples run with this batch.

____ No QC samples run with this sample batch.

____ No QC samples for this constituent and matrix type available within EM-9

SUMMARY OF CONTROL STATUS OF BLANK QC SAMPLES RUN WITH THIS BATCH

Blank Results

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	QC VALUE	QC UNCERTAINTY	COMPLETION DATE	COMMENT	COMPOUN
00.20226	91.06434	83329	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Acenaphthene
00.20226	91.06434	208968	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Acenaphthylene
00.20226	91.06434	62533	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Aniline
00.20226	91.06434	120127	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Anthracene
00.20226	91.06434	103333	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Azobenzene
00.20226	91.06434	92875	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	m-Benzidine
00.20226	91.06434	56553	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Benzo[a]anthracene
00.20226	91.06434	50328	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Benzo[a]pyrene
00.20226	91.06434	205992	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Benzo[b]fluoranthene
00.20226	91.06434	191242	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Benzo[g,h,i]perylene
00.20226	91.06434	207089	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Benzo[k]fluoranthene
00.20226	91.06434	65850	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Benzoic acid
00.20226	91.06434	100516	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Benzyl alcohol
00.20226	91.06434	111911	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Bis(2-chloroethoxy)methane
00.20226	91.06434	111444	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Bis(2-chloroethyl)ether
00.20226	91.06434	108601	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Bis(2-chloroisopropyl)ether
00.20226	91.06434	117817	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Bis(2-ethylhexyl)phthalate
00.20226	91.06434	101553	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	4-Bromophenylphenyl ether
00.20226	91.06434	85687	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Butylbenzyl phthalate
00.20226	91.06434	59507	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	4-Chloro-3-methylphenol
00.20226	91.06434	106478	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	4-Chloroaniline
00.20226	91.06434	91587	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	2-Chloronaphthalene
00.20226	91.06434	95578	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	o-Chlorophenol
00.20226	91.06434	7005723	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	4-Chlorophenylphenyl ether
00.20226	91.06434	218019	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Chrysene
00.20226	91.06434	84742	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Di-n-butyl phthalate
00.20226	91.06434	117840	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Di-n-octyl phthalate
00.20226	91.06434	53703	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Dibenzo[a,h]anthracene
00.20226	91.06434	132649	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Dibenzofuran
00.20226	91.06434	95501	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	o-Dichlorobenzene (1,2)
00.20226	91.06434	541731	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	m-Dichlorobenzene (1,3)
00.20226	91.06434	106467	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	p-Dichlorobenzene (1,4)
00.20226	91.06434	91941	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	3,3'-Dichlorobenzidine

00.20226	91.06434	120832	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	2,4-Dichlorophenol
00.20226	91.06434	84662	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Diethyl phthalate
00.20226	91.06434	131113	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Dimethyl phthalate
00.20226	91.06434	105679	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	2,4-Dimethylphenol
00.20226	91.06434	51285	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	2,4-Dinitrophenol
00.20226	91.06434	121142	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	2,4-Dinitrotoluene
00.20226	91.06434	606202	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	2,6-Dinitrotoluene
00.20226	91.06434	206440	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Fluoranthene
00.20226	91.06434	86737	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Fluorene
00.20226	91.06434	118741	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Hexachlorobenzene
00.20226	91.06434	87683	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Hexachlorobutadiene
00.20226	91.06434	77474	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Hexachlorocyclopentadiene
00.20226	91.06434	67721	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Hexachloroethane
00.20226	91.06434	193395	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Indeno[1,2,3-cd]pyrene
00.20226	91.06434	78591	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Isophorone
00.20226	91.06434	534521	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	2-Methyl-4,6-dinitrophenol
00.20226	91.06434	91576	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	2-Methylnaphthalene
00.20226	91.06434	95487	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	2-Methylphenol
00.20226	91.06434	106445	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	4-Methylphenol
00.20226	91.06434	91203	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Naphthalene
00.20226	91.06434	88744	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	2-Nitroaniline
00.20226	91.06434	99092	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	3-Nitroaniline
00.20226	91.06434	100016	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	4-Nitroaniline
00.20226	91.06434	98953	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Nitrobenzene
00.20226	91.06434	88755	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	2-Nitrophenol
00.20226	91.06434	100027	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	4-Nitrophenol
00.20226	91.06434	621647	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	N-Nitrosodi-n-propylamine
00.20226	91.06434	62759	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	N-Nitrosodimethylamine
00.20226	91.06434	86306	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	N-Nitrosodiphenylamine
00.20226	91.06434	87865	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Pentachlorophenol
00.20226	91.06434	85018	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Phenanthrene
00.20226	91.06434	108952	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Phenol
00.20226	91.06434	129000	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	Pyrene
00.20226	91.06434	120821	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	1,2,4-Trichlorobenzene
00.20226	91.06434	95954	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	2,4,5-Trichlorophenol
00.20226	91.06434	88062	< 10.	UG/L	0.0	8/13/91	UNDER CONTROL	2,4,6-Trichlorophenol

Blank Spike Results

none

Blank Spike Duplicate Results

none

SUMMARY OF CONTROL STATUS OF BLIND QA SAMPLES RUN WITH THIS BATCH

Blind QC Results, Sample # 91.05768

SAMPLE NUM	ANALYSIS	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	QC VALUE	QC UNCERTAINTY	COMPLETION DATE	COMMENT	COMPOUND-NAME
91.05768	83329	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Acenaphthene
91.05768	208968	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Acenaphthylene
91.05768	62533	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Aniline
91.05768	120127	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Anthracene
91.05768	103333	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Azobenzene
91.05768	92875	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	m-Benzidine
91.05768	56553	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzo[a]anthracene
91.05768	50328	84.	25.2	UG/L	140.4	14.	8/12/91	UNDER CONTROL	Benzo[a]pyrene
91.05768	205992	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzo[b]fluoranthene
91.05768	191242	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzo[g,h,i]perylene
91.05768	207089	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzo[k]fluoranthene
91.05768	65850	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzoic acid
91.05768	100516	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzyl alcohol
91.05768	111911	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Bis(2-chloroethoxy)methane
91.05768	111444	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Bis(2-chloroethyl)ether
91.05768	108601	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Bis(2-chloroisopropyl)ether
91.05768	117817	< 10.		UG/L	117.6	12.	8/12/91	OUT OF CONTROL	Bis(2-ethylhexyl)phthalate
91.05768	101553	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	4-Bromophenylphenyl ether
91.05768	85687	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Butylbenzyl phthalate
91.05768	59507	140.	42.	UG/L	127.2	13.	8/12/91	UNDER CONTROL	4-Chloro-3-methylphenol
91.05768	106478	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	4-Chloroaniline
91.05768	91587	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2-Chloronaphthalene
91.05768	95578	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	o-Chlorophenol
91.05768	7005723	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	4-Chlorophenylphenyl ether
91.05768	218019	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Chrysene
91.05768	84742	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Di-n-butyl phthalate
91.05768	117840	110.	33.	UG/L	0.0		8/12/91	OUT OF CONTROL	Di-n-octyl phthalate
91.05768	53703	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Dibenzo[a,h]anthracene
91.05768	132649	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Dibenzofuran
91.05768	95501	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	o-Dichlorobenzene (1,2)
91.05768	541731	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	m-Dichlorobenzene (1,3)
91.05768	106467	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	p-Dichlorobenzene (1,4)
91.05768	91941	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	3,3'-Dichlorobenzidine
91.05768	120832	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2,4-Dichlorophenol
91.057[illegible]	84662	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Diethyl phthalate

91.05768	131113	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Dimethyl phthalate
91.05768	105679	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2,4-Dimethylphenol
91.05768	51285	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2,4-Dinitrophenol
91.05768	121142	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2,4-Dinitrotoluene
91.05768	606202	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2,6-Dinitrotoluene
91.05768	206440	130.		UG/L	134.4	13.	8/12/91	UNDER CONTROL	Fluoranthene
91.05768	86737	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Fluorene
91.05768	118741	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Hexachlorobenzene
91.05768	87683	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Hexachlorobutadiene
91.05768	77474	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Hexachlorocyclopentadiene
91.05768	67721	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Hexachloroethane
91.05768	193395	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Indeno[1,2,3-cd]pyrene
91.05768	78591	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Isophorone
91.05768	534521	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2-Methyl-4,6-dinitrophenol
91.05768	91576	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2-Methylnaphthalene
91.05768	95487	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2-Methylphenol
91.05768	106445	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	4-Methylphenol
91.05768	91203	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Naphthalene
91.05768	88744	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2-Nitroaniline
91.05768	99092	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	3-Nitroaniline
91.05768	100016		42.	UG/L	152.4	15.	8/12/91	UNDER CONTROL	4-Nitroaniline
91.05768	98953	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Nitrobenzene
91.05768	88755	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2-Nitrophenol
91.05768	100027	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	4-Nitrophenol
91.05768	621647	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	N-Nitrosodi-n-propylamine
91.05768	62759	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	N-Nitrosodimethylamine
91.05768	86306	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	N-Nitrosodiphenylamine
91.05768	87865	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Pentachlorophenol
91.05768	85018	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Phenanthrene
91.05768	108952	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Phenol
91.05768	129000	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Pyrene
91.05768	120821	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	1,2,4-Trichlorobenzene
91.05768	95954	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2,4,5-Trichlorophenol
91.05768	88062	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2,4,6-Trichlorophenol

Blind QC Results, Sample # 91.06433

Date Collected: 7/15/91 Date Received: 7/15/91 Date Extracted: 7/16/91 Date Analyzed: 7/20/91

91.06433	83329	22.	6.6	UG/L	172.	17.	8/13/91	OUT OF CONTROL	Acenaphthene
91.06433	208968	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Acenaphthylene
91.06433	62533	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Aniline
91.06433	120127	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Anthracene
91.06433	103333	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Azobenzene
91.06433	92875	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	m-Benzidine
91.06433	56553	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Benzo[a]anthracene

91.06433	50328	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Benzo[a]pyrene
91.06433	205992	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Benzo[b]fluoranthene
91.06433	191242	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Benzo[g,h,i]perylene
91.06433	207089	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Benzo[k]fluoranthene
91.06433	65850	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Benzoic acid
91.06433	100516	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Benzyl alcohol
91.06433	111911	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Bis(2-chloroethoxy)methane
91.06433	111444	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Bis(2-chloroethyl)ether
91.06433	108601	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Bis(2-chloroisopropyl)ether
91.06433	117817	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Bis(2-ethylhexyl)phthalate
91.06433	101553	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	4-Bromophenylphenyl ether
91.06433	85687	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Butylbenzyl phthalate
91.06433	59507	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	4-Chloro-3-methylphenol
91.06433	106478	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	4-Chloroaniline
91.06433	91587	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	2-Chloronaphthalene
91.06433	95578	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	o-Chlorophenol
91.06433	7005723	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	4-Chlorophenylphenyl ether
91.06433	218019	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Chrysene
91.06433	84742	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Di-n-butyl phthalate
91.06433	117840	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Di-n-octyl phthalate
91.06433	53703	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Dibenzo[a,h]anthracene
91.06433	132649	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Dibenzofuran
91.06433	95501	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	o-Dichlorobenzene (1,2)
91.06433	541731	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	m-Dichlorobenzene (1,3)
91.06433	106467	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	p-Dichlorobenzene (1,4)
91.06433	91941	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	3,3'-Dichlorobenzidine
91.06433	120832	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	2,4-Dichlorophenol
91.06433	84662	< 10.		UG/L	166.	17.	8/13/91	OUT OF CONTROL	Diethyl phthalate
91.06433	131113	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Dimethyl phthalate
91.06433	105679	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	2,4-Dimethylphenol
91.06433	51285	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	2,4-Dinitrophenol
91.06433	121142	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	2,4-Dinitrotoluene
91.06433	606202	[redacted]	6.	UG/L	172.	17.	8/13/91	OUT OF CONTROL	2,6-Dinitrotoluene
91.06433	206440	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Fluoranthene
91.06433	86737	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Fluorene
91.06433	118741	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Hexachlorobenzene
91.06433	87683	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Hexachlorobutadiene
91.06433	77474	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Hexachlorocyclopentadiene
91.06433	67721	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Hexachloroethane
91.06433	193395	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Indeno[1,2,3-cd]pyrene
91.06433	78591	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Isophorone
91.06433	534521	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	2-Methyl-4,6-dinitrophenol
91.06433	91576	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	2-Methylnaphthalene
91.06433	95487	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	2-Methylphenol
91.06433	106445	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	4-Methylphenol

91.06433	91203	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Naphthalene
91.06433	88744	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	2-Nitroaniline
91.06433	99092	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	3-Nitroaniline
91.06433	100016	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	4-Nitroaniline
91.06433	98953	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Nitrobenzene
91.06433	88755	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	2-Nitrophenol
91.06433	100027	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	4-Nitrophenol
91.06433	621647	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	N-Nitrosodi-n-propylamine
91.06433	62759	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	N-Nitrosodimethylamine
91.06433	86306	16.	5.4	UG/L	163.	16.	8/13/91	OUT OF CONTROL	N-Nitrosodiphenylamine
91.06433	87865	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Pentachlorophenol
91.06433	85018	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Phenanthrene
91.06433	108952	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Phenol
91.06433	129000	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	Pyrene
91.06433	120821	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	1,2,4-Trichlorobenzene
91.06433	95954	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	2,4,5-Trichlorophenol
91.06433	88062	< 10.		UG/L	0.0		8/13/91	UNDER CONTROL	2,4,6-Trichlorophenol

SURROGATE RESULTS FOR EPA SEMIVOLATILES

Surrogate 1 = 2-Fluorophenol (CAS # = 367124)
Surrogate 2 = Phenol-d5 (CAS # = 4165622)
Surrogate 3 = Nitrobenzene-d5 (CAS # = 4165600)
Surrogate 4 = 2-Fluorobiphenyl (CAS # = 321608)
Surrogate 5 = 2,4,6-Tribromophenol (CAS # = 118796)
Surrogate 6 = p-Terphenyl-d14 (CAS # =)

SAMPLE NUMBER	UNITS	Surrogate 1	Surrogate 2	Surrogate 3	Surrogate 4	Surrogate 5	Surrogate 6	COMPLETION DATE
91.05740	%	65.03	79.07	88.4	79.58	111.25	21.5	13-Aug-1991
91.05740	%	65.4	82.7	89.	75.12	117.54	23.58	13-Aug-1991
91.05768	%	99.38	77.16	124.88	110.18	122.3	126.46	12-Aug-1991
91.06429	%	47.72	67.2	46.48	61.16	69.04	14.5	13-Aug-1991
91.06430	%	92.82	119.59	110.98	96.48	116.2	30.4	13-Aug-1991
91.06431	%	68.84	87.36	89.08	80.02	72.92	22.42	13-Aug-1991
91.06432	%	74.48	115.12	90.42	85.74	104.2	25.	13-Aug-1991
91.06433	%	10.65	12.4	12.04	12.32	11.42	15.88	13-Aug-1991
91.06434	%	91.73	104.57	98.94	96.32	98.43	118.14	13-Aug-1991

EPA Limits:

Water	%	21 - 100	10 - 94	35 - 114	43 - 116	10 - 123	33 - 141
Soil	%	25 - 121	24 - 113	23 - 120	30 - 115	19 - 122	18 - 137

REPORT NUMBER: 11232

Analyst	Reviewer	Section Leader	QA Officer
M. Monaco	L. Bigthorwis	SB for CL	mag
8/19/91	8/14/91	8/23/91	8/23/91
Date	Date	Date	Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in 'Quality Assurance for Health and Environmental Chemistry: 1986,' LA-11114-MS, pp. 3-4.

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HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman
From: Matthew Monagle

Request Number: 11673
Matrix: Waters
Summary Date: 02 August 1991

Sample ID	Target Compounds Found	Amount (ug/L)	Level of Quantitation (ug/L)	TIC's
Blank (04-Jul.-1991)	Bis 2-ethylhexyl-phthalate	22	10	Yes
91.05740	Benzoic Acid	18	10	Yes
91.05741	NONE		10	Yes
91.05742	NONE		10	Yes
91.05747	NONE		10	Yes
91.05748	NONE		10	Yes
91.05749	NONE		10	Yes
91.05750	NONE		10	Yes
91.05754	NONE		10	Yes
91.05755	NONE		10	Yes
91.05756	NONE		10	Yes

c:\wp51\m2\qnt11673 8/13/91

HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman CL
From: Matthew Monagle

Request Number: 11673
Matrix: Waters
Summary Date: 02 August 1991

Summary:

Ten water samples were received by Sandra Cisneros Flores (HSE-9) on 02 July 1991 at TA-50. The samples, along with a quality control blind, matrix spikes and a method blank were extracted by continuous liquid-liquid extraction on 04 July 1991. Surrogate compounds were added to the matrix to determine the efficiency of the extraction. Analysis was performed on 10 and 20 July 1991 at TA-35 by capillary gas chromatography/mass spectrometry using methods consistent with EPA method SW-846.

Reportable quantities of one target compound was found in one of the water samples submitted. Benzoic acid was found in 91.05740. Additionally, bis-(2-ethylhexyl)phthalate, a common plasticizer found in environmental samples, was found in the blank at reportable levels.

Significant amounts of tentatively identified compounds, were found in all the samples submitted. A complete listing of these compounds may be obtained by calling Lara Tsiagkouris at 7-5889.

Surrogate and Matrix Spike Recoveries:

Surrogate recoveries for many of the samples were <u>not</u> within the EPA guidelines. There were several samples that had very low terphenyl d-14 recoveries. As per our phone conversation, some of these samples were re-sampled. However, upon further analysis, two of the samples (91.05747 and 91.05755) had low base neutral recoveries and were not re-sampled. You may wish to re-sample these samples. However, it is my opinion that, due to consistent low recoveries of the base neutral surrogates on these samples as well as the re-submitted samples, this is actually a matrix effect and not due to the analytical process. Matrix spike recoveries for some acid components were high while the base neutrals were low which agrees well with the surrogate recoveries. The relative percent deviation on these matrix spikes is very low.

All holding times <u>were</u> met

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8/13/91

HSE-9 SEMI-VOLATILE ORGANIC ANALYSIS
SUMMARY OF ANALYTICAL RESULTS

To: Alice Barr
Thru: Chris Leibman
From: Matthew Monagle

Request Number: 11673
Matrix: Waters
Summary Date: 02 August 1991

Problems encountered:

All samples were received with a pH of 1-2 as per our pre-sampling agreement. Because of this, the acid fraction was extracted first. The condensers went dry on both the base-neutral and acid fractions of this extraction. Appropriate steps were taken to recover the samples.

c:\wp51\m2\qnt11673 VK 8/13/91

LOS ALAMOS NATIONAL LABORATORY
HEALTH, SAFETY AND ENVIRONMENT DIVISION
HSE-9
MATRIX SPIKE RECOVERIES FOR SEMI-VOLATILES

		DRY WT WGL (G or L)		AMOUNT SPIKED (50 OR 100 ug/ml) IN UG/KG or UG/L		
REQUEST #:	11673			ACIDS	BASES	LOQ (UG/KG)
NUMBER OF SAMPLES:	14					
SPIKE ID: (STARTS M OR E)	M91.05740	SPIKE	0.89	114	57	1.
SPIKE DUP ID: (STARTS D OR F)	D91.05740	SPIKE-DUP	0.92	109	54	10
RAW DATA WITH:	11673					
ANALYST:	MM					

	SPIKE RED.	SPIKE-DUP RED.	SPIKE % RED.	SPIKE-DUP % RED.	RPD	LOW. REC. LIM.	UPP. REC. LIM.	RPD LIM.
PHENOL	85	39	75%	82%	9%	12	89	42
2-CHLOROPHENOL	91	88	80%	81%	1%	27	123	40
1,4-DICHLOROBENZENE	~~42~~ 4 JA	42	~~44%~~ 77%	77%	5%	36	97	28
N-NITROSO-DI-N-PROPYLAMINE	46	40	81%	74%	16%	41	116	38
1,2,4-TRICHLOROBENZENE	45	45	79%	83%	4%	39	98	28
4-CHLORO-3-METHYLPHENOL	120	98	106%+	90%	16%	23	97	42
ACENAPHTHENE	41	36	73%	66%	9%	46	118	31
[illegible]	120	111	114%+	101%+	12%	10	93	50
[illegible]	[illegible]	93	120%+	109%+	11%	24	96	28
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	102	50
PYRENE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	31

[illegible]

[illegible] JT 8/12/91

LOS ALAMOS NATIONAL LABORATORY
HEALTH, SAFETY AND ENVIRONMENT DIVISION
HSE-9
SURROGATE RECOVERIES FOR SEMI-VOLATILES
IN WATER

REQUEST #: 11675

NUMBER OF SAMPLES: 14
MATRIX W
ANALYST: MM
Date: 08/02/91

SURROGATE RECOVERIES

SURROGATE
RECOVERIES IN PERCENT (%)

	SAMPLE NUMBERS	TYPE	2-FLUORO-PHENOL	PHENOL (D6)	NITRO-BENZENE (D5)	2-FLUORO-BIPHENYL	2,4,6-TRIBROMO-PHENOL	TERPHENYL (D14)
1	891.05769	BLANK	49	49	59	53	58	52
2	M91.05740	MATRIX SPIK	65	79	88	80	111	22 *
3	891.05740	MATRIX SP-D	65	92	89	75	118	24 *
4	891.05740	SAMPLE	40	46	55	40 *	52	8 *
5	891.05741	SAMPLE	33	33	48	48	34	5 *
6	891.05742	SAMPLE	34	39	47	43	45	7 *
7	891.05747	SAMPLE	36	36	40	36 *	45	12 *
8	891.05748	SAMPLE	36	33	39	38 *	47	37
9	891.05749	SAMPLE	32	40	46	52	42	19 *
10	891.05750	SAMPLE	39	49	44	50	53	12 *
11	891.05754	SAMPLE	41	50	53	46	62	11 *
12	891.05755	SAMPLE	25	31	25 *	38 *	37	11 *
13	891.05756	SAMPLE	31	37	40	49	48	8 *
14	891.05768	SAMPLE	99	77	125 *	110	122	126
15								
16								
17								
18								
19								
20								
21								
22								

Average % Surrogate Recovery...	41	49	55	58	61	20
Defined Lower QC Limits (%)...	21	10	35	42	10	33
Defined Upper QC Limits (%)...	100	94	114	116	123	141
Observed Lower QC Limits (%)...	34	33	37	34	34	7
Observed Upper QC Limits (%)...	67	83	29	90	113	52

"*" If % Surrogate Recovery is Followed by a "*", is Outside of QC Limits.

Reviewed By: 8/12/91

REPORT NUMBER: 11225

********** EM-9 ANALYTICAL REPORT **********

Prepared by: LAT on 12-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05740

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/04/91 Date Analyzed: 7/10/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-1W	91.05740	83329	< 10.		UG/L	8/12/91		Acenaphthene
AB-53-NW-1W	91.05740	208968	< 10.		UG/L	8/12/91		Acenaphthylene
AB-53-NW-1W	91.05740	62533	< 10.		UG/L	8/12/91		Aniline
AB-53-NW-1W	91.05740	120127	< 10.		UG/L	8/12/91		Anthracene
AB-53-NW-1W	91.05740	103333	< 10.		UG/L	8/12/91		Azobenzene
AB-53-NW-1W	91.05740	92875	< 10.		UG/L	8/12/91		m-Benzidine
AB-53-NW-1W	91.05740	56553	< 10.		UG/L	8/12/91		Benzo[a]anthracene
AB-53-NW-1W	91.05740	50328	< 10.		UG/L	8/12/91		Benzo[a]pyrene
AB-53-NW-1W	91.05740	205992	< 10.		UG/L	8/12/91		Benzo[b]fluoranthene
AB-53-NW-1W	91.05740	191242	< 10.		UG/L	8/12/91		Benzo[g,h,i]perylene
AB-53-NW-1W	91.05740	207089	< 10		UG/L	8/12/91		Benzo[k]fluoranthene
AB-53-NW-1W	91.05740	65850	[redacted]	4.5	UG/L	8/12/91		Benzoic acid
AB-53-NW-1W	91.05740	100516	< 10.		UG/L	8/12/91		Benzyl alcohol
AB-53-NW-1W	91.05740	111911	< 10.		UG/L	8/12/91		Bis(2-chloroethoxy)methane
AB-53-NW-1W	91.05740	111444	< 10.		UG/L	8/12/91		Bis(2-chloroethyl)ether
AB-53-NW-1W	91.05740	108601	< 10.		UG/L	8/12/91		Bis(2-chloroisopropyl)ether
AB-53-NW-1W	91.05740	117817	< 10.		UG/L	8/12/91		Bis(2-ethylhexyl)phthalate
AB-53-NW-1W	91.05740	101553	< 10.		UG/L	8/12/91		4-Bromophenylphenyl ether
AB-53-NW-1W	91.05740	85687	< 10.		UG/L	8/12/91		Butylbenzyl phthalate
AB-53-NW-1W	91.05740	59507	< 10.		UG/L	8/12/91		4-Chloro-3-methylphenol
AB-53-NW-1W	91.05740	106478	< 10.		UG/L	8/12/91		4-Chloroaniline

AB-53-NW-1W	91.05740	91587	< 10.	UG/L	8/12/91	2-Chloronaphthalene
AB-53-NW-1W	91.05740	95578	< 10.	UG/L	8/12/91	o-Chlorophenol
AB-53-NW-1W	91.05740	7005723	< 10.	UG/L	8/12/91	4-Chlorophenylphenyl ether
AB-53-NW-1W	91.05740	218019	< 10.	UG/L	8/12/91	Chrysene
AB-53-NW-1W	91.05740	84742	< 10.	UG/L	8/12/91	Di-n-butyl phthalate
AB-53-NW-1W	91.05740	117840	< 10.	UG/L	8/12/91	Di-n-octyl phthalate
AB-53-NW-1W	91.05740	53703	< 10.	UG/L	8/12/91	Dibenzo[a,h]anthracene
AB-53-NW-1W	91.05740	132649	< 10.	UG/L	8/12/91	Dibenzofuran
AB-53-NW-1W	91.05740	95501	< 10.	UG/L	8/12/91	o-Dichlorobenzene (1,2)
AB-53-NW-1W	91.05740	541731	< 10.	UG/L	8/12/91	m-Dichlorobenzene (1,3)
AB-53-NW-1W	91.05740	106467	< 10.	UG/L	8/12/91	p-Dichlorobenzene (1,4)
AB-53-NW-1W	91.05740	91941	< 10.	UG/L	8/12/91	3,3'-Dichlorobenzidine
AB-53-NW-1W	91.05740	120832	< 10.	UG/L	8/12/91	2,4-Dichlorophenol
AB-53-NW-1W	91.05740	84662	< 10.	UG/L	8/12/91	Diethyl phthalate
AB-53-NW-1W	91.05740	131113	< 10.	UG/L	8/12/91	Dimethyl phthalate
AB-53-NW-1W	91.05740	105679	< 10.	UG/L	8/12/91	2,4-Dimethylphenol
AB-53-NW-1W	91.05740	51285	< 10.	UG/L	8/12/91	2,4-Dinitrophenol
AB-53-NW-1W	91.05740	121142	< 10.	UG/L	8/12/91	2,4-Dinitrotoluene
AB-53-NW-1W	91.05740	606202	< 10.	UG/L	8/12/91	2,6-Dinitrotoluene
AB-53-NW-1W	91.05740	206440	< 10.	UG/L	8/12/91	Fluoranthene
AB-53-NW-1W	91.05740	86737	< 10.	UG/L	8/12/91	Fluorene
AB-53-NW-1W	91.05740	118741	< 10.	UG/L	8/12/91	Hexachlorobenzene
AB-53-NW-1W	91.05740	87683	< 10.	UG/L	8/12/91	Hexachlorobutadiene
AB-53-NW-1W	91.05740	77474	< 10.	UG/L	8/12/91	Hexachlorocyclopentadiene
AB-53-NW-1W	91.05740	67721	< 10.	UG/L	8/12/91	Hexachloroethane
AB-53-NW-1W	91.05740	193395	< 10.	UG/L	8/12/91	Indeno[1,2,3-cd]pyrene
AB-53-NW-1W	91.05740	78591	< 10.	UG/L	8/12/91	Isophorone
AB-53-NW-1W	91.05740	534521	< 10.	UG/L	8/12/91	2-Methyl-4,6-dinitrophenol
AB-53-NW-1W	91.05740	91576	< 10.	UG/L	8/12/91	2-Methylnaphthalene
AB-53-NW-1W	91.05740	95487	< 10.	UG/L	8/12/91	2-Methylphenol
AB-53-NW-1W	91.05740	106445	< 10.	UG/L	8/12/91	4-Methylphenol
AB-53-NW-1W	91.05740	91203	< 10.	UG/L	8/12/91	Naphthalene
AB-53-NW-1W	91.05740	88744	< 10.	UG/L	8/12/91	2-Nitroaniline
AB-53-NW-1W	91.05740	99092	< 10.	UG/L	8/12/91	3-Nitroaniline
AB-53-NW-1W	91.05740	100016	< 10.	UG/L	8/12/91	4-Nitroaniline
AB-53-NW-1W	91.05740	98953	< 10.	UG/L	8/12/91	Nitrobenzene
AB-53-NW-1W	91.05740	88755	< 10.	UG/L	8/12/91	2-Nitrophenol
AB-53-NW-1W	91.05740	100027	< 10.	UG/L	8/12/91	4-Nitrophenol
AB-53-NW-1W	91.05740	621647	< 10.	UG/L	8/12/91	N-Nitrosodi-n-propylamine
AB-53-NW-1W	91.05740	62759	< 10.	UG/L	8/12/91	N-Nitrosodimethylamine
AB-53-NW-1W	91.05740	86306	< 10.	UG/L	8/12/91	N-Nitrosodiphenylamine
AB-53-NW-1W	91.05740	87865	< 10.	UG/L	8/12/91	Pentachlorophenol
AB-53-NW-1W	91.05740	85018	< 10.	UG/L	8/12/91	Phenanthrene
AB-53-NW-1W	91.05740	108952	< 10.	UG/L	8/12/91	Phenol
AB-53-NW-1W	91.05740	129000	< 10.	UG/L	8/12/91	Pyrene

AB-53-NW-1W	91.05740	120821	< 10.		UG/L	8/12/91	1,2,4-Trichlorobenzene
AB-53-NW-1W	91.05740	95954	< 10.		UG/L	8/12/91	2,4,5-Trichlorophenol
AB-53-NW-1W	91.05740	88062	< 10.		UG/L	8/12/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05740

none

Customer Sample Duplicate Results for Sample # 91.05740

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05740

none

Matrix Spike Results for Sample # 91.05740

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	AMOUNT SPIKED	AMOUNT RECOVERED	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-1W	91.05740	83329	56.82	41.	UG/L	8/12/91		Acenaphthene
AB-53-NW-1W	91.05740	59507	113.64	120.	UG/L	8/12/91		4-Chloro-3-methylphenol
AB-53-NW-1W	91.05740	95578	113.64	91.	UG/L	8/12/91		o-Chlorophenol
AB-53-NW-1W	91.05740	106467	56.82	46.	UG/L	8/12/91		p-Dichlorobenzene (1,4)
AB-53-NW-1W	91.05740	106467	0.0			8/12/91		p-Dichlorobenzene (1,4)
AB-53-NW-1W	91.05740	121142	56.82	69.	UG/L	8/12/91		2,4-Dinitrotoluene
AB-53-NW-1W	91.05740	100027	113.64	130.	UG/L	8/12/91		4-Nitrophenol
AB-53-NW-1W	91.05740	621647	56.82	46.	UG/L	8/12/91		N-Nitrosodi-n-propylamine
AB-53-NW-1W	91.05740	87865	113.64	110.	UG/L	8/12/91		Pentachlorophenol
AB-53-NW-1W	91.05740	108952	113.64	85.	UG/L	8/12/91		Phenol
AB-53-NW-1W	91.05740	129000	56.82	23.	UG/L	8/12/91		Pyrene
AB-53-NW-1W	91.05740	120821	56.82	45.	UG/L	8/12/91		1,2,4-Trichlorobenzene

Matrix Spike Duplicate Results for Sample # 91.05740

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	AMOUNT SPIKED	AMOUNT RECOVERED	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-1W	91.05740	83329	54.35	36.	UG/L	8/12/91		Acenaphthene
AB-53-NW-1W	91.05740	59507	108.7	98.	UG/L	8/12/91		4-Chloro-3-methylphenol
AB-53-NW-1W	91.05740	95578	108.7	88.	UG/L	8/12/91		o-Chlorophenol
AB-53-NW-1W	91.05740	106467	54.35	42.	UG/L	8/12/91		p-Dichlorobenzene (1,4)
AB-53-NW-1W	91.05740	121142	54.35	59.	UG/L	8/12/91		2,4-Dinitrotoluene
AB-53-[illegible]W	91.05740	100027	108.7	110.	UG/L	8/12/91		4-Nitrophenol

AB-53-NW-1W	91.05740	621647	54.35	40.	UG/L	8/12/91	N-Nitrosodi-n-propylamine
AB-53-NW-1W	91.05740	87865	108.7	120.	UG/L	8/12/91	Pentachlorophenol
AB-53-NW-1W	91.05740	108952	108.7	89.	UG/L	8/12/91	Phenol
AB-53-NW-1W	91.05740	129000	54.35	26.	UG/L	8/12/91	Pyrene
AB-53-NW-1W	91.05740	120821	54.35	45.	UG/L	8/12/91	1,2,4-Trichlorobenzene

REPORT NUMBER: 11225

********** EM-9 ANALYTICAL REPORT **********

Prepared by: LAT on 12-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05741

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/04/91 Date Analyzed: 7/10/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-2W	91.05741	83329	< 11.		UG/L	8/12/91		Acenaphthene
AB-53-NW-2W	91.05741	208968	< 11.		UG/L	8/12/91		Acenaphthylene
AB-53-NW-2W	91.05741	62533	< 11.		UG/L	8/12/91		Aniline
AB-53-NW-2W	91.05741	120127	< 11.		UG/L	8/12/91		Anthracene
AB-53-NW-2W	91.05741	103333	< 11.		UG/L	8/12/91		Azobenzene
AB-53-NW-2W	91.05741	92875	< 11.		UG/L	8/12/91		m-Benzidine
AB-53-NW-2W	91.05741	56553	< 11.		UG/L	8/12/91		Benzo[a]anthracene
AB-53-NW-2W	91.05741	50328	< 11.		UG/L	8/12/91		Benzo[a]pyrene
AB-53-NW-2W	91.05741	205992	< 11.		UG/L	8/12/91		Benzo[b]fluoranthene
AB-53-NW-2W	91.05741	191242	< 11.		UG/L	8/12/91		Benzo[g,h,i]perylene
AB-53-NW-2W	91.05741	207089	< 11.		UG/L	8/12/91		Benzo[k]fluoranthene
AB-53-NW-2W	91.05741	65850	< 11.		UG/L	8/12/91		Benzoic acid
AB-53-NW-2W	91.05741	100516	< 11.		UG/L	8/12/91		Benzyl alcohol
AB-53-NW-2W	91.05741	111911	< 11.		UG/L	8/12/91		Bis(2-chloroethoxy)methane
AB-53-NW-2W	91.05741	111444	< 11.		UG/L	8/12/91		Bis(2-chloroethyl)ether
AB-53-NW-2W	91.05741	108601	< 11.		UG/L	8/12/91		Bis(2-chloroisopropyl)ether
AB-53-NW-2W	91.05741	117817	< 11.		UG/L	8/12/91		Bis(2-ethylhexyl)phthalate
AB-53-NW-2W	91.05741	101553	< 11.		UG/L	8/12/91		4-Bromophenylphenyl ether
AB-53-NW-2W	91.05741	85687	< 11.		UG/L	8/12/91		Butylbenzyl phthalate
AB-53-NW-2W	91.05741	59507	< 11.		UG/L	8/12/91		4-Chloro-3-methylphenol
AB-53-NW-2W	91.05741	106478	< 11.		UG/L	8/12/91		4-Chloroaniline

AB-53-NW-2W	91.05741	91587	< 11.	UG/L	8/12/91	2-Chloronaphthalene
AB-53-NW-2W	91.05741	95578	< 11.	UG/L	8/12/91	o-Chlorophenol
AB-53-NW-2W	91.05741	7005723	< 11.	UG/L	8/12/91	4-Chlorophenylphenyl ether
AB-53-NW-2W	91.05741	218019	< 11.	UG/L	8/12/91	Chrysene
AB-53-NW-2W	91.05741	84742	< 11.	UG/L	8/12/91	Di-n-butyl phthalate
AB-53-NW-2W	91.05741	117840	< 11.	UG/L	8/12/91	Di-n-octyl phthalate
AB-53-NW-2W	91.05741	53703	< 11.	UG/L	8/12/91	Dibenzo[a,h]anthracene
AB-53-NW-2W	91.05741	132649	< 11.	UG/L	8/12/91	Dibenzofuran
AB-53-NW-2W	91.05741	95501	< 11.	UG/L	8/12/91	o-Dichlorobenzene (1,2)
AB-53-NW-2W	91.05741	541731	< 11.	UG/L	8/12/91	m-Dichlorobenzene (1,3)
AB-53-NW-2W	91.05741	106467	< 11.	UG/L	8/12/91	p-Dichlorobenzene (1,4)
AB-53-NW-2W	91.05741	91941	< 11.	UG/L	8/12/91	3,3'-Dichlorobenzidine
AB-53-NW-2W	91.05741	120832	< 11.	UG/L	8/12/91	2,4-Dichlorophenol
AB-53-NW-2W	91.05741	84662	< 11.	UG/L	8/12/91	Diethyl phthalate
AB-53-NW-2W	91.05741	131113	< 11.	UG/L	8/12/91	Dimethyl phthalate
AB-53-NW-2W	91.05741	105679	< 11.	UG/L	8/12/91	2,4-Dimethylphenol
AB-53-NW-2W	91.05741	51285	< 11.	UG/L	8/12/91	2,4-Dinitrophenol
AB-53-NW-2W	91.05741	121142	< 11.	UG/L	8/12/91	2,4-Dinitrotoluene
AB-53-NW-2W	91.05741	606202	< 11.	UG/L	8/12/91	2,6-Dinitrotoluene
AB-53-NW-2W	91.05741	206440	< 11.	UG/L	8/12/91	Fluoranthene
AB-53-NW-2W	91.05741	86737	< 11.	UG/L	8/12/91	Fluorene
AB-53-NW-2W	91.05741	118741	< 11.	UG/L	8/12/91	Hexachlorobenzene
AB-53-NW-2W	91.05741	87683	< 11.	UG/L	8/12/91	Hexachlorobutadiene
AB-53-NW-2W	91.05741	77474	< 11.	UG/L	8/12/91	Hexachlorocyclopentadiene
AB-53-NW-2W	91.05741	67721	< 11.	UG/L	8/12/91	Hexachloroethane
AB-53-NW-2W	91.05741	193395	< 11.	UG/L	8/12/91	Indeno[1,2,3-cd]pyrene
AB-53-NW-2W	91.05741	78591	< 11.	UG/L	8/12/91	Isophorone
AB-53-NW-2W	91.05741	534521	< 11.	UG/L	8/12/91	2-Methyl-4,6-dinitrophenol
AB-53-NW-2W	91.05741	91576	< 11.	UG/L	8/12/91	2-Methylnaphthalene
AB-53-NW-2W	91.05741	95487	< 11.	UG/L	8/12/91	2-Methylphenol
AB-53-NW-2W	91.05741	106445	< 11.	UG/L	8/12/91	4-Methylphenol
AB-53-NW-2W	91.05741	91203	< 11.	UG/L	8/12/91	Naphthalene
AB-53-NW-2W	91.05741	88744	< 11.	UG/L	8/12/91	2-Nitroaniline
AB-53-NW-2W	91.05741	99092	< 11.	UG/L	8/12/91	3-Nitroaniline
AB-53-NW-2W	91.05741	100016	< 11.	UG/L	8/12/91	4-Nitroaniline
AB-53-NW-2W	91.05741	98953	< 11.	UG/L	8/12/91	Nitrobenzene
AB-53-NW-2W	91.05741	88755	< 11.	UG/L	8/12/91	2-Nitrophenol
AB-53-NW-2W	91.05741	100027	< 11.	UG/L	8/12/91	4-Nitrophenol
AB-53-NW-2W	91.05741	621647	< 11.	UG/L	8/12/91	N-Nitrosodi-n-propylamine
AB-53-NW-2W	91.05741	62759	< 11.	UG/L	8/12/91	N-Nitrosodimethylamine
AB-53-NW-2W	91.05741	86306	< 11.	UG/L	8/12/91	N-Nitrosodiphenylamine
AB-53-NW-2W	91.05741	87865	< 11.	UG/L	8/12/91	Pentachlorophenol
AB-53-NW-2W	91.05741	85018	< 11.	UG/L	8/12/91	Phenanthrene
AB-53-NW-2W	91.05741	108952	< 11.	UG/L	8/12/91	Phenol
AB-53 2W	91.05741	129000	< 11.	UG/L	8/12/91	Pyrene

AB-53-NW-2W	91.05741	120821	< 11.	UG/L	8/12/91	1,2,4-Trichlorobenzene
AB-53-NW-2W	91.05741	95954	< 11.	UG/L	8/12/91	2,4,5-Trichlorophenol
AB-53-NW-2W	91.05741	88062	< 11.	UG/L	8/12/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05741

none

Customer Sample Duplicate Results for Sample # 91.05741

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05741

none

REPORT NUMBER: 11225

********** EM-9 ANALYTICAL REPORT **********

Prepared by: LAT on 12-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05742

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/04/91 Date Analyzed: 7/10/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NW-3W	91.05742	83329	< 12.		UG/L	8/12/91		Acenaphthene
AB-53-NW-3W	91.05742	208968	< 12.		UG/L	8/12/91		Acenaphthylene
AB-53-NW-3W	91.05742	62533	< 12.		UG/L	8/12/91		Aniline
AB-53-NW-3W	91.05742	120127	< 12.		UG/L	8/12/91		Anthracene
AB-53-NW-3W	91.05742	103333	< 12.		UG/L	8/12/91		Azobenzene
AB-53-NW-3W	91.05742	92875	< 12.		UG/L	8/12/91		m-Benzidine
AB-53-NW-3W	91.05742	56553	< 12.		UG/L	8/12/91		Benzo[a]anthracene
AB-53-NW-3W	91.05742	50328	< 12.		UG/L	8/12/91		Benzo[a]pyrene
AB-53-NW-3W	91.05742	205992	< 12.		UG/L	8/12/91		Benzo[b]fluoranthene
AB-53-NW-3W	91.05742	191242	< 12.		UG/L	8/12/91		Benzo[g,h,i]perylene
AB-53-NW-3W	91.05742	207089	< 12.		UG/L	8/12/91		Benzo[k]fluoranthene
AB-53-NW-3W	91.05742	65850	< 12.		UG/L	8/12/91		Benzoic acid
AB-53-NW-3W	91.05742	100516	< 12.		UG/L	8/12/91		Benzyl alcohol
AB-53-NW-3W	91.05742	111911	< 12.		UG/L	8/12/91		Bis(2-chloroethoxy)methane
AB-53-NW-3W	91.05742	111444	< 12.		UG/L	8/12/91		Bis(2-chloroethyl)ether
AB-53-NW-3W	91.05742	108601	< 12.		UG/L	8/12/91		Bis(2-chloroisopropyl)ether
AB-53-NW-3W	91.05742	117817	< 12.		UG/L	8/12/91		Bis(2-ethylhexyl)phthalate
AB-53-NW-3W	91.05742	101553	< 12.		UG/L	8/12/91		4-Bromophenylphenyl ether
AB-53-NW-3W	91.05742	85687	< 12.		UG/L	8/12/91		Butylbenzyl phthalate
AB-53-NW-3W	91.05742	59507	< 12.		UG/L	8/12/91		4-Chloro-3-methylphenol
AB-53 3W	91.05742	106478	< 12.		UG/L	8/12/91		4-Chloroaniline

AB-53-NW-3W	91.05742	91587	< 12.	UG/L	8/12/91	2-Chloronaphthalene
AB-53-NW-3W	91.05742	95578	< 12.	UG/L	8/12/91	o-Chlorophenol
AB-53-NW-3W	91.05742	7005723	< 12.	UG/L	8/12/91	4-Chlorophenylphenyl ether
AB-53-NW-3W	91.05742	218019	< 12.	UG/L	8/12/91	Chrysene
AB-53-NW-3W	91.05742	84742	< 12.	UG/L	8/12/91	Di-n-butyl phthalate
AB-53-NW-3W	91.05742	117840	< 12.	UG/L	8/12/91	Di-n-octyl phthalate
AB-53-NW-3W	91.05742	53703	< 12.	UG/L	8/12/91	Dibenzo[a,h]anthracene
AB-53-NW-3W	91.05742	132649	< 12.	UG/L	8/12/91	Dibenzofuran
AB-53-NW-3W	91.05742	95501	< 12.	UG/L	8/12/91	o-Dichlorobenzene (1,2)
AB-53-NW-3W	91.05742	541731	< 12.	UG/L	8/12/91	m-Dichlorobenzene (1,3)
AB-53-NW-3W	91.05742	106467	< 12.	UG/L	8/12/91	p-Dichlorobenzene (1,4)
AB-53-NW-3W	91.05742	91941	< 12.	UG/L	8/12/91	3,3'-Dichlorobenzidine
AB-53-NW-3W	91.05742	120832	< 12.	UG/L	8/12/91	2,4-Dichlorophenol
AB-53-NW-3W	91.05742	84662	< 12.	UG/L	8/12/91	Diethyl phthalate
AB-53-NW-3W	91.05742	131113	< 12.	UG/L	8/12/91	Dimethyl phthalate
AB-53-NW-3W	91.05742	105679	< 12.	UG/L	8/12/91	2,4-Dimethylphenol
AB-53-NW-3W	91.05742	51285	< 12.	UG/L	8/12/91	2,4-Dinitrophenol
AB-53-NW-3W	91.05742	121142	< 12.	UG/L	8/12/91	2,4-Dinitrotoluene
AB-53-NW-3W	91.05742	606202	< 12.	UG/L	8/12/91	2,6-Dinitrotoluene
AB-53-NW-3W	91.05742	206440	< 12.	UG/L	8/12/91	Fluoranthene
AB-53-NW-3W	91.05742	86737	< 12.	UG/L	8/12/91	Fluorene
AB-53-NW-3W	91.05742	118741	< 12.	UG/L	8/12/91	Hexachlorobenzene
AB-53-NW-3W	91.05742	87683	< 12.	UG/L	8/12/91	Hexachlorobutadiene
AB-53-NW-3W	91.05742	77474	< 12.	UG/L	8/12/91	Hexachlorocyclopentadiene
AB-53-NW-3W	91.05742	67721	< 12.	UG/L	8/12/91	Hexachloroethane
AB-53-NW-3W	91.05742	193395	< 12.	UG/L	8/12/91	Indeno[1,2,3-cd]pyrene
AB-53-NW-3W	91.05742	78591	< 12.	UG/L	8/12/91	Isophorone
AB-53-NW-3W	91.05742	534521	< 12.	UG/L	8/12/91	2-Methyl-4,6-dinitrophenol
AB-53-NW-3W	91.05742	91576	< 12.	UG/L	8/12/91	2-Methylnaphthalene
AB-53-NW-3W	91.05742	95487	< 12.	UG/L	8/12/91	2-Methylphenol
AB-53-NW-3W	91.05742	106445	< 12.	UG/L	8/12/91	4-Methylphenol
AB-53-NW-3W	91.05742	91203	< 12.	UG/L	8/12/91	Naphthalene
AB-53-NW-3W	91.05742	88744	< 12.	UG/L	8/12/91	2-Nitroaniline
AB-53-NW-3W	91.05742	99092	< 12.	UG/L	8/12/91	3-Nitroaniline
AB-53-NW-3W	91.05742	100016	< 12.	UG/L	8/12/91	4-Nitroaniline
AB-53-NW-3W	91.05742	98953	< 12.	UG/L	8/12/91	Nitrobenzene
AB-53-NW-3W	91.05742	88755	< 12.	UG/L	8/12/91	2-Nitrophenol
AB-53-NW-3W	91.05742	100027	< 12.	UG/L	8/12/91	4-Nitrophenol
AB-53-NW-3W	91.05742	621647	< 12.	UG/L	8/12/91	N-Nitrosodi-n-propylamine
AB-53-NW-3W	91.05742	62759	< 12.	UG/L	8/12/91	N-Nitrosodimethylamine
AB-53-NW-3W	91.05742	86306	< 12.	UG/L	8/12/91	N-Nitrosodiphenylamine
AB-53-NW-3W	91.05742	87865	< 12.	UG/L	8/12/91	Pentachlorophenol
AB-53-NW-3W	91.05742	85018	< 12.	UG/L	8/12/91	Phenanthrene
AB-53-NW-3W	91.05742	108952	< 12.	UG/L	8/12/91	Phenol
AB-53-NW-3W	91.05742	129000	< 12.	UG/L	8/12/91	Pyrene

AB-53-NW-3W	91.05742	120821	< 12.	UG/L	8/12/91	1,2,4-Trichlorobenzene
AB-53-NW-3W	91.05742	95954	< 12.	UG/L	8/12/91	2,4,5-Trichlorophenol
AB-53-NW-3W	91.05742	88062	< 12.	UG/L	8/12/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05742

none

Customer Sample Duplicate Results for Sample # 91.05742

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05742

none

REPORT NUMBER: 11225

********** EM-9 ANALYTICAL REPORT **********

Prepared by: LAT on 12-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05747

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/04/91 Date Analyzed: 7/10/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-1W	91.05747	83329	< 11.		UG/L	8/12/91		Acenaphthene
AB-53-NE-1W	91.05747	208968	< 11.		UG/L	8/12/91		Acenaphthylene
AB-53-NE-1W	91.05747	62533	< 11.		UG/L	8/12/91		Aniline
AB-53-NE-1W	91.05747	120127	< 11.		UG/L	8/12/91		Anthracene
AB-53-NE-1W	91.05747	103333	< 11.		UG/L	8/12/91		Azobenzene
AB-53-NE-1W	91.05747	92875	< 11.		UG/L	8/12/91		m-Benzidine
AB-53-NE-1W	91.05747	56553	< 11.		UG/L	8/12/91		Benzo[a]anthracene
AB-53-NE-1W	91.05747	50328	< 11.		UG/L	8/12/91		Benzo[a]pyrene
AB-53-NE-1W	91.05747	205992	< 11.		UG/L	8/12/91		Benzo[b]fluoranthene
AB-53-NE-1W	91.05747	191242	< 11.		UG/L	8/12/91		Benzo[g,h,i]perylene
AB-53-NE-1W	91.05747	207089	< 11.		UG/L	8/12/91		Benzo[k]fluoranthene
AB-53-NE-1W	91.05747	65850	< 11.		UG/L	8/12/91		Benzoic acid
AB-53-NE-1W	91.05747	100516	< 11.		UG/L	8/12/91		Benzyl alcohol
AB-53-NE-1W	91.05747	111911	< 11.		UG/L	8/12/91		Bis(2-chloroethoxy)methane
AB-53-NE-1W	91.05747	111444	< 11.		UG/L	8/12/91		Bis(2-chloroethyl)ether
AB-53-NE-1W	91.05747	108601	< 11.		UG/L	8/12/91		Bis(2-chloroisopropyl)ether
AB-53-NE-1W	91.05747	117817	< 11.		UG/L	8/12/91		Bis(2-ethylhexyl)phthalate
AB-53-NE-1W	91.05747	101553	< 11.		UG/L	8/12/91		4-Bromophenylphenyl ether
AB-53-NE-1W	91.05747	85687	< 11.		UG/L	8/12/91		Butylbenzyl phthalate
AB-53-NE-1W	91.05747	59507	< 11.		UG/L	8/12/91		4-Chloro-3-methylphenol
AB-53-NE-1W	91.05747	106478	< 11.		UG/L	8/12/91		4-Chloroaniline

AB-53-NE-1W	91.05747	91587	< 11.	UG/L	8/12/91	2-Chloronaphthalene
AB-53-NE-1W	91.05747	95578	< 11.	UG/L	8/12/91	o-Chlorophenol
AB-53-NE-1W	91.05747	7005723	< 11.	UG/L	8/12/91	4-Chlorophenylphenyl ether
AB-53-NE-1W	91.05747	218019	< 11.	UG/L	8/12/91	Chrysene
AB-53-NE-1W	91.05747	84742	< 11.	UG/L	8/12/91	Di-n-butyl phthalate
AB-53-NE-1W	91.05747	117840	< 11.	UG/L	8/12/91	Di-n-octyl phthalate
AB-53-NE-1W	91.05747	53703	< 11.	UG/L	8/12/91	Dibenzo[a,h]anthracene
AB-53-NE-1W	91.05747	132649	< 11.	UG/L	8/12/91	Dibenzofuran
AB-53-NE-1W	91.05747	95501	< 11.	UG/L	8/12/91	o-Dichlorobenzene (1,2)
AB-53-NE-1W	91.05747	541731	< 11.	UG/L	8/12/91	m-Dichlorobenzene (1,3)
AB-53-NE-1W	91.05747	106467	< 11.	UG/L	8/12/91	p-Dichlorobenzene (1,4)
AB-53-NE-1W	91.05747	91941	< 11.	UG/L	8/12/91	3,3'-Dichlorobenzidine
AB-53-NE-1W	91.05747	120832	< 11.	UG/L	8/12/91	2,4-Dichlorophenol
AB-53-NE-1W	91.05747	84662	< 11.	UG/L	8/12/91	Diethyl phthalate
AB-53-NE-1W	91.05747	131113	< 11.	UG/L	8/12/91	Dimethyl phthalate
AB-53-NE-1W	91.05747	105679	< 11.	UG/L	8/12/91	2,4-Dimethylphenol
AB-53-NE-1W	91.05747	51285	< 11.	UG/L	8/12/91	2,4-Dinitrophenol
AB-53-NE-1W	91.05747	121142	< 11.	UG/L	8/12/91	2,4-Dinitrotoluene
AB-53-NE-1W	91.05747	606202	< 11.	UG/L	8/12/91	2,6-Dinitrotoluene
AB-53-NE-1W	91.05747	206440	< 11.	UG/L	8/12/91	Fluoranthene
AB-53-NE-1W	91.05747	86737	< 11.	UG/L	8/12/91	Fluorene
AB-53-NE-1W	91.05747	118741	< 11.	UG/L	8/12/91	Hexachlorobenzene
AB-53-NE-1W	91.05747	87683	< 11.	UG/L	8/12/91	Hexachlorobutadiene
AB-53-NE-1W	91.05747	77474	< 11.	UG/L	8/12/91	Hexachlorocyclopentadiene
AB-53-NE-1W	91.05747	67721	< 11.	UG/L	8/12/91	Hexachloroethane
AB-53-NE-1W	91.05747	193395	< 11.	UG/L	8/12/91	Indeno[1,2,3-cd]pyrene
AB-53-NE-1W	91.05747	78591	< 11.	UG/L	8/12/91	Isophorone
AB-53-NE-1W	91.05747	534521	< 11.	UG/L	8/12/91	2-Methyl-4,6-dinitrophenol
AB-53-NE-1W	91.05747	91576	< 11.	UG/L	8/12/91	2-Methylnaphthalene
AB-53-NE-1W	91.05747	95487	< 11.	UG/L	8/12/91	2-Methylphenol
AB-53-NE-1W	91.05747	106445	< 11.	UG/L	8/12/91	4-Methylphenol
AB-53-NE-1W	91.05747	91203	< 11.	UG/L	8/12/91	Naphthalene
AB-53-NE-1W	91.05747	88744	< 11.	UG/L	8/12/91	2-Nitroaniline
AB-53-NE-1W	91.05747	99092	< 11.	UG/L	8/12/91	3-Nitroaniline
AB-53-NE-1W	91.05747	100016	< 11.	UG/L	8/12/91	4-Nitroaniline
AB-53-NE-1W	91.05747	98953	< 11.	UG/L	8/12/91	Nitrobenzene
AB-53-NE-1W	91.05747	88755	< 11.	UG/L	8/12/91	2-Nitrophenol
AB-53-NE-1W	91.05747	100027	< 11.	UG/L	8/12/91	4-Nitrophenol
AB-53-NE-1W	91.05747	621647	< 11.	UG/L	8/12/91	N-Nitrosodi-n-propylamine
AB-53-NE-1W	91.05747	62759	< 11.	UG/L	8/12/91	N-Nitrosodimethylamine
AB-53-NE-1W	91.05747	86306	< 11.	UG/L	8/12/91	N-Nitrosodiphenylamine
AB-53-NE-1W	91.05747	87865	< 11.	UG/L	8/12/91	Pentachlorophenol
AB-53-NE-1W	91.05747	85018	< 11.	UG/L	8/12/91	Phenanthrene
AB-53-NE-1W	91.05747	108952	< 11.	UG/L	8/12/91	Phenol
AB-53-[illegible]-1W	91.05747	129000	< 11.	UG/L	8/12/91	Pyrene

AB-53-NE-1W	91.05747	120821	< 11.	UG/L	8/12/91	1,2,4-Trichlorobenzene
AB-53-NE-1W	91.05747	95954	< 11.	UG/L	8/12/91	2,4,5-Trichlorophenol
AB-53-NE-1W	91.05747	88062	< 11.	UG/L	8/12/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05747

none

Customer Sample Duplicate Results for Sample # 91.05747

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05747

none

REPORT NUMBER: 11225

********** EM-9 ANALYTICAL REPORT **********

Prepared by: LAT on 12-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05748

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/04/91 Date Analyzed: 7/10/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-2W	91.05748	83329	< 10.		UG/L	8/12/91		Acenaphthene
AB-53-NE-2W	91.05748	208968	< 10.		UG/L	8/12/91		Acenaphthylene
AB-53-NE-2W	91.05748	62533	< 10.		UG/L	8/12/91		Aniline
AB-53-NE-2W	91.05748	120127	< 10.		UG/L	8/12/91		Anthracene
AB-53-NE-2W	91.05748	103333	< 10.		UG/L	8/12/91		Azobenzene
AB-53-NE-2W	91.05748	92875	< 10.		UG/L	8/12/91		m-Benzidine
AB-53-NE-2W	91.05748	56553	< 10.		UG/L	8/12/91		Benzo[a]anthracene
AB-53-NE-2W	91.05748	50328	< 10.		UG/L	8/12/91		Benzo[a]pyrene
AB-53-NE-2W	91.05748	205992	< 10.		UG/L	8/12/91		Benzo[b]fluoranthene
AB-53-NE-2W	91.05748	191242	< 10.		UG/L	8/12/91		Benzo[g,h,i]perylene
AB-53-NE-2W	91.05748	207089	< 10.		UG/L	8/12/91		Benzo[k]fluoranthene
AB-53-NE-2W	91.05748	65850	< 10.		UG/L	8/12/91		Benzoic acid
AB-53-NE-2W	91.05748	100516	< 10.		UG/L	8/12/91		Benzyl alcohol
AB-53-NE-2W	91.05748	111911	< 10.		UG/L	8/12/91		Bis(2-chloroethoxy)methane
AB-53-NE-2W	91.05748	111444	< 10.		UG/L	8/12/91		Bis(2-chloroethyl)ether
AB-53-NE-2W	91.05748	108601	< 10.		UG/L	8/12/91		Bis(2-chloroisopropyl)ether
AB-53-NE-2W	91.05748	117817	< 10.		UG/L	8/12/91		Bis(2-ethylhexyl)phthalate
AB-53-NE-2W	91.05748	101553	< 10.		UG/L	8/12/91		4-Bromophenylphenyl ether
AB-53-NE-2W	91.05748	85687	< 10.		UG/L	8/12/91		Butylbenzyl phthalate
AB-53-NE-2W	91.05748	59507	< 10.		UG/L	8/12/91		4-Chloro-3-methylphenol
AB-53-[illegible] 2W	91.05748	106478	< 10.		UG/L	8/12/91		4-Chloroaniline

AB-53-NE-2W	91.05748	91587	< 10.	UG/L	8/12/91	2-Chloronaphthalene
AB-53-NE-2W	91.05748	95578	< 10.	UG/L	8/12/91	o-Chlorophenol
AB-53-NE-2W	91.05748	7005723	< 10.	UG/L	8/12/91	4-Chlorophenylphenyl ether
AB-53-NE-2W	91.05748	218019	< 10.	UG/L	8/12/91	Chrysene
AB-53-NE-2W	91.05748	84742	< 10.	UG/L	8/12/91	Di-n-butyl phthalate
AB-53-NE-2W	91.05748	117840	< 10.	UG/L	8/12/91	Di-n-octyl phthalate
AB-53-NE-2W	91.05748	53703	< 10.	UG/L	8/12/91	Dibenzo[a,h]anthracene
AB-53-NE-2W	91.05748	132649	< 10.	UG/L	8/12/91	Dibenzofuran
AB-53-NE-2W	91.05748	95501	< 10.	UG/L	8/12/91	o-Dichlorobenzene (1,2)
AB-53-NE-2W	91.05748	541731	< 10.	UG/L	8/12/91	m-Dichlorobenzene (1,3)
AB-53-NE-2W	91.05748	106467	< 10.	UG/L	8/12/91	p-Dichlorobenzene (1,4)
AB-53-NE-2W	91.05748	91941	< 10.	UG/L	8/12/91	3,3'-Dichlorobenzidine
AB-53-NE-2W	91.05748	120832	< 10.	UG/L	8/12/91	2,4-Dichlorophenol
AB-53-NE-2W	91.05748	84662	< 10.	UG/L	8/12/91	Diethyl phthalate
AB-53-NE-2W	91.05748	131113	< 10.	UG/L	8/12/91	Dimethyl phthalate
AB-53-NE-2W	91.05748	105679	< 10.	UG/L	8/12/91	2,4-Dimethylphenol
AB-53-NE-2W	91.05748	51285	< 10.	UG/L	8/12/91	2,4-Dinitrophenol
AB-53-NE-2W	91.05748	121142	< 10.	UG/L	8/12/91	2,4-Dinitrotoluene
AB-53-NE-2W	91.05748	606202	< 10.	UG/L	8/12/91	2,6-Dinitrotoluene
AB-53-NE-2W	91.05748	206440	< 10.	UG/L	8/12/91	Fluoranthene
AB-53-NE-2W	91.05748	86737	< 10.	UG/L	8/12/91	Fluorene
AB-53-NE-2W	91.05748	118741	< 10.	UG/L	8/12/91	Hexachlorobenzene
AB-53-NE-2W	91.05748	87683	< 10.	UG/L	8/12/91	Hexachlorobutadiene
AB-53-NE-2W	91.05748	77474	< 10.	UG/L	8/12/91	Hexachlorocyclopentadiene
AB-53-NE-2W	91.05748	67721	< 10.	UG/L	8/12/91	Hexachloroethane
AB-53-NE-2W	91.05748	193395	< 10.	UG/L	8/12/91	Indeno[1,2,3-cd]pyrene
AB-53-NE-2W	91.05748	78591	< 10.	UG/L	8/12/91	Isophorone
AB-53-NE-2W	91.05748	534521	< 10.	UG/L	8/12/91	2-Methyl-4,6-dinitrophenol
AB-53-NE-2W	91.05748	91576	< 10.	UG/L	8/12/91	2-Methylnaphthalene
AB-53-NE-2W	91.05748	95487	< 10.	UG/L	8/12/91	2-Methylphenol
AB-53-NE-2W	91.05748	106445	< 10.	UG/L	8/12/91	4-Methylphenol
AB-53-NE-2W	91.05748	91203	< 10.	UG/L	8/12/91	Naphthalene
AB-53-NE-2W	91.05748	88744	< 10.	UG/L	8/12/91	2-Nitroaniline
AB-53-NE-2W	91.05748	99092	< 10.	UG/L	8/12/91	3-Nitroaniline
AB-53-NE-2W	91.05748	100016	< 10.	UG/L	8/12/91	4-Nitroaniline
AB-53-NE-2W	91.05748	98953	< 10.	UG/L	8/12/91	Nitrobenzene
AB-53-NE-2W	91.05748	88755	< 10.	UG/L	8/12/91	2-Nitrophenol
AB-53-NE-2W	91.05748	100027	< 10.	UG/L	8/12/91	4-Nitrophenol
AB-53-NE-2W	91.05748	621647	< 10.	UG/L	8/12/91	N-Nitrosodi-n-propylamine
AB-53-NE-2W	91.05748	62759	< 10.	UG/L	8/12/91	N-Nitrosodimethylamine
AB-53-NE-2W	91.05748	86306	< 10.	UG/L	8/12/91	N-Nitrosodiphenylamine
AB-53-NE-2W	91.05748	87865	< 10.	UG/L	8/12/91	Pentachlorophenol
AB-53-NE-2W	91.05748	85018	< 10.	UG/L	8/12/91	Phenanthrene
AB-53-NE-2W	91.05748	108952	< 10.	UG/L	8/12/91	Phenol
AB-53-NE-2W	91.05748	129000	< 10.	UG/L	8/12/91	Pyrene

AB-53-NE-2W	91.05748	120821	< 10.	UG/L	8/12/91	1,2,4-Trichlorobenzene
AB-53-NE-2W	91.05748	95954	< 10.	UG/L	8/12/91	2,4,5-Trichlorophenol
AB-53-NE-2W	91.05748	88062	< 10.	UG/L	8/12/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05748

none

Customer Sample Duplicate Results for Sample # 91.05748

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05748

none

REPORT NUMBER: 11225

********** EM-9 ANALYTICAL REPORT **********

Prepared by: LAT on 12-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05749

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/04/91 Date Analyzed: 7/10/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-3W	91.05749	83329	< 24.		UG/L	8/12/91		Acenaphthene
AB-53-NE-3W	91.05749	208968	< 24.		UG/L	8/12/91		Acenaphthylene
AB-53-NE-3W	91.05749	62533	< 24.		UG/L	8/12/91		Aniline
AB-53-NE-3W	91.05749	120127	< 24.		UG/L	8/12/91		Anthracene
AB-53-NE-3W	91.05749	103333	< 24.		UG/L	8/12/91		Azobenzene
AB-53-NE-3W	91.05749	92875	< 24.		UG/L	8/12/91		m-Benzidine
AB-53-NE-3W	91.05749	56553	< 24.		UG/L	8/12/91		Benzo[a]anthracene
AB-53-NE-3W	91.05749	50328	< 24.		UG/L	8/12/91		Benzo[a]pyrene
AB-53-NE-3W	91.05749	205992	< 24.		UG/L	8/12/91		Benzo[b]fluoranthene
AB-53-NE-3W	91.05749	191242	< 24.		UG/L	8/12/91		Benzo[g,h,i]perylene
AB-53-NE-3W	91.05749	207089	< 24.		UG/L	8/12/91		Benzo[k]fluoranthene
AB-53-NE-3W	91.05749	65850	< 24.		UG/L	8/12/91		Benzoic acid
AB-53-NE-3W	91.05749	100516	< 24.		UG/L	8/12/91		Benzyl alcohol
AB-53-NE-3W	91.05749	111911	< 24.		UG/L	8/12/91		Bis(2-chloroethoxy)methane
AB-53-NE-3W	91.05749	111444	< 24.		UG/L	8/12/91		Bis(2-chloroethyl)ether
AB-53-NE-3W	91.05749	108601	< 24.		UG/L	8/12/91		Bis(2-chloroisopropyl)ether
AB-53-NE-3W	91.05749	117817	< 24.		UG/L	8/12/91		Bis(2-ethylhexyl)phthalate
AB-53-NE-3W	91.05749	101553	< 24.		UG/L	8/12/91		4-Bromophenylphenyl ether
AB-53-NE-3W	91.05749	85687	< 24.		UG/L	8/12/91		Butylbenzyl phthalate
AB-53-NE-3W	91.05749	59507	< 24.		UG/L	8/12/91		4-Chloro-3-methylphenol
AB-53-[illegible] 3W	91.05749	106478	< 24.		UG/L	8/12/91		4-Chloroaniline

AB-53-NE-3W	91.05749	91587	< 24.	UG/L	8/12/91	2-Chloronaphthalene
AB-53-NE-3W	91.05749	95578	< 24.	UG/L	8/12/91	o-Chlorophenol
AB-53-NE-3W	91.05749	7005723	< 24.	UG/L	8/12/91	4-Chlorophenylphenyl ether
AB-53-NE-3W	91.05749	218019	< 24.	UG/L	8/12/91	Chrysene
AB-53-NE-3W	91.05749	84742	< 24.	UG/L	8/12/91	Di-n-butyl phthalate
AB-53-NE-3W	91.05749	117840	< 24.	UG/L	8/12/91	Di-n-octyl phthalate
AB-53-NE-3W	91.05749	53703	< 24.	UG/L	8/12/91	Dibenzo[a,h]anthracene
AB-53-NE-3W	91.05749	132649	< 24.	UG/L	8/12/91	Dibenzofuran
AB-53-NE-3W	91.05749	95501	< 24.	UG/L	8/12/91	o-Dichlorobenzene (1,2)
AB-53-NE-3W	91.05749	541731	< 24.	UG/L	8/12/91	m-Dichlorobenzene (1,3)
AB-53-NE-3W	91.05749	106467	< 24.	UG/L	8/12/91	p-Dichlorobenzene (1,4)
AB-53-NE-3W	91.05749	91941	< 24.	UG/L	8/12/91	3,3'-Dichlorobenzidine
AB-53-NE-3W	91.05749	120832	< 24.	UG/L	8/12/91	2,4-Dichlorophenol
AB-53-NE-3W	91.05749	84662	< 24.	UG/L	8/12/91	Diethyl phthalate
AB-53-NE-3W	91.05749	131113	< 24.	UG/L	8/12/91	Dimethyl phthalate
AB-53-NE-3W	91.05749	105679	< 24.	UG/L	8/12/91	2,4-Dimethylphenol
AB-53-NE-3W	91.05749	51285	< 24.	UG/L	8/12/91	2,4-Dinitrophenol
AB-53-NE-3W	91.05749	121142	< 24.	UG/L	8/12/91	2,4-Dinitrotoluene
AB-53-NE-3W	91.05749	606202	< 24.	UG/L	8/12/91	2,6-Dinitrotoluene
AB-53-NE-3W	91.05749	206440	< 24.	UG/L	8/12/91	Fluoranthene
AB-53-NE-3W	91.05749	86737	< 24.	UG/L	8/12/91	Fluorene
AB-53-NE-3W	91.05749	118741	< 24.	UG/L	8/12/91	Hexachlorobenzene
AB-53-NE-3W	91.05749	87683	< 24.	UG/L	8/12/91	Hexachlorobutadiene
AB-53-NE-3W	91.05749	77474	< 24.	UG/L	8/12/91	Hexachlorocyclopentadiene
AB-53-NE-3W	91.05749	67721	< 24.	UG/L	8/12/91	Hexachloroethane
AB-53-NE-3W	91.05749	193395	< 24.	UG/L	8/12/91	Indeno[1,2,3-cd]pyrene
AB-53-NE-3W	91.05749	78591	< 24.	UG/L	8/12/91	Isophorone
AB-53-NE-3W	91.05749	534521	< 24.	UG/L	8/12/91	2-Methyl-4,6-dinitrophenol
AB-53-NE-3W	91.05749	91576	< 24.	UG/L	8/12/91	2-Methylnaphthalene
AB-53-NE-3W	91.05749	95487	< 24.	UG/L	8/12/91	2-Methylphenol
AB-53-NE-3W	91.05749	106445	< 24.	UG/L	8/12/91	4-Methylphenol
AB-53-NE-3W	91.05749	91203	< 24.	UG/L	8/12/91	Naphthalene
AB-53-NE-3W	91.05749	88744	< 24.	UG/L	8/12/91	2-Nitroaniline
AB-53-NE-3W	91.05749	99092	< 24.	UG/L	8/12/91	3-Nitroaniline
AB-53-NE-3W	91.05749	100016	< 24.	UG/L	8/12/91	4-Nitroaniline
AB-53-NE-3W	91.05749	98953	< 24.	UG/L	8/12/91	Nitrobenzene
AB-53-NE-3W	91.05749	88755	< 24.	UG/L	8/12/91	2-Nitrophenol
AB-53-NE-3W	91.05749	100027	< 24.	UG/L	8/12/91	4-Nitrophenol
AB-53-NE-3W	91.05749	621647	< 24.	UG/L	8/12/91	N-Nitrosodi-n-propylamine
AB-53-NE-3W	91.05749	62759	< 24.	UG/L	8/12/91	N-Nitrosodimethylamine
AB-53-NE-3W	91.05749	86306	< 24.	UG/L	8/12/91	N-Nitrosodiphenylamine
AB-53-NE-3W	91.05749	87865	< 24.	UG/L	8/12/91	Pentachlorophenol
AB-53-NE-3W	91.05749	85018	< 24.	UG/L	8/12/91	Phenanthrene
AB-53-NE-3W	91.05749	108952	< 24.	UG/L	8/12/91	Phenol
AB-53- 3W	91.05749	129000	< 24.	UG/L	8/12/91	Pyrene

AB-53-NE-3W	91.05749	120821	< 24.	UG/L	8/12/91	1,2,4-Trichlorobenzene
AB-53-NE-3W	91.05749	95954	< 24.	UG/L	8/12/91	2,4,5-Trichlorophenol
AB-53-NE-3W	91.05749	88062	< 24.	UG/L	8/12/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05749

none

Customer Sample Duplicate Results for Sample # 91.05749

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05749

none

REPORT NUMBER: 11225

********** EM-9 ANALYTICAL REPORT **********

Prepared by: LAT on 12-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05750

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/04/91 Date Analyzed: 7/10/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-NE-4WQ	91.05750	83329	< 10.		UG/L	8/12/91		Acenaphthene
AB-53-NE-4WQ	91.05750	208968	< 10.		UG/L	8/12/91		Acenaphthylene
AB-53-NE-4WQ	91.05750	62533	< 10.		UG/L	8/12/91		Aniline
AB-53-NE-4WQ	91.05750	120127	< 10.		UG/L	8/12/91		Anthracene
AB-53-NE-4WQ	91.05750	103333	< 10.		UG/L	8/12/91		Azobenzene
AB-53-NE-4WQ	91.05750	92875	< 10.		UG/L	8/12/91		m-Benzidine
AB-53-NE-4WQ	91.05750	56553	< 10.		UG/L	8/12/91		Benzo[a]anthracene
AB-53-NE-4WQ	91.05750	50328	< 10.		UG/L	8/12/91		Benzo[a]pyrene
AB-53-NE-4WQ	91.05750	205992	< 10.		UG/L	8/12/91		Benzo[b]fluoranthene
AB-53-NE-4WQ	91.05750	191242	< 10.		UG/L	8/12/91		Benzo[g,h,i]perylene
AB-53-NE-4WQ	91.05750	207089	< 10.		UG/L	8/12/91		Benzo[k]fluoranthene
AB-53-NE-4WQ	91.05750	65850	< 10.		UG/L	8/12/91		Benzoic acid
AB-53-NE-4WQ	91.05750	100516	< 10.		UG/L	8/12/91		Benzyl alcohol
AB-53-NE-4WQ	91.05750	111911	< 10.		UG/L	8/12/91		Bis(2-chloroethoxy)methane
AB-53-NE-4WQ	91.05750	111444	< 10.		UG/L	8/12/91		Bis(2-chloroethyl)ether
AB-53-NE-4WQ	91.05750	108601	< 10.		UG/L	8/12/91		Bis(2-chloroisopropyl)ether
AB-53-NE-4WQ	91.05750	117817	< 10.		UG/L	8/12/91		Bis(2-ethylhexyl)phthalate
AB-53-NE-4WQ	91.05750	101553	< 10.		UG/L	8/12/91		4-Bromophenylphenyl ether
AB-53-NE-4WQ	91.05750	85687	< 10.		UG/L	8/12/91		Butylbenzyl phthalate
AB-53-NE-4WQ	91.05750	59507	< 10.		UG/L	8/12/91		4-Chloro-3-methylphenol
AB-53- 4WQ	91.05750	106478	< 10.		UG/L	8/12/91		4-Chloroaniline

AB-53-NE-4WQ	91.05750	91587	< 10.	UG/L	8/12/91	2-Chloronaphthalene
AB-53-NE-4WQ	91.05750	95578	< 10.	UG/L	8/12/91	o-Chlorophenol
AB-53-NE-4WQ	91.05750	7005723	< 10.	UG/L	8/12/91	4-Chlorophenylphenyl ether
AB-53-NE-4WQ	91.05750	218019	< 10.	UG/L	8/12/91	Chrysene
AB-53-NE-4WQ	91.05750	84742	< 10.	UG/L	8/12/91	Di-n-butyl phthalate
AB-53-NE-4WQ	91.05750	117840	< 10.	UG/L	8/12/91	Di-n-octyl phthalate
AB-53-NE-4WQ	91.05750	53703	< 10.	UG/L	8/12/91	Dibenzo[a,h]anthracene
AB-53-NE-4WQ	91.05750	132649	< 10.	UG/L	8/12/91	Dibenzofuran
AB-53-NE-4WQ	91.05750	95501	< 10.	UG/L	8/12/91	o-Dichlorobenzene (1,2)
AB-53-NE-4WQ	91.05750	541731	< 10.	UG/L	8/12/91	m-Dichlorobenzene (1,3)
AB-53-NE-4WQ	91.05750	106467	< 10.	UG/L	8/12/91	p-Dichlorobenzene (1,4)
AB-53-NE-4WQ	91.05750	91941	< 10.	UG/L	8/12/91	3,3'-Dichlorobenzidine
AB-53-NE-4WQ	91.05750	120832	< 10.	UG/L	8/12/91	2,4-Dichlorophenol
AB-53-NE-4WQ	91.05750	84662	< 10.	UG/L	8/12/91	Diethyl phthalate
AB-53-NE-4WQ	91.05750	131113	< 10.	UG/L	8/12/91	Dimethyl phthalate
AB-53-NE-4WQ	91.05750	105679	< 10.	UG/L	8/12/91	2,4-Dimethylphenol
AB-53-NE-4WQ	91.05750	51285	< 10.	UG/L	8/12/91	2,4-Dinitrophenol
AB-53-NE-4WQ	91.05750	121142	< 10.	UG/L	8/12/91	2,4-Dinitrotoluene
AB-53-NE-4WQ	91.05750	606202	< 10.	UG/L	8/12/91	2,6-Dinitrotoluene
AB-53-NE-4WQ	91.05750	206440	< 10.	UG/L	8/12/91	Fluoranthene
AB-53-NE-4WQ	91.05750	86737	< 10.	UG/L	8/12/91	Fluorene
AB-53-NE-4WQ	91.05750	118741	< 10.	UG/L	8/12/91	Hexachlorobenzene
AB-53-NE-4WQ	91.05750	87683	< 10.	UG/L	8/12/91	Hexachlorobutadiene
AB-53-NE-4WQ	91.05750	77474	< 10.	UG/L	8/12/91	Hexachlorocyclopentadiene
AB-53-NE-4WQ	91.05750	67721	< 10.	UG/L	8/12/91	Hexachloroethane
AB-53-NE-4WQ	91.05750	193395	< 10.	UG/L	8/12/91	Indeno[1,2,3-cd]pyrene
AB-53-NE-4WQ	91.05750	78591	< 10.	UG/L	8/12/91	Isophorone
AB-53-NE-4WQ	91.05750	534521	< 10.	UG/L	8/12/91	2-Methyl-4,6-dinitrophenol
AB-53-NE-4WQ	91.05750	91576	< 10.	UG/L	8/12/91	2-Methylnaphthalene
AB-53-NE-4WQ	91.05750	95487	< 10.	UG/L	8/12/91	2-Methylphenol
AB-53-NE-4WQ	91.05750	106445	< 10.	UG/L	8/12/91	4-Methylphenol
AB-53-NE-4WQ	91.05750	91203	< 10.	UG/L	8/12/91	Naphthalene
AB-53-NE-4WQ	91.05750	88744	< 10.	UG/L	8/12/91	2-Nitroaniline
AB-53-NE-4WQ	91.05750	99092	< 10.	UG/L	8/12/91	3-Nitroaniline
AB-53-NE-4WQ	91.05750	100016	< 10.	UG/L	8/12/91	4-Nitroaniline
AB-53-NE-4WQ	91.05750	98953	< 10.	UG/L	8/12/91	Nitrobenzene
AB-53-NE-4WQ	91.05750	88755	< 10.	UG/L	8/12/91	2-Nitrophenol
AB-53-NE-4WQ	91.05750	100027	< 10.	UG/L	8/12/91	4-Nitrophenol
AB-53-NE-4WQ	91.05750	621647	< 10.	UG/L	8/12/91	N-Nitrosodi-n-propylamine
AB-53-NE-4WQ	91.05750	62759	< 10.	UG/L	8/12/91	N-Nitrosodimethylamine
AB-53-NE-4WQ	91.05750	86306	< 10.	UG/L	8/12/91	N-Nitrosodiphenylamine
AB-53-NE-4WQ	91.05750	87865	< 10.	UG/L	8/12/91	Pentachlorophenol
AB-53-NE-4WQ	91.05750	85018	< 10.	UG/L	8/12/91	Phenanthrene
AB-53-NE-4WQ	91.05750	108952	< 10.	UG/L	8/12/91	Phenol
AB-53-[illegible]4WQ	91.05750	129000	< 10.	UG/L	8/12/91	Pyrene

AB-53-NE-4WQ 91.05750	120821	< 10.	UG/L	8/12/91	1,2,4-Trichlorobenzene
AB-53-NE-4WQ 91.05750	95954	< 10.	UG/L	8/12/91	2,4,5-Trichlorophenol
AB-53-NE-4WQ 91.05750	88062	< 10.	UG/L	8/12/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05750

none

Customer Sample Duplicate Results for Sample # 91.05750

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05750

none

REPORT NUMBER: 11225

********** EM-9 ANALYTICAL REPORT **********

Prepared by: LAT on 12-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05754

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/04/91 Date Analyzed: 7/10/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-SO-1W	91.05754	83329	< 10.		UG/L	8/12/91		Acenaphthene
AB-53-SO-1W	91.05754	208968	< 10.		UG/L	8/12/91		Acenaphthylene
AB-53-SO-1W	91.05754	62533	< 10.		UG/L	8/12/91		Aniline
AB-53-SO-1W	91.05754	120127	< 10.		UG/L	8/12/91		Anthracene
AB-53-SO-1W	91.05754	103333	< 10.		UG/L	8/12/91		Azobenzene
AB-53-SO-1W	91.05754	92875	< 10.		UG/L	8/12/91		m-Benzidine
AB-53-SO-1W	91.05754	56553	< 10.		UG/L	8/12/91		Benzo[a]anthracene
AB-53-SO-1W	91.05754	50328	< 10.		UG/L	8/12/91		Benzo[a]pyrene
AB-53-SO-1W	91.05754	205992	< 10.		UG/L	8/12/91		Benzo[b]fluoranthene
AB-53-SO-1W	91.05754	191242	< 10.		UG/L	8/12/91		Benzo[g,h,i]perylene
AB-53-SO-1W	91.05754	207089	< 10.		UG/L	8/12/91		Benzo[k]fluoranthene
AB-53-SO-1W	91.05754	65850	< 10.		UG/L	8/12/91		Benzoic acid
AB-53-SO-1W	91.05754	100516	< 10.		UG/L	8/12/91		Benzyl alcohol
AB-53-SO-1W	91.05754	111911	< 10.		UG/L	8/12/91		Bis(2-chloroethoxy)methane
AB-53-SO-1W	91.05754	111444	< 10.		UG/L	8/12/91		Bis(2-chloroethyl)ether
AB-53-SO-1W	91.05754	108601	< 10.		UG/L	8/12/91		Bis(2-chloroisopropyl)ether
AB-53-SO-1W	91.05754	117817	< 10.		UG/L	8/12/91		Bis(2-ethylhexyl)phthalate
AB-53-SO-1W	91.05754	101553	< 10.		UG/L	8/12/91		4-Bromophenylphenyl ether
AB-53-SO-1W	91.05754	85687	< 10.		UG/L	8/12/91		Butylbenzyl phthalate
AB-53-SO-1W	91.05754	59507	< 10.		UG/L	8/12/91		4-Chloro-3-methylphenol
AB-53-SO-1W	91.05754	106478	< 10.		UG/L	8/12/91		4-Chloroaniline

AB-53-SO-1W	91.05754	91587	< 10.	UG/L	8/12/91	2-Chloronaphthalene
AB-53-SO-1W	91.05754	95578	< 10.	UG/L	8/12/91	o-Chlorophenol
AB-53-SO-1W	91.05754	7005723	< 10.	UG/L	8/12/91	4-Chlorophenylphenyl ether
AB-53-SO-1W	91.05754	218019	< 10.	UG/L	8/12/91	Chrysene
AB-53-SO-1W	91.05754	84742	< 10.	UG/L	8/12/91	Di-n-butyl phthalate
AB-53-SO-1W	91.05754	117840	< 10.	UG/L	8/12/91	Di-n-octyl phthalate
AB-53-SO-1W	91.05754	53703	< 10.	UG/L	8/12/91	Dibenzo[a,h]anthracene
AB-53-SO-1W	91.05754	132649	< 10.	UG/L	8/12/91	Dibenzofuran
AB-53-SO-1W	91.05754	95501	< 10.	UG/L	8/12/91	o-Dichlorobenzene (1,2)
AB-53-SO-1W	91.05754	541731	< 10.	UG/L	8/12/91	m-Dichlorobenzene (1,3)
AB-53-SO-1W	91.05754	106467	< 10.	UG/L	8/12/91	p-Dichlorobenzene (1,4)
AB-53-SO-1W	91.05754	91941	< 10.	UG/L	8/12/91	3,3'-Dichlorobenzidine
AB-53-SO-1W	91.05754	120832	< 10.	UG/L	8/12/91	2,4-Dichlorophenol
AB-53-SO-1W	91.05754	84662	< 10.	UG/L	8/12/91	Diethyl phthalate
AB-53-SO-1W	91.05754	131113	< 10.	UG/L	8/12/91	Dimethyl phthalate
AB-53-SO-1W	91.05754	105679	< 10.	UG/L	8/12/91	2,4-Dimethylphenol
AB-53-SO-1W	91.05754	51285	< 10.	UG/L	8/12/91	2,4-Dinitrophenol
AB-53-SO-1W	91.05754	121142	< 10.	UG/L	8/12/91	2,4-Dinitrotoluene
AB-53-SO-1W	91.05754	606202	< 10.	UG/L	8/12/91	2,6-Dinitrotoluene
AB-53-SO-1W	91.05754	206440	< 10.	UG/L	8/12/91	Fluoranthene
AB-53-SO-1W	91.05754	86737	< 10.	UG/L	8/12/91	Fluorene
AB-53-SO-1W	91.05754	118741	< 10.	UG/L	8/12/91	Hexachlorobenzene
AB-53-SO-1W	91.05754	87683	< 10.	UG/L	8/12/91	Hexachlorobutadiene
AB-53-SO-1W	91.05754	77474	< 10.	UG/L	8/12/91	Hexachlorocyclopentadiene
AB-53-SO-1W	91.05754	67721	< 10.	UG/L	8/12/91	Hexachloroethane
AB-53-SO-1W	91.05754	193395	< 10.	UG/L	8/12/91	Indeno[1,2,3-cd]pyrene
AB-53-SO-1W	91.05754	78591	< 10.	UG/L	8/12/91	Isophorone
AB-53-SO-1W	91.05754	534521	< 10.	UG/L	8/12/91	2-Methyl-4,6-dinitrophenol
AB-53-SO-1W	91.05754	91576	< 10.	UG/L	8/12/91	2-Methylnaphthalene
AB-53-SO-1W	91.05754	95487	< 10.	UG/L	8/12/91	2-Methylphenol
AB-53-SO-1W	91.05754	106445	< 10.	UG/L	8/12/91	4-Methylphenol
AB-53-SO-1W	91.05754	91203	< 10.	UG/L	8/12/91	Naphthalene
AB-53-SO-1W	91.05754	88744	< 10.	UG/L	8/12/91	2-Nitroaniline
AB-53-SO-1W	91.05754	99092	< 10.	UG/L	8/12/91	3-Nitroaniline
AB-53-SO-1W	91.05754	100016	< 10.	UG/L	8/12/91	4-Nitroaniline
AB-53-SO-1W	91.05754	98953	< 10.	UG/L	8/12/91	Nitrobenzene
AB-53-SO-1W	91.05754	88755	< 10.	UG/L	8/12/91	2-Nitrophenol
AB-53-SO-1W	91.05754	100027	< 10.	UG/L	8/12/91	4-Nitrophenol
AB-53-SO-1W	91.05754	621647	< 10.	UG/L	8/12/91	N-Nitrosodi-n-propylamine
AB-53-SO-1W	91.05754	62759	< 10.	UG/L	8/12/91	N-Nitrosodimethylamine
AB-53-SO-1W	91.05754	86306	< 10.	UG/L	8/12/91	N-Nitrosodiphenylamine
AB-53-SO-1W	91.05754	87865	< 10.	UG/L	8/12/91	Pentachlorophenol
AB-53-SO-1W	91.05754	85018	< 10.	UG/L	8/12/91	Phenanthrene
AB-53-SO-1W	91.05754	108952	< 10.	UG/L	8/12/91	Phenol
AB-53-SO-1W	91.05754	129000	< 10.	UG/L	8/12/91	Pyrene

AB-53-SO-1W	91.05754	120821	< 10.	UG/L	8/12/91	1,2,4-Trichlorobenzene
AB-53-SO-1W	91.05754	95954	< 10.	UG/L	8/12/91	2,4,5-Trichlorophenol
AB-53-SO-1W	91.05754	88062	< 10.	UG/L	8/12/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05754

none

Customer Sample Duplicate Results for Sample # 91.05754

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05754

none

REPORT NUMBER: 11225

********** EM-9 ANALYTICAL REPORT **********

Prepared by: LAT on 12-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05755

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/04/91 Date Analyzed: 7/10/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-SO-2W	91.05755	83329	< 10.		UG/L	8/12/91		Acenaphthene
AB-53-SO-2W	91.05755	208968	< 10.		UG/L	8/12/91		Acenaphthylene
AB-53-SO-2W	91.05755	62533	< 10.		UG/L	8/12/91		Aniline
AB-53-SO-2W	91.05755	120127	< 10.		UG/L	8/12/91		Anthracene
AB-53-SO-2W	91.05755	103333	< 10.		UG/L	8/12/91		Azobenzene
AB-53-SO-2W	91.05755	92875	< 10.		UG/L	8/12/91		m-Benzidine
AB-53-SO-2W	91.05755	56553	< 10.		UG/L	8/12/91		Benzo[a]anthracene
AB-53-SO-2W	91.05755	50328	< 10.		UG/L	8/12/91		Benzo[a]pyrene
AB-53-SO-2W	91.05755	205992	< 10.		UG/L	8/12/91		Benzo[b]fluoranthene
AB-53-SO-2W	91.05755	191242	< 10.		UG/L	8/12/91		Benzo[g,h,i]perylene
AB-53-SO-2W	91.05755	207089	< 10.		UG/L	8/12/91		Benzo[k]fluoranthene
AB-53-SO-2W	91.05755	65850	< 10.		UG/L	8/12/91		Benzoic acid
AB-53-SO-2W	91.05755	100516	< 10.		UG/L	8/12/91		Benzyl alcohol
AB-53-SO-2W	91.05755	111911	< 10.		UG/L	8/12/91		Bis(2-chloroethoxy)methane
AB-53-SO-2W	91.05755	111444	< 10.		UG/L	8/12/91		Bis(2-chloroethyl)ether
AB-53-SO-2W	91.05755	108601	< 10.		UG/L	8/12/91		Bis(2-chloroisopropyl)ether
AB-53-SO-2W	91.05755	117817	< 10.		UG/L	8/12/91		Bis(2-ethylhexyl)phthalate
AB-53-SO-2W	91.05755	101553	< 10.		UG/L	8/12/91		4-Bromophenylphenyl ether
AB-53-SO-2W	91.05755	85687	< 10.		UG/L	8/12/91		Butylbenzyl phthalate
AB-53-SO-2W	91.05755	59507	< 10.		UG/L	8/12/91		4-Chloro-3-methylphenol
AB-53-SO-2W	91.05755	106478	< 10.		UG/L	8/12/91		4-Chloroaniline

AB-53-SO-2W	91.05755	91587	< 10.	UG/L	8/12/91	2-Chloronaphthalene
AB-53-SO-2W	91.05755	95578	< 10.	UG/L	8/12/91	o-Chlorophenol
AB-53-SO-2W	91.05755	7005723	< 10.	UG/L	8/12/91	4-Chlorophenylphenyl ether
AB-53-SO-2W	91.05755	218019	< 10.	UG/L	8/12/91	Chrysene
AB-53-SO-2W	91.05755	84742	< 10.	UG/L	8/12/91	Di-n-butyl phthalate
AB-53-SO-2W	91.05755	117840	< 10.	UG/L	8/12/91	Di-n-octyl phthalate
AB-53-SO-2W	91.05755	53703	< 10.	UG/L	8/12/91	Dibenzo[a,h]anthracene
AB-53-SO-2W	91.05755	132649	< 10.	UG/L	8/12/91	Dibenzofuran
AB-53-SO-2W	91.05755	95501	< 10.	UG/L	8/12/91	o-Dichlorobenzene (1,2)
AB-53-SO-2W	91.05755	541731	< 10.	UG/L	8/12/91	m-Dichlorobenzene (1,3)
AB-53-SO-2W	91.05755	106467	< 10.	UG/L	8/12/91	p-Dichlorobenzene (1,4)
AB-53-SO-2W	91.05755	91941	< 10.	UG/L	8/12/91	3,3'-Dichlorobenzidine
AB-53-SO-2W	91.05755	120832	< 10.	UG/L	8/12/91	2,4-Dichlorophenol
AB-53-SO-2W	91.05755	84662	< 10.	UG/L	8/12/91	Diethyl phthalate
AB-53-SO-2W	91.05755	131113	< 10.	UG/L	8/12/91	Dimethyl phthalate
AB-53-SO-2W	91.05755	105679	< 10.	UG/L	8/12/91	2,4-Dimethylphenol
AB-53-SO-2W	91.05755	51285	< 10.	UG/L	8/12/91	2,4-Dinitrophenol
AB-53-SO-2W	91.05755	121142	< 10.	UG/L	8/12/91	2,4-Dinitrotoluene
AB-53-SO-2W	91.05755	606202	< 10.	UG/L	8/12/91	2,6-Dinitrotoluene
AB-53-SO-2W	91.05755	206440	< 10.	UG/L	8/12/91	Fluoranthene
AB-53-SO-2W	91.05755	86737	< 10.	UG/L	8/12/91	Fluorene
AB-53-SO-2W	91.05755	118741	< 10.	UG/L	8/12/91	Hexachlorobenzene
AB-53-SO-2W	91.05755	87683	< 10.	UG/L	8/12/91	Hexachlorobutadiene
AB-53-SO-2W	91.05755	77474	< 10.	UG/L	8/12/91	Hexachlorocyclopentadiene
AB-53-SO-2W	91.05755	67721	< 10.	UG/L	8/12/91	Hexachloroethane
AB-53-SO-2W	91.05755	193395	< 10.	UG/L	8/12/91	Indeno[1,2,3-cd]pyrene
AB-53-SO-2W	91.05755	78591	< 10.	UG/L	8/12/91	Isophorone
AB-53-SO-2W	91.05755	534521	< 10.	UG/L	8/12/91	2-Methyl-4,6-dinitrophenol
AB-53-SO-2W	91.05755	91576	< 10.	UG/L	8/12/91	2-Methylnaphthalene
AB-53-SO-2W	91.05755	95487	< 10.	UG/L	8/12/91	2-Methylphenol
AB-53-SO-2W	91.05755	106445	< 10.	UG/L	8/12/91	4-Methylphenol
AB-53-SO-2W	91.05755	91203	< 10.	UG/L	8/12/91	Naphthalene
AB-53-SO-2W	91.05755	88744	< 10.	UG/L	8/12/91	2-Nitroaniline
AB-53-SO-2W	91.05755	99092	< 10.	UG/L	8/12/91	3-Nitroaniline
AB-53-SO-2W	91.05755	100016	< 10.	UG/L	8/12/91	4-Nitroaniline
AB-53-SO-2W	91.05755	98953	< 10.	UG/L	8/12/91	Nitrobenzene
AB-53-SO-2W	91.05755	88755	< 10.	UG/L	8/12/91	2-Nitrophenol
AB-53-SO-2W	91.05755	100027	< 10.	UG/L	8/12/91	4-Nitrophenol
AB-53-SO-2W	91.05755	621647	< 10.	UG/L	8/12/91	N-Nitrosodi-n-propylamine
AB-53-SO-2W	91.05755	62759	< 10.	UG/L	8/12/91	N-Nitrosodimethylamine
AB-53-SO-2W	91.05755	86306	< 10.	UG/L	8/12/91	N-Nitrosodiphenylamine
AB-53-SO-2W	91.05755	87865	< 10.	UG/L	8/12/91	Pentachlorophenol
AB-53-SO-2W	91.05755	85018	< 10.	UG/L	8/12/91	Phenanthrene
AB-53-SO-2W	91.05755	108952	< 10.	UG/L	8/12/91	Phenol
AB-53-SO-2W	91.05755	129000	< 10.	UG/L	8/12/91	Pyrene

AB-53-SO-2W	91.05755	120821	< 10.	UG/L	8/12/91	1,2,4-Trichlorobenzene
AB-53-SO-2W	91.05755	95954	< 10.	UG/L	8/12/91	2,4,5-Trichlorophenol
AB-53-SO-2W	91.05755	88062	< 10.	UG/L	8/12/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05755

none

Customer Sample Duplicate Results for Sample # 91.05755

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05755

none

REPORT NUMBER: 11225

********** EM-9 ANALYTICAL REPORT **********

Prepared by: LAT on 12-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

Customer Sample Results, Sample # 91.05756

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/04/91 Date Analyzed: 7/10/91

CUSTOMER NUMBER	SAMPLE NUMBER	ANALYSIS	RESULT	UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT	COMPOUND NAME
AB-53-SO-3W	91.05756	83329	< 10.		UG/L	8/12/91		Acenaphthene
AB-53-SO-3W	91.05756	208968	< 10.		UG/L	8/12/91		Acenaphthylene
AB-53-SO-3W	91.05756	62533	< 10.		UG/L	8/12/91		Aniline
AB-53-SO-3W	91.05756	120127	< 10.		UG/L	8/12/91		Anthracene
AB-53-SO-3W	91.05756	103333	< 10.		UG/L	8/12/91		Azobenzene
AB-53-SO-3W	91.05756	92875	< 10.		UG/L	8/12/91		m-Benzidine
AB-53-SO-3W	91.05756	56553	< 10.		UG/L	8/12/91		Benzo[a]anthracene
AB-53-SO-3W	91.05756	50328	< 10.		UG/L	8/12/91		Benzo[a]pyrene
AB-53-SO-3W	91.05756	205992	< 10.		UG/L	8/12/91		Benzo[b]fluoranthene
AB-53-SO-3W	91.05756	191242	< 10.		UG/L	8/12/91		Benzo[g,h,i]perylene
AB-53-SO-3W	91.05756	207089	< 10.		UG/L	8/12/91		Benzo[k]fluoranthene
AB-53-SO-3W	91.05756	65850	< 10.		UG/L	8/12/91		Benzoic acid
AB-53-SO-3W	91.05756	100516	< 10.		UG/L	8/12/91		Benzyl alcohol
AB-53-SO-3W	91.05756	111911	< 10.		UG/L	8/12/91		Bis(2-chloroethoxy)methane
AB-53-SO-3W	91.05756	111444	< 10.		UG/L	8/12/91		Bis(2-chloroethyl)ether
AB-53-SO-3W	91.05756	108601	< 10.		UG/L	8/12/91		Bis(2-chloroisopropyl)ether
AB-53-SO-3W	91.05756	117817	< 10.		UG/L	8/12/91		Bis(2-ethylhexyl)phthalate
AB-53-SO-3W	91.05756	101553	< 10.		UG/L	8/12/91		4-Bromophenylphenyl ether
AB-53-SO-3W	91.05756	85687	< 10.		UG/L	8/12/91		Butylbenzyl phthalate
AB-53-SO-3W	91.05756	59507	< 10.		UG/L	8/12/91		4-Chloro-3-methylphenol
AB-53-SO-3W	91.05756	106478	< 10.		UG/L	8/12/91		4-Chloroaniline

AB-53-SO-3W	91.05756	91587	< 10.	UG/L	8/12/91	2-Chloronaphthalene
AB-53-SO-3W	91.05756	95578	< 10.	UG/L	8/12/91	o-Chlorophenol
AB-53-SO-3W	91.05756	7005723	< 10.	UG/L	8/12/91	4-Chlorophenylphenyl ether
AB-53-SO-3W	91.05756	218019	< 10.	UG/L	8/12/91	Chrysene
AB-53-SO-3W	91.05756	84742	< 10.	UG/L	8/12/91	Di-n-butyl phthalate
AB-53-SO-3W	91.05756	117840	< 10.	UG/L	8/12/91	Di-n-octyl phthalate
AB-53-SO-3W	91.05756	53703	< 10.	UG/L	8/12/91	Dibenzo[a,h]anthracene
AB-53-SO-3W	91.05756	132649	< 10.	UG/L	8/12/91	Dibenzofuran
AB-53-SO-3W	91.05756	95501	< 10.	UG/L	8/12/91	o-Dichlorobenzene (1,2)
AB-53-SO-3W	91.05756	541731	< 10.	UG/L	8/12/91	m-Dichlorobenzene (1,3)
AB-53-SO-3W	91.05756	106467	< 10.	UG/L	8/12/91	p-Dichlorobenzene (1,4)
AB-53-SO-3W	91.05756	91941	< 10.	UG/L	8/12/91	3,3'-Dichlorobenzidine
AB-53-SO-3W	91.05756	120832	< 10.	UG/L	8/12/91	2,4-Dichlorophenol
AB-53-SO-3W	91.05756	84662	< 10.	UG/L	8/12/91	Diethyl phthalate
AB-53-SO-3W	91.05756	131113	< 10.	UG/L	8/12/91	Dimethyl phthalate
AB-53-SO-3W	91.05756	105679	< 10.	UG/L	8/12/91	2,4-Dimethylphenol
AB-53-SO-3W	91.05756	51285	< 10.	UG/L	8/12/91	2,4-Dinitrophenol
AB-53-SO-3W	91.05756	121142	< 10.	UG/L	8/12/91	2,4-Dinitrotoluene
AB-53-SO-3W	91.05756	606202	< 10.	UG/L	8/12/91	2,6-Dinitrotoluene
AB-53-SO-3W	91.05756	206440	< 10.	UG/L	8/12/91	Fluoranthene
AB-53-SO-3W	91.05756	86737	< 10.	UG/L	8/12/91	Fluorene
AB-53-SO-3W	91.05756	118741	< 10.	UG/L	8/12/91	Hexachlorobenzene
AB-53-SO-3W	91.05756	87683	< 10.	UG/L	8/12/91	Hexachlorobutadiene
AB-53-SO-3W	91.05756	77474	< 10.	UG/L	8/12/91	Hexachlorocyclopentadiene
AB-53-SO-3W	91.05756	67721	< 10.	UG/L	8/12/91	Hexachloroethane
AB-53-SO-3W	91.05756	193395	< 10.	UG/L	8/12/91	Indeno[1,2,3-cd]pyrene
AB-53-SO-3W	91.05756	78591	< 10.	UG/L	8/12/91	Isophorone
AB-53-SO-3W	91.05756	534521	< 10.	UG/L	8/12/91	2-Methyl-4,6-dinitrophenol
AB-53-SO-3W	91.05756	91576	< 10.	UG/L	8/12/91	2-Methylnaphthalene
AB-53-SO-3W	91.05756	95487	< 10.	UG/L	8/12/91	2-Methylphenol
AB-53-SO-3W	91.05756	106445	< 10.	UG/L	8/12/91	4-Methylphenol
AB-53-SO-3W	91.05756	91203	< 10.	UG/L	8/12/91	Naphthalene
AB-53-SO-3W	91.05756	88744	< 10.	UG/L	8/12/91	2-Nitroaniline
AB-53-SO-3W	91.05756	99092	< 10.	UG/L	8/12/91	3-Nitroaniline
AB-53-SO-3W	91.05756	100016	< 10.	UG/L	8/12/91	4-Nitroaniline
AB-53-SO-3W	91.05756	98953	< 10.	UG/L	8/12/91	Nitrobenzene
AB-53-SO-3W	91.05756	88755	< 10.	UG/L	8/12/91	2-Nitrophenol
AB-53-SO-3W	91.05756	100027	< 10.	UG/L	8/12/91	4-Nitrophenol
AB-53-SO-3W	91.05756	621647	< 10.	UG/L	8/12/91	N-Nitrosodi-n-propylamine
AB-53-SO-3W	91.05756	62759	< 10.	UG/L	8/12/91	N-Nitrosodimethylamine
AB-53-SO-3W	91.05756	86306	< 10.	UG/L	8/12/91	N-Nitrosodiphenylamine
AB-53-SO-3W	91.05756	87865	< 10.	UG/L	8/12/91	Pentachlorophenol
AB-53-SO-3W	91.05756	85018	< 10.	UG/L	8/12/91	Phenanthrene
AB-53-SO-3W	91.05756	108952	< 10.	UG/L	8/12/91	Phenol
AB-53-[illegible]W	91.05756	129000	< 10.	UG/L	8/12/91	Pyrene

AB-53-SO-3W	91.05756	120821	< 10.	UG/L	8/12/91	1,2,4-Trichlorobenzene
AB-53-SO-3W	91.05756	95954	< 10.	UG/L	8/12/91	2,4,5-Trichlorophenol
AB-53-SO-3W	91.05756	88062	< 10.	UG/L	8/12/91	2,4,6-Trichlorophenol

Tentatively Identified Compounds in Customer Sample # 91.05756

none

Customer Sample Duplicate Results for Sample # 91.05756

none

Tentatively Identified Compounds in Customer Sample Duplicates for Sample # 91.05756

none

****

********** EM-9 QUALITY ASSURANCE REPORT **********

Prepared by: LAT on 12-Aug-1991

EPA SEMIVOLATILES

REQUEST NUMBER: 11673 MATRIX: WW ANALYST: Matthew Monagle PROGRAM CODE: WH54

OWNER: Alice Barr GROUP: HSE-8 MAIL-STOP: K490 PHONE: 7-0820

SUMMARY OF CONTROL STATUS OF OPEN (NON-BLIND) QA SAMPLES RUN WITH THIS BATCH

There were no open (non-blind) Quality Control materials run with the samples reported above for one of the following reasons:

____ Only qualitative data requested

____ Only Blind QC samples run with this batch.

____ No QC samples run with this sample batch.

____ No QC samples for this constituent and matrix type available within EM-9

SUMMARY OF CONTROL STATUS OF BLANK QC SAMPLES RUN WITH THIS BATCH

Blank Results

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	QC VALUE	QC UNCERTAINTY	COMPLETION DATE	COMMENT	COMPOUN
00.20226	91.05769	83329	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Acenaphthene
00.20226	91.05769	208968	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Acenaphthylene
00.20226	91.05769	62533	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Aniline
00.20226	91.05769	120127	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Anthracene
00.20226	91.05769	103333	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Azobenzene
00.20226	91.05769	92875	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	m-Benzidine
00.20226	91.05769	56553	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzo[a]anthracene
00.20226	91.05769	50328	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzo[a]pyrene
00.20226	91.05769	205992	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzo[b]fluoranthene
00.20226	91.05769	191242	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzo[g,h,i]perylene
00.20226	91.05769	207089	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzo[k]fluoranthene
00.20226	91.05769	65850	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzoic acid
00.20226	91.05769	100516	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzyl alcohol
00.20226	91.05769	111911	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Bis(2-chloroethoxy)methane
00.20226	91.05769	111444	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Bis(2-chloroethyl)ether
00.20226	91.05769	108601	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Bis(2-chloroisopropyl)ether
00.20226	91.05769	117817	22.	6.6	UG/L	0.0		8/12/91	OUT OF CONTROL	Bis(2-ethylhexyl)phthalate
00.20226	91.05769	101553	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	4-Bromophenylphenyl ether
00.20226	91.05769	85687	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Butylbenzyl phthalate
00.20226	91.05769	59507	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	4-Chloro-3-methylphenol
00.20226	91.05769	106478	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	4-Chloroaniline
00.20226	91.05769	91587	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2-Chloronaphthalene
00.20226	91.05769	95578	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	o-Chlorophenol
00.20226	91.05769	7005723	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	4-Chlorophenylphenyl ether
00.20226	91.05769	218019	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Chrysene
00.20226	91.05769	84742	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Di-n-butyl phthalate
00.20226	91.05769	117840	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Di-n-octyl phthalate
00.20226	91.05769	53703	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Dibenzo[a,h]anthracene
00.20226	91.05769	132649	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Dibenzofuran
00.20226	91.05769	95501	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	o-Dichlorobenzene (1,2)
00.20226	91.05769	541731	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	m-Dichlorobenzene (1,3)
00.20226	91.05769	106467	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	p-Dichlorobenzene (1,4)
00.202[illegible]	91.05769	91941	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	3,3'-Dichl[illegible]nzidine

00.20226	91.05769	120832	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	2,4-Dichlorophenol
00.20226	91.05769	84662	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Diethyl phthalate
00.20226	91.05769	131113	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Dimethyl phthalate
00.20226	91.05769	105679	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	2,4-Dimethylphenol
00.20226	91.05769	51285	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	2,4-Dinitrophenol
00.20226	91.05769	121142	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	2,4-Dinitrotoluene
00.20226	91.05769	606202	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	2,6-Dinitrotoluene
00.20226	91.05769	206440	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Fluoranthene
00.20226	91.05769	86737	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Fluorene
00.20226	91.05769	118741	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Hexachlorobenzene
00.20226	91.05769	87683	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Hexachlorobutadiene
00.20226	91.05769	77474	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Hexachlorocyclopentadiene
00.20226	91.05769	67721	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Hexachloroethane
00.20226	91.05769	193395	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Indeno[1,2,3-cd]pyrene
00.20226	91.05769	78591	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Isophorone
00.20226	91.05769	534521	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	2-Methyl-4,6-dinitrophenol
00.20226	91.05769	91576	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	2-Methylnaphthalene
00.20226	91.05769	95487	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	2-Methylphenol
00.20226	91.05769	106445	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	4-Methylphenol
00.20226	91.05769	91203	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Naphthalene
00.20226	91.05769	88744	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	2-Nitroaniline
00.20226	91.05769	99092	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	3-Nitroaniline
00.20226	91.05769	100016	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	4-Nitroaniline
00.20226	91.05769	98953	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Nitrobenzene
00.20226	91.05769	88755	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	2-Nitrophenol
00.20226	91.05769	100027	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	4-Nitrophenol
00.20226	91.05769	621647	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	N-Nitrosodi-n-propylamine
00.20226	91.05769	62759	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	N-Nitrosodimethylamine
00.20226	91.05769	86306	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	N-Nitrosodiphenylamine
00.20226	91.05769	87865	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Pentachlorophenol
00.20226	91.05769	85018	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Phenanthrene
00.20226	91.05769	108952	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Phenol
00.20226	91.05769	129000	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	Pyrene
00.20226	91.05769	120821	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	1,2,4-Trichlorobenzene
00.20226	91.05769	95954	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	2,4,5-Trichlorophenol
00.20226	91.05769	88062	< 10.	UG/L	0.0	8/12/91	UNDER CONTROL	2,4,6-Trichlorophenol

Blank Spike Results

none

Blank Spike Duplicate Results

none

SUMMARY OF CONTROL STATUS OF BLIND QA SAMPLES RUN WITH THIS BATCH

Blind QC Results, Sample # 91.05768

Date Collected: 7/01/91 Date Received: 7/02/91 Date Extracted: 7/04/91 Date Analyzed: 7/20/91

SAMPLE NUM	ANALYSIS	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	QC VALUE	QC UNCERTAINTY	COMPLETION DATE	COMMENT	COMPOUND-NAME
91.05768	83329	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Acenaphthene
91.05768	208968	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Acenaphthylene
91.05768	62533	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Aniline
91.05768	120127	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Anthracene
91.05768	103333	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Azobenzene
91.05768	92875	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	m-Benzidine
91.05768	56553	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzo[a]anthracene
91.05768	50328	84.	25.2	UG/L	140.4	14.	8/12/91	UNDER CONTROL	Benzo[a]pyrene
91.05768	205992	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzo[b]fluoranthene
91.05768	191242	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzo[g,h,i]perylene
91.05768	207089	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzo[k]fluoranthene
91.05768	65850	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzoic acid
91.05768	100516	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Benzyl alcohol
91.05768	111911	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Bis(2-chloroethoxy)methane
91.05768	111444	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Bis(2-chloroethyl)ether
91.05768	108601	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Bis(2-chloroisopropyl)ether
91.05768	117817	< 10.		UG/L	117.6	12.	8/12/91	OUT OF CONTROL	Bis(2-ethylhexyl)phthalate
91.05768	101553	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	4-Bromophenylphenyl ether
91.05768	85687	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Butylbenzyl phthalate
91.05768	59507	140.	42.	UG/L	127.2	13.	8/12/91	UNDER CONTROL	4-Chloro-3-methylphenol
91.05768	106478	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	4-Chloroaniline
91.05768	91587	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2-Chloronaphthalene
91.05768	95578	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	o-Chlorophenol
91.05768	7005723	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	4-Chlorophenylphenyl ether
91.05768	218019	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Chrysene
91.05768	84742	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Di-n-butyl phthalate
91.05768	117840	110.	33.	UG/L	0.0		8/12/91	OUT OF CONTROL	Di-n-octyl phthalate
91.05768	53703	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Dibenzo[a,h]anthracene
91.05768	132649	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Dibenzofuran
91.05768	95501	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	o-Dichlorobenzene (1,2)
91.05768	541731	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	m-Dichlorobenzene (1,3)
91.05768	106467	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	p-Dichlorobenzene (1,4)
91.057	91941	< 10.		UG/L	0		8/12/91	UNDER CONTROL	3,3'-Dichloroben[illegible]e

91.05768	120832	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2,4-Dichlorophenol
91.05768	84662	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Diethyl phthalate
91.05768	131113	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Dimethyl phthalate
91.05768	105679	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2,4-Dimethylphenol
91.05768	51285	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2,4-Dinitrophenol
91.05768	121142	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2,4-Dinitrotoluene
91.05768	606202	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2,6-Dinitrotoluene
91.05768	206440	130.	39.	UG/L	134.4	13.	8/12/91	UNDER CONTROL	Fluoranthene
91.05768	86737	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Fluorene
91.05768	118741	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Hexachlorobenzene
91.05768	87683	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Hexachlorobutadiene
91.05768	77474	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Hexachlorocyclopentadiene
91.05768	67721	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Hexachloroethane
91.05768	193395	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Indeno[1,2,3-cd]pyrene
91.05768	78591	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Isophorone
91.05768	534521	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2-Methyl-4,6-dinitrophenol
91.05768	91576	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2-Methylnaphthalene
91.05768	95487	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2-Methylphenol
91.05768	106445	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	4-Methylphenol
91.05768	91203	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Naphthalene
91.05768	88744	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2-Nitroaniline
91.05768	99092	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	3-Nitroaniline
91.05768	100016	140.	42.	UG/L	152.4	15.	8/12/91	UNDER CONTROL	4-Nitroaniline
91.05768	98953	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Nitrobenzene
91.05768	88755	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2-Nitrophenol
91.05768	100027	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	4-Nitrophenol
91.05768	621647	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	N-Nitrosodi-n-propylamine
91.05768	62759	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	N-Nitrosodimethylamine
91.05768	86306	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	N-Nitrosodiphenylamine
91.05768	87865	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Pentachlorophenol
91.05768	85018	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Phenanthrene
91.05768	108952	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Phenol
91.05768	129000	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	Pyrene
91.05768	120821	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	1,2,4-Trichlorobenzene
91.05768	95954	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2,4,5-Trichlorophenol
91.05768	88062	< 10.		UG/L	0.0		8/12/91	UNDER CONTROL	2,4,6-Trichlorophenol

SURROGATE RESULTS FOR EPA SEMIVOLATILES

Surrogate 1 = 2-Fluorophenol (CAS # = 367124)
Surrogate 2 = Phenol-d5 (CAS # = 4165622)
Surrogate 3 = Nitrobenzene-d5 (CAS # = 4165600)
Surrogate 4 = 2-Fluorobiphenyl (CAS # = 321608)
Surrogate 5 = 2,4,6-Tribromophenol (CAS # = 118796)
Surrogate 6 = p-Terphenyl-d14 (CAS # =)

SAMPLE NUMBER	UNITS	Surrogate 1	Surrogate 2	Surrogate 3	Surrogate 4	Surrogate 5	Surrogate 6	COMPLETION DATE
91.05740	%	65.03	79.07	88.4	79.58	111.25	21.5	12-Aug-1991
91.05740	%	65.4	82.7	89.	75.12	117.54	23.58	12-Aug-1991
91.05740	%	39.74	45.83	54.58	40.12	52.65	8.26	12-Aug-1991
91.05741	%	33.09	33.07	47.98	48.24	34.22	8.26	12-Aug-1991
91.05742	%	33.53	39.3	47.38	47.68	45.11	6.98	12-Aug-1991
91.05747	%	25.53	36.3	39.72	36.12	44.82	11.56	12-Aug-1991
91.05748	%	25.9	33.34	38.56	38.14	46.78	36.66	12-Aug-1991
91.05749	%	32.24	39.91	45.72	52.44	41.73	19.2	12-Aug-1991
91.05750	%	39.38	48.82	44.12	49.54	58.03	11.76	12-Aug-1991
91.05754	%	41.08	49.85	52.5	47.9	62.45	11.06	12-Aug-1991
91.05755	%	24.54	31.16	29.18	28.36	37.39	11.26	12-Aug-1991
91.05756	%	30.61	36.53	39.62	47.52	47.94	8.2	12-Aug-1991
91.05768	%	99.38	77.16	124.88	110.18	122.3	126.46	12-Aug-1991
91.05769	%	48.87	48.63	58.88	58.16	58.14	51.86	12-Aug-1991
EPA Limits:								
Water	%	21 - 100	10 - 94	35 - 114	43 - 116	10 - 123	33 - 141	
Soil	%	25 - 121	24 - 113	23 - 120	30 - 115	19 - 122	18 - 137	

REPORT NUMBER: 11225

M. Monrad
Analyst

J. Bingham
Reviewer

Section Leader

QA Officer

8.12.91
Date

8/12/91
Date

8/15/91
Date

Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in 'Quality Assurance for Health and Environmental Chemistry: 1986,' LA-11114-MS, pp. 3-4.

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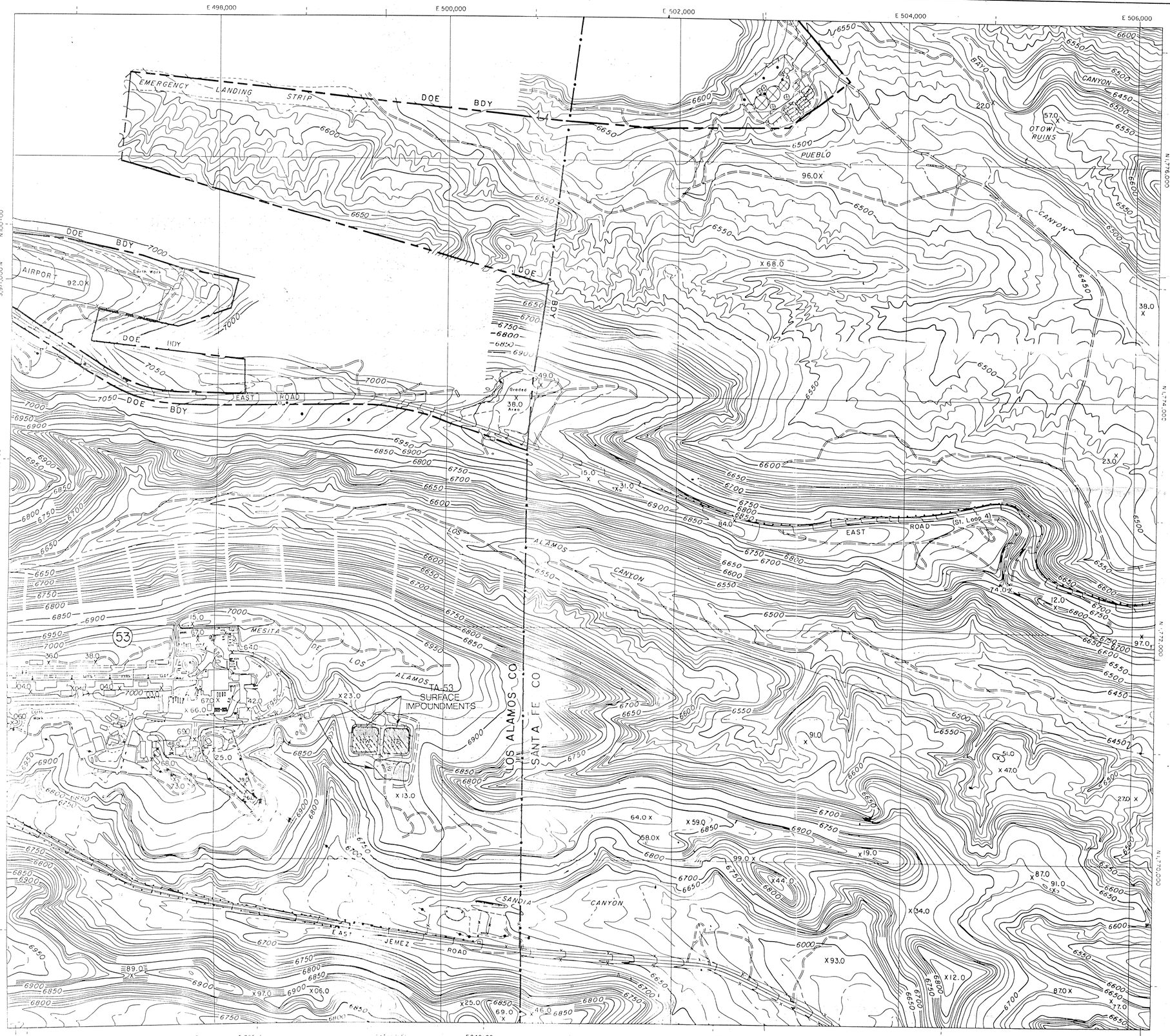


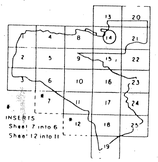
LEGEND

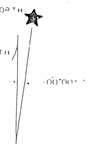
- X 93.0 — SPOT ELEVATION
- 6900 — INDEX CONTOUR
- INTERMEDIATE CONTOUR 10ft.
- SUPPLEMENTARY CONTOUR 5ft.
- CONTOURS THROUGH HEAVY VEGETATION
- COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.
- DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.
- DOE BOUNDARY – SURVEY DESCRIPTIONS OR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

GRAPHIC SCALE: 1 in.=400 ft.

CONTOUR INTERVAL 5 ft

TECHNICAL AREAS

(53) MPF–SITE

4296

LOS ALAMOS SCIENTIFIC LABORATORY

FIGURE 2-3
CONTOUR MAP SHOWING
THE LOCATIONS OF
THE SURFACE IMPOUNDMENTS
AT TA-53

LAB JOB NO. 5682
1" = 400' SCALE
PLAN / TOPO