

A Report Prepared for:

Sparton Technology, Inc.
4901 Rockaway Boulevard, SE
Rio Rancho, New Mexico

RCRA FACILITY INVESTIGATION
Sparton Technology, Inc.
Coors Road Facility
Albuquerque, New Mexico

Prepared by Harding Lawson Associates
9800 Richmond Avenue, Suite 150
Houston, Texas 77042

December 14, 1990

Revised by HDR Engineering, Inc.
12700 Hillcrest Avenue, Suite 125
Dallas, Texas 75230-2096

in conjunction with
Metric Corporation
8429 Washington Place NE, Suite A
Albuquerque, New Mexico 87113

May 1, 1992



Gary L. Richardson, P.E.
Executive Vice President
Metric Corporation



Pierce L. Chandler, Jr., P.E.
Senior Project Manager
HDR Engineering, Inc.

TABLE OF CONTENTS

	LIST OF FIGURES	v
	LIST OF ATTACHMENTS	viii
I	INTRODUCTION	1
II	BACKGROUND	2
III	SOURCE CHARACTERIZATION	9
	A. Description of Ponds and Sump	9
	B. Waste Description	10
	C. Fate and Transport of Volatile Organic Compounds	14
	1. Physical Processes - Saturated Zone	14
	2. Chemical Processes - Saturated Zone	15
	3. Unsaturated Zone Processes	17
	D. Fate and Transport of Metals	18
IV	ENVIRONMENTAL SETTING	19
	A. Regional	19
	1. Physiography	19
	2. Geology/Hydrogeology	21
	a. Stratigraphy	21
	b. Structural	23
	c. Depositional History	25
	d. Water Levels/Seasonal Changes	26
	e. Groundwater Flow Direction	27
	f. Regional Groundwater Volumes and Velocities	31
	g. Groundwater Recharge	32
	B. Site-Specific	33
	1. Site Topography	33
	2. Geology/Hydrogeology	33
	a. General	33
	b. Soil Characterization	36
	c. Site Stratigraphy	39
	d. Project Hydrogeology	43
	e. Summary of Recent Groundwater Levels and Flow Direction	73
	C. Surface Waters	74

TABLE OF CONTENTS (Continued)

D.	Climate	78
V	CONTAMINATION CHARACTERIZATION	
A.	Soil Contamination	82
1.	Vadose Zone Investigation	82
a.	Volatile Organic Constituents	82
b.	Total Metals	83
2.	Surface Soil Gas Investigations	84
B.	Surface Water and Sediment Contamination	98
C.	Air Contamination	98
D.	Groundwater Contamination	99
1.	Definition of Plume	99
2.	Horizontal Extent of Contamination	104
a.	Upper Flow Zone	105
	(1) TCE Plume Configuration	105
	(2) TCA Plume Configuration	107
b.	Upper Lower Flow Zone	107
	(1) TCE Plume Configuration	107
	(2) TCA Plume Configuration	110
c.	Lower Lower Flow Zone	110
	(1) TCE Plume Configuration	110
	(2) TCA Plume Configuration	113
d.	Third Flow Zone	113
3.	Vertical Extent of Contamination	113
a.	Data Presentation	113
b.	TCE Vertical Profile Trends	118
c.	TCA Vertical Profile Trends	125
4.	Plume Movement	125
5.	Presence of Appendix IX Constituents	126
6.	Fate and Transport of Volatile Organic Constituents	127
a.	Constituent Physical and Chemical Characteristics	127
b.	Active Source Period	129
	(1) Unsaturated zone	129
	(2) Saturated zone	131
c.	Inactive Source Period	132
	(1) Unsaturated zone	132
	(2) Saturated zone	133
d.	Future Movement	134
7.	Fate and Transport of Metallic Constituents	144
8.	Effectiveness of Interim Recovery Well System	145

TABLE OF CONTENTS (Continued)

VI	POTENTIAL RECEPTORS	146
A.	Groundwater	146
B.	Surface Waters	149
C.	Human Use or Access	150
D.	Surface Water Biota	152
E.	Ecology	152
F.	Demographic Profile	153
G.	Endangered or Threatened Species	154
VII	GROUNDWATER PROTECTION STANDARDS	155
A.	Maximum Concentration Limits (MCLs)	155
B.	Maximum Contaminant Levels (MCLs)	155
C.	New Mexico Groundwater Standards	155
D.	Other Standards	155
E.	Background Concentrations	161

BIBLIOGRAPHY

DISTRIBUTION

TABLE OF CONTENTS (Continued)

LIST OF ATTACHMENTS

- | | |
|------------------|---|
| Volume I | 1. Alternate Groundwater Monitoring Database |
| | 2. Contaminant Properties |
| | 3. Plume Delineation Database |
| Volume II | 4. Boring Logs and Well Completion Diagrams |
| | 5. Groundwater Flow |
| | 6. Unsaturated Zone Boring Logs and Analytical Data |
| | 7. Off-Site Investigation |
| | 8. Description of Vicinity Wells |
| | 9. June 1991 Sampling and Analysis |
| | 10. Pumping Test Analysis |
| | 11. November 1991 Sampling and Analysis of MW-32 |

V CONTAMINATION CHARACTERIZATION

A. Soil Contamination

1. Vadose Zone Investigation

An investigation of the vadose zone beneath the pond and sump area was conducted in September 1985. The results of this investigation were published in a report titled "Soil Investigation of the Unsaturated and Upper Saturated Zones, Sparton Technology, Inc., Coors Road Plant, Albuquerque, New Mexico" (HLA, 1986). A copy of the boring logs and analytical results from that report are included as Attachment 6.

The results of PID field screening during drilling, surface soil gas screening, and analytical testing of soil samples indicate that contaminants migrated downward from the ponds and sump. The vertical migration was influenced by the relative location of fine grained silt and/or clay lenses and the presence of more porous coarse-grained sand and gravel layers. Interpretation of the results indicates both sorption and lateral spreading occurred due to the silt/clay. However, based on available results, the bulk of the contaminant release has completed its migration to the water table, leaving behind only scattered residual levels in the vadose zone in the pond and sump area.

a. Volatile Organic Constituents

Soil gas screening indicated a general increase in soil gas VOC concentrations with depth with the highest concentrations observed under the sump/pond

area. Isolated occurrences of higher soil gas concentrations were also observed at depths corresponding to fine-grained clay/silt lenses. These localized soil gas concentrations are believed to be related to residual VOC sorbed onto the finer-grained soil materials.

To identify residual concentration in the soil, total organic halogen (TOX) determinations were conducted on 126 soil samples using a modified Test Method 9020 procedure. The detection limit for this modified 9020 procedure was 2 milligrams per kilogram (mg/kg). Positive TOX detections were obtained in 21 of the soil samples from a total of 7 borings. Samples with positive TOX detections were also tested for target VOC previously identified in groundwater at the site. Target VOC concentrations were determined using Method 8010. However, the 8010 analyses confirmed the TOX analysis in only six of the samples representing three soil borings (B-5, B-7, and B-8) in the sump/pond area.

b. Total Metals

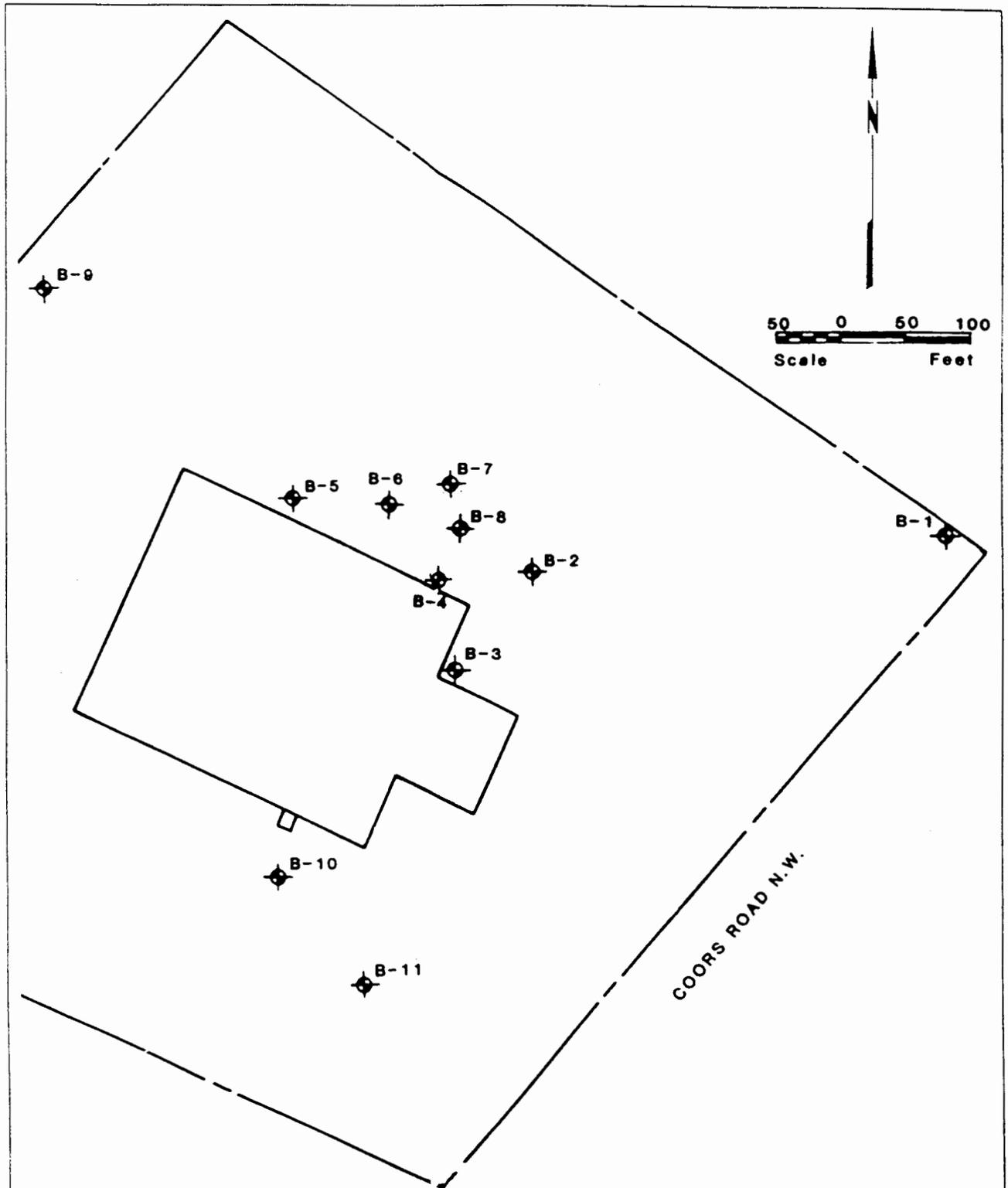
Total metals analyses were conducted on 126 soil samples to determine concentrations of cadmium, chromium, lead, and nickel. Analytical results on 34 samples exceeded nominal background levels for chromium (2-3 mg/kg). Maximum chromium concentration exceeded 3000 mg/kg at B-4 and B-8 underneath the sump/pond area. Evaluation of the data indicates sorption onto fine-grained silts and clays is probably the

dominant process affecting chromium concentration. The variation in chromium concentration is graphically depicted on Figures 41 through 52 which show the depth profiles of chromium concentration relative to subsurface lithology.

2. Surface Soil Gas Investigations

Three soil gas investigations have been conducted at the Sparton facility. The first soil gas investigation was conducted in 1984, and involved primarily on-site locations. The second investigation was conducted in 1987, and involved both on-site and off-site locations for soil gas measurements. The third investigation was conducted in June 1990, and covered both on-site and off-site locations. The investigations were conducted by Tracer Research Corporation using the same techniques and equipment. The results of the first two investigations were published in an HLA report dated October 19, 1987 and titled "Off-Site Investigation, Sparton Technology, Inc., Coors Road Plant, Albuquerque, New Mexico", a copy of which is included in Attachment 7. The report on the third investigation, "Shallow Soil Gas Investigation, Sparton Technology Building, 9621 North Coors Road, Albuquerque, New Mexico", is included in Attachment 9.

The purpose of these investigations was to obtain an estimate of the areal extent of the contaminant plume and to examine the impact of the upper flow zone pump and treat remediation on soil gas. All soil gas samples were taken in the shallow subsurface, approximately five to six feet below ground surface.



* DATA FROM HLA REPORT "SOIL INVESTIGATION OF THE UNSATURATED AND UPPER SATURATED ZONES"

HDR

HDR ENGINEERING, INC.
DALLAS, TEXAS

PLAN OF SOIL BORINGS

SPARTON TECHNOLOGY, INC.
ALBUQUERQUE, NEW MEXICO

Date
12/01/91

Figure
41

Based on these soil gas surveys, it appeared that the contaminant plume had moved a short distance beyond the facility boundaries. The shape of the soil gas plumes also seem to suggest dispersion and diffusion as the predominant plume transport mechanisms with a lesser advection influence.

Based on the results of the 1987 and 1991 soil gas surveys, TCA and TCE were detected in the soil gas over approximately the same area. Within the facility boundary, however, TCE concentration dropped approximately one order of magnitude with only a single sampling point south of the building above 10 ug/l. TCA decreased approximately 1/3 to 1/2 within the property boundary to a single peak level above 10 ug/l. Comparison to 1984 on-site data indicate over a 30X decrease in TCA and a 50X decrease in TCE.

The soil gas results indicate a significant change in soil gas concentration due to both source removal and initiation of the pump and treat remediation in 1989. The decrease in concentration with time is also reflected in the quarterly groundwater monitoring results which were collected under the state program.

An anomalous soil gas concentration of TCE and TCA southwest of Congress Avenue and Irving Boulevard has been observed in both the 1991 and 1987 surveys. Based on the general shape and location of the anomaly, the absence of analytical detection in MW-34 and MW-35, and the general groundwater flow characteristics, the soil gas anomaly is not related to the contaminant plume originating at the Sparton Facility.

B. Surface Water and Sediment Contamination

There are three surface water bodies in the vicinity of the Sparton facility. The Rio Grande is located approximately 3,000 feet east of the Sparton facility and is considered a permanent surface water body. The river flows from northeast to southwest in the vicinity of the Sparton facility. The Las Calabacillas Arroyo located approximately 2800 feet north of the facility is an intermittent stream used for area precipitation runoff control. The Corrales Main Canal, an irrigation channel, is located approximately 300 feet east of the facility, across Coors Road, and runs southwest from there. This irrigation canal is generally used from March through October, and, except for precipitation, is dry from November through February.

Based on regional and site-specific groundwater gradients, each of these surface water bodies is either upgradient or cross-gradient from the source area at the Sparton facility, and hence would not be expected to be affected by the contaminant plume.

C. Air Contamination

Since the contaminant release occurred in the subsurface soils and has subsequently migrated to the groundwater, the only ongoing release of constituents to the atmosphere from the release is by volatilization of the constituents from the groundwater and subsequent movement of these vapors through the vadose zone and ultimately to the ground surface where they are released into the atmosphere. Soil gas concentrations measured in 1991, approximately 5 to 6 feet below ground surface, indicated average TCE

and TCA soil gas concentrations of less than 10 micrograms per liter (ug/l) on-site at the Sparton facility, tapering off to 0.001 ug/l approximately 1/2 mile away. The mass flux rate of these constituents into the atmosphere, while not measured, is felt to be minimal due to the low concentrations of soil gas measured during the 1991 survey.

An additional source of air emissions is associated with the interim groundwater recovery system. The air stripper, which strips the volatile organic contaminants from the groundwater, releases these contaminants into the atmosphere. These emissions are permitted by the City Albuquerque Environmental Health Department (Air Quality Permit Number 187).

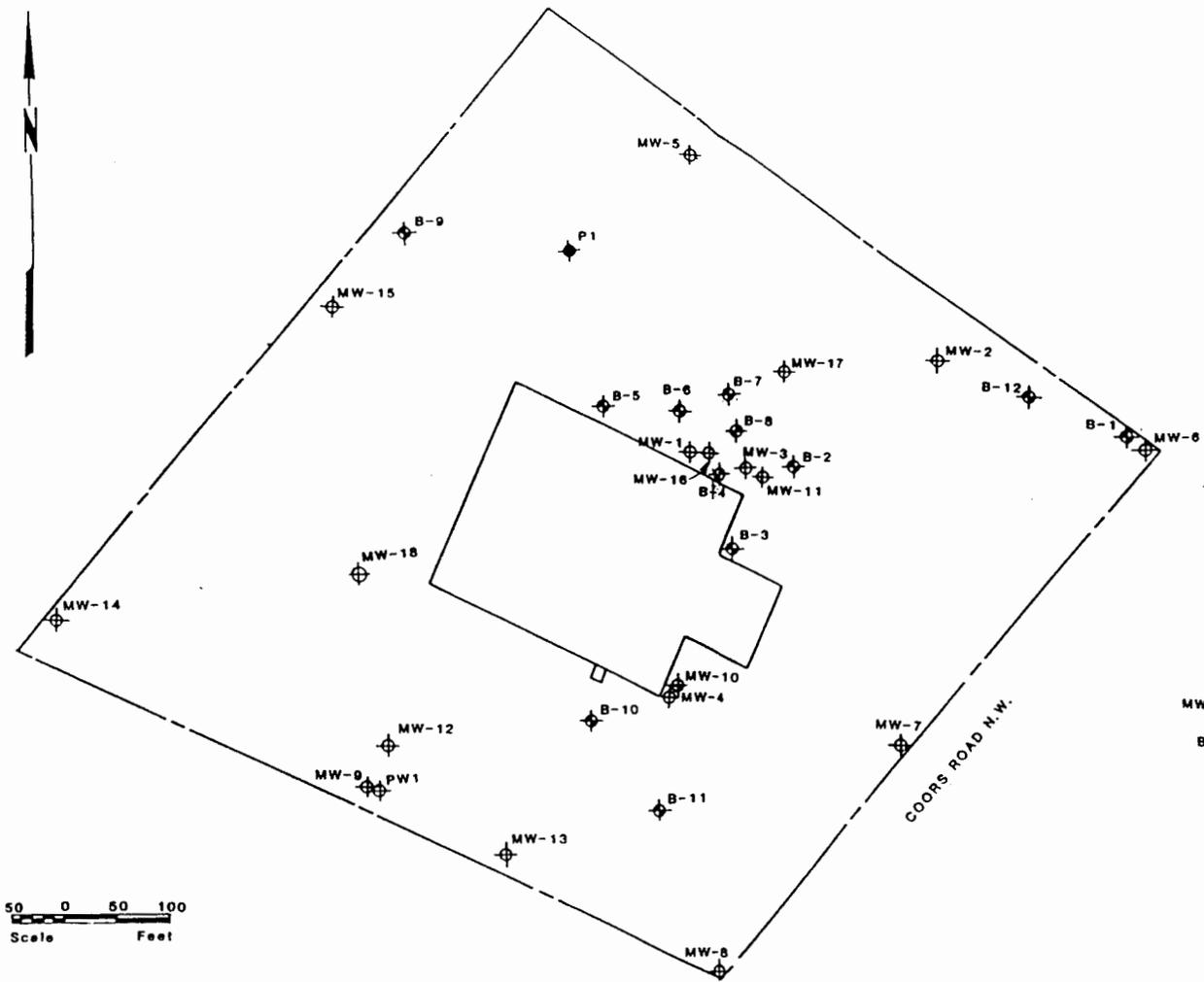
D. Groundwater Contamination

1. Definition of Plume

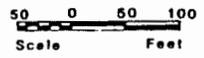
A total of 56 groundwater monitoring wells have been installed to determine groundwater elevations and to collect representative samples for chemical analyses in an effort to define the horizontal and vertical limits of the contaminant plume. Figure 53 presents pertinent well screen data for the wells. For the purposes of the investigation, TCE and TCA concentration values have been plotted to define the plume configuration. These two compounds are the major constituents of the groundwater contamination as they are found to be the most prevalent in groundwater sample analyses. Acetone, DCE and MeCl have also been detected, but are not as prevalent as TCE and TCA.

ATTACHMENT 6

Unsaturated Zone Boring Logs and Analytical Data



- LEGEND:**
- MW-2 WELL LOCATION
 - B-3 SOIL BORING LOCATION
 - P1 PIEZOMETER



REFERENCE: SPARTON TECH. INC. SURVEY BY DENNEY-GROSS & ASSOC., INC., DATED 10/6/84

Harding Lawson Associates Engineers, Geologists & Geophysicists	BORING LOCATION PLAN		15411
	Sparton Technology, Inc. Albuquerque, New Mexico		1
Drawn by <i>EB</i>	JOB NUMBER 6310,023.12	APPROVED <i>T.C.</i>	DATE <i>6/12/84</i>
		REVISED 	DATE

Ⓜ MW-17

EXISTING DIRT ROAD

WATER METER

B-7

OLD GAS METER LOCATION

CARPENTER'S SHOP

B-6

6" WATER LINE

B-8

WEST POND

EAST POND

CLOSED BUMP

MW-1

HVAC TO BE RELOCATED

MW-16

2" PVC DISCHARGE LINE

MW-3

MW-11

PAVED PARKING AREA

B-2

CONCRETE ENCLOSURE

WALKWAY

B-4

CUT-OFF SAW

B-5

MANUFACTURING BUILDING

LEGEND:

- PVC Discharge Line
- - - Gas Line
- - - Water Line
- - - Chain Link Fencing (To be relocated in the area of the Ponds and Sump)
- ∇ Water Valve
- Ⓜ Monitor Well with 2-foot concrete pad
- B-8 ⚡ Soil Boring



Staffing Licensed Associates
Engineers, Geologists
& Geophysicists

**BORING LOCATION DETAIL
IN THE POND AND
DUMP AREA**

2

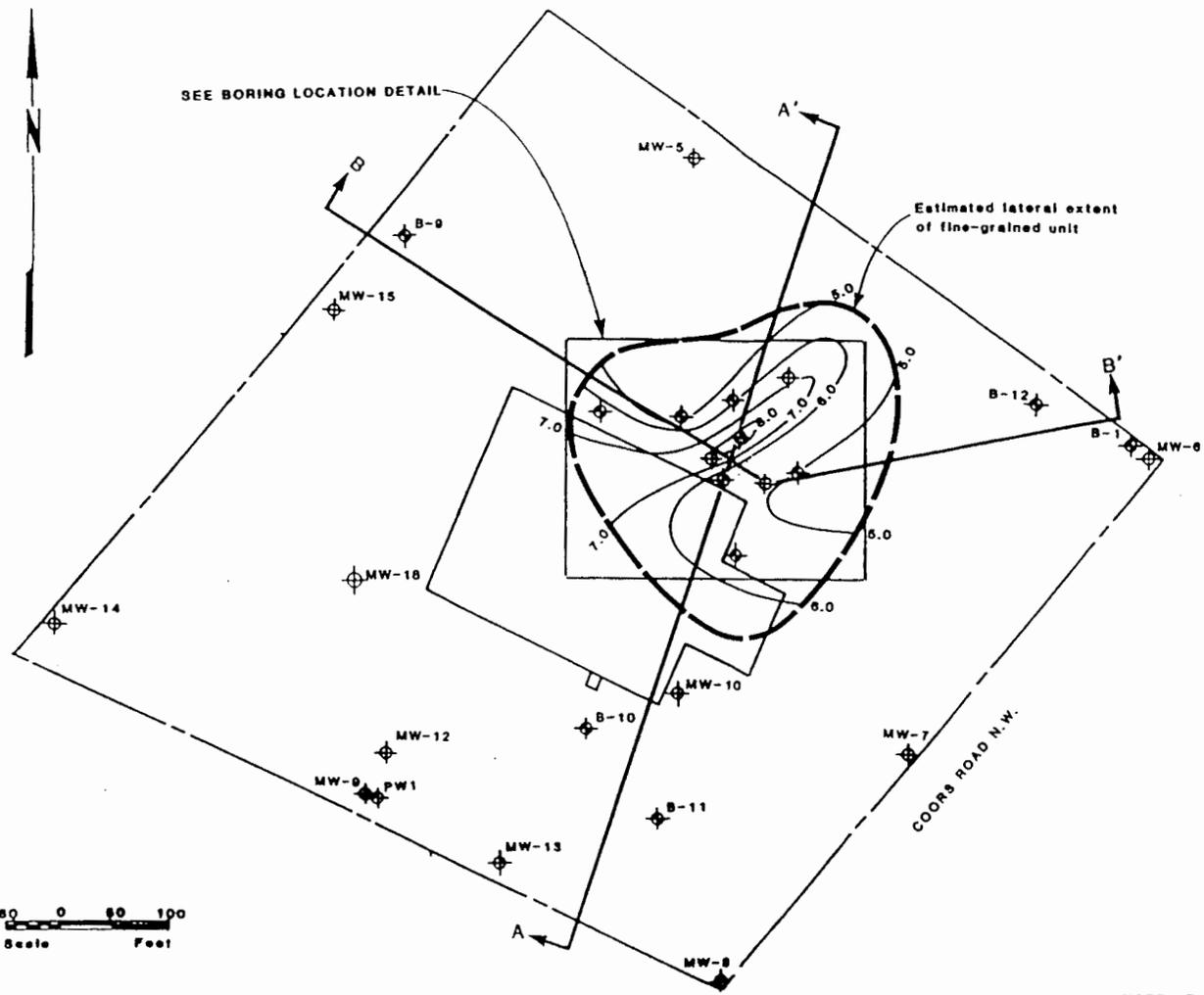
SPARTON TECHNOLOGY, INC.
ALBUQUERQUE, NEW MEXICO

JD

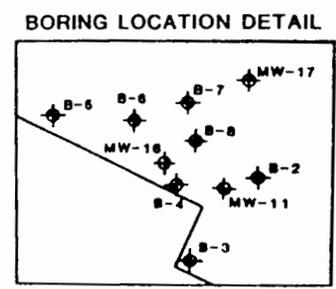
8310.082.17

12/18/06

6/25/06



Upper Surface Elevation of Fine-grained Unit in Soil Samples	
Boring No.	Elevation (MSL)
B-2	5004.0
B-3	5005.5
B-4	5005.3
B-5	5006.3
B-6	5004.9
B-7	5005.8
B-8	5008.2
MW-11	5005.5
MW-16	5008.0
MW-17	5006.5



- LEGEND:**
- MW-2 WELL LOCATION
 - B-3 SOIL BORING LOCATION
 - GEOLOGIC SECTION LINE
 - 5.0 — CONTOUR LINE OF EQUAL ELEVATION, INTERVAL IS 1.0 foot.

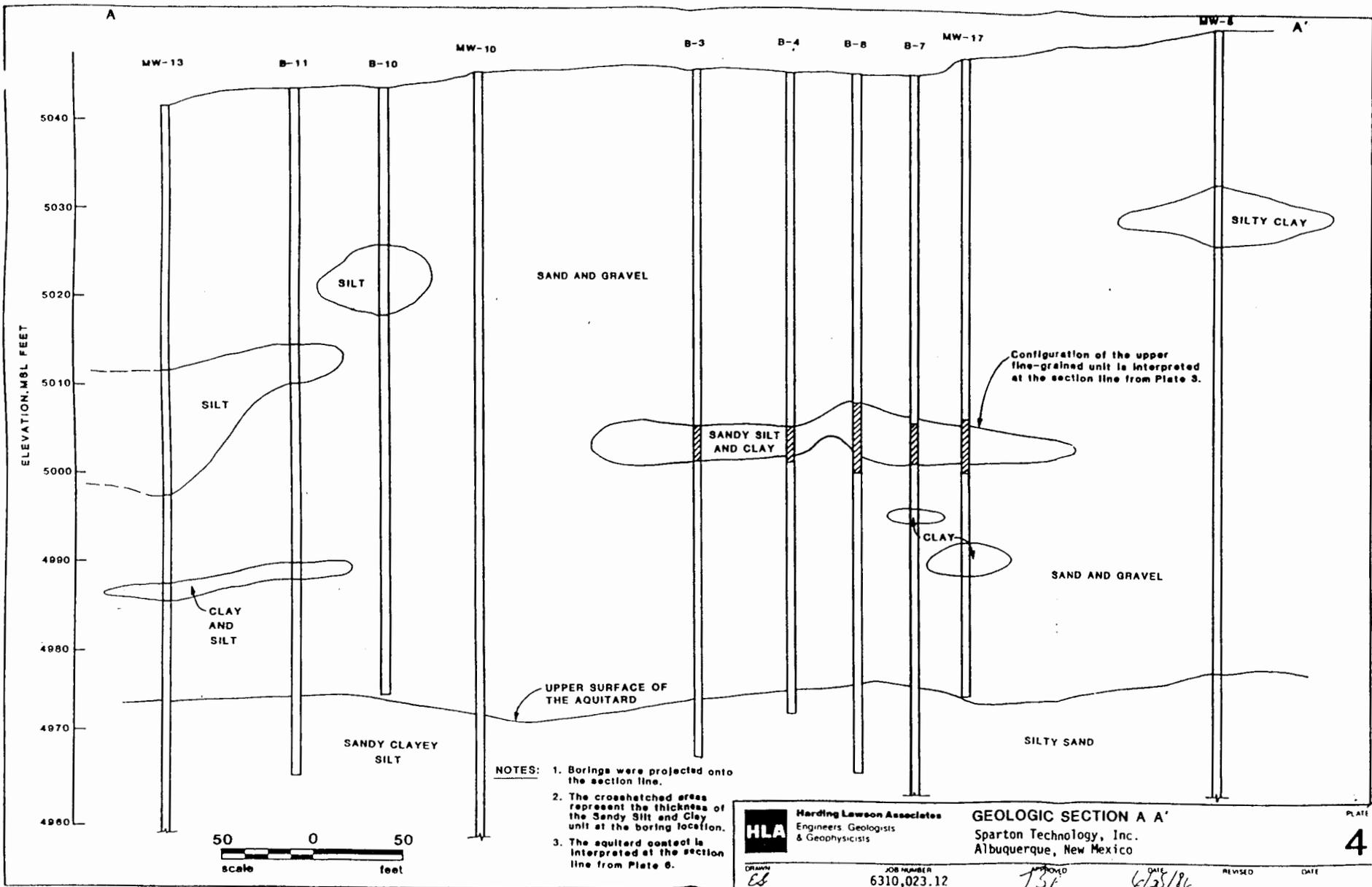
NOTE: Zero elevation datum is 5000' MSL.

REFERENCE: SPARTON TECH. INC. SURVEY BY DENNEY-DROBS & ASSOC., INC., DATED 10/5/84

HLA Harrell Larson Associates
Engineers, Geologists
& Geophysicists

CONFIGURATION OF UPPER SURFACE
OF THE FINE-GRAINED UNIT AT
APPROXIMATELY 8005 FEET MSL
Sparton Technology, Inc.
Albuquerque, New Mexico

DATE: 1/20/88 JOB NUMBER: 6310,023.12 APPROVED: [Signature] DATE: 1/20/88 REVISED: DATE:



- NOTES:**
1. Borings were projected onto the section line.
 2. The crosshatched areas represent the thickness of the Sandy Silt and Clay unit at the boring location.
 3. The aquitard contact is interpreted at the section line from Plate 6.



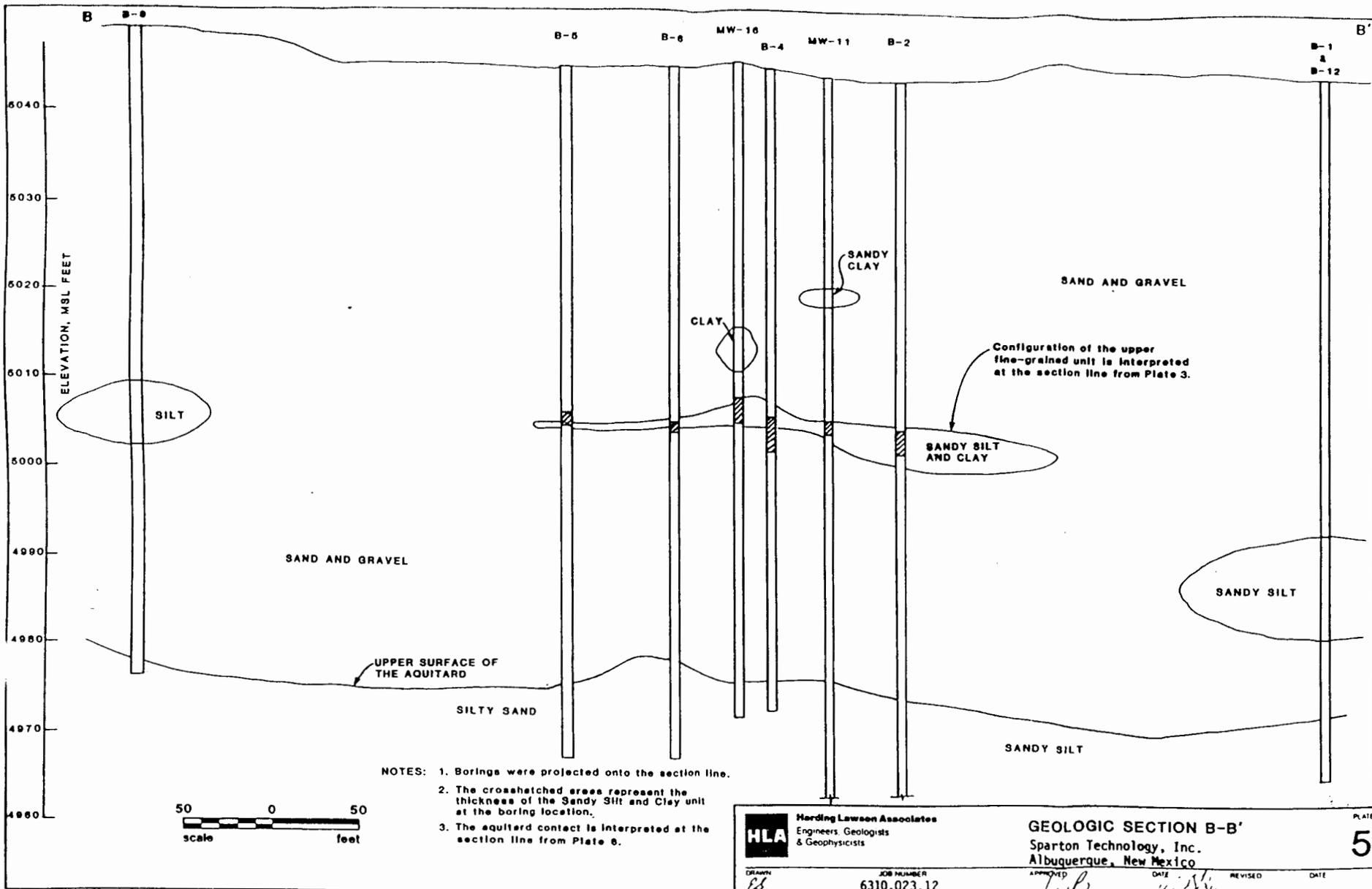
Harding Lawson Associates
Engineers, Geologists
& Geophysicists

GEOLOGIC SECTION A A'
Sparton Technology, Inc.
Albuquerque, New Mexico

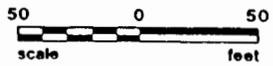
PLATE

4

DRAWN <i>Ed</i>	JOB NUMBER 6310,023.12	APPROVED <i>TSE</i>	DATE 6/25/86	REVISED	DATE
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- NOTES: 1. Borings were projected onto the section line.
 2. The crosshatched areas represent the thickness of the Sandy Silt and Clay unit at the boring location.
 3. The aquitard contact is interpreted at the section line from Plate 3.

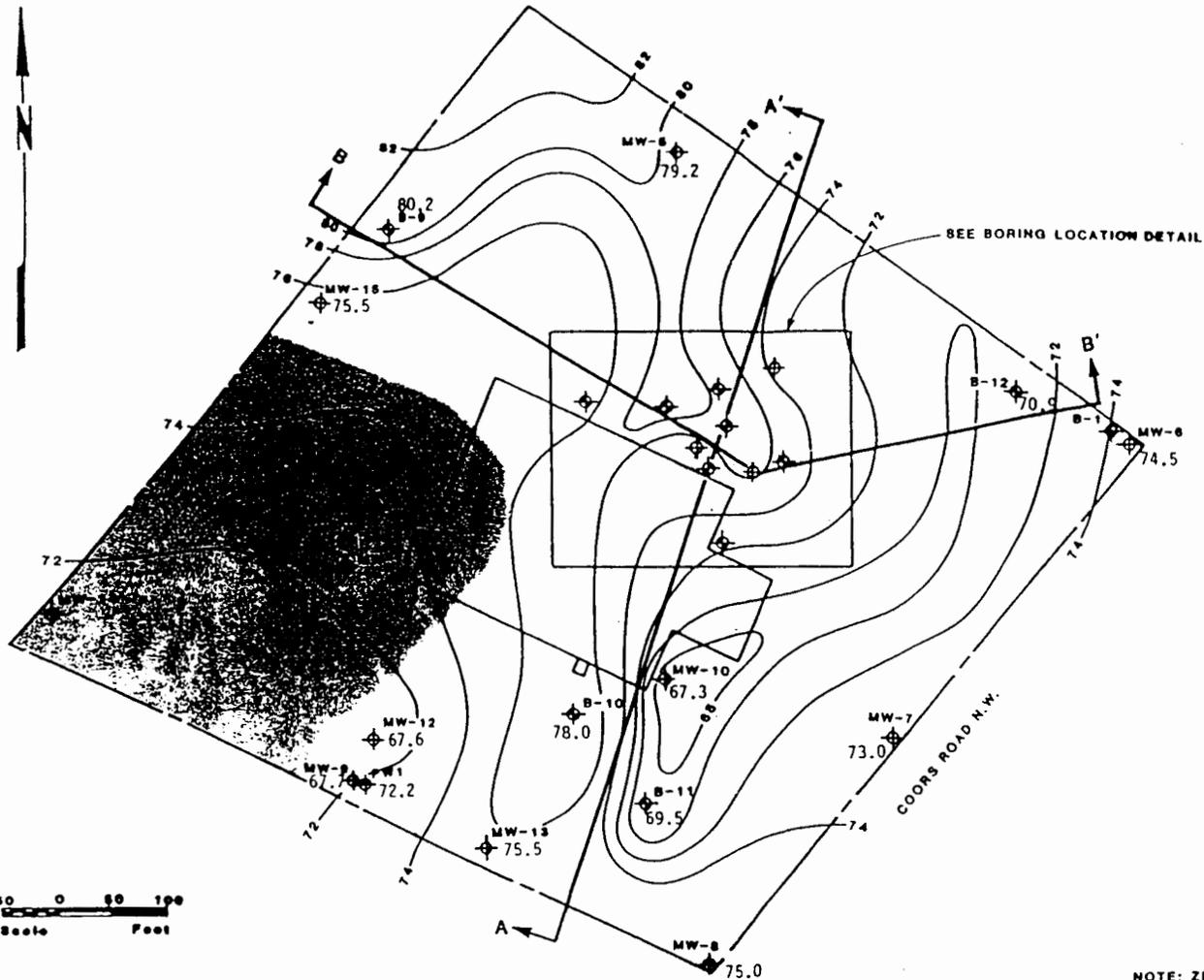


HLA Harding Lawson Associates
 Engineers, Geologists
 & Geophysicists

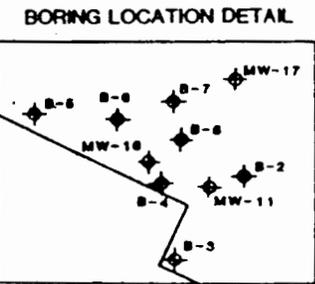
GEOLOGIC SECTION B-B'
 Sparton Technology, Inc.
 Albuquerque, New Mexico

PLATE **5**

DRAWN: *ES* JOB NUMBER: 6310,023.12 APPROVED: *TJB* DATE: *11/11/81* REVISED: DATE



Aquitard Upper Surface Elevation in Detail	
Boring No.	Elevation (MSL)
B-2	4974.5
B-3	4972.0
B-4	<4973.9
B-5	4975.5
B-6	4979.6
B-7	4977.8
B-8	4977.4
MW-11	4976.4
MW-16	<4973.0
MW-17	4973.0



- LEGEND:**
- MW-2 WELL LOCATION
 - B-3 SOIL BORING LOCATION
 - GEOLOGIC SECTION LINE
 - CONTOUR LINE OF EQUAL ELEVATION INTERVAL IS 2 FEET.
 - SHADED AREA REPRESENTS ZONE WHERE AQUITARD MAY BE THIN OR ABSENT.

NOTE: ZERO ELEVATION DATUM IS 4900 FEET MSL.

REFERENCE: SPARTON TECH. INC. SURVEY BY DENNEY-GROSS & ASSOC., INC., DATED 10/8/84

HLA Consulting Engineers, Geologists & Geophysicists

CONFIGURATION OF THE UPPER SURFACE OF THE AQUITARD
Sparton Technology, Inc.
Albuquerque, New Mexico

PLATE
6

DATE: 11/8/84 JOB NUMBER: 6310.023.12 APPROVED: TSB DATE: 12/28/84 REVISION: DATE:

MAJOR DIVISIONS					TYPICAL NAMES
COARSE - GRAINED SOILS MORE THAN HALF IS LARGER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GP		POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GM		SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC		CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN No. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL-GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SP		POORLY GRADED SANDS, GRAVELLY SANDS
			SM		SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC		CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE - GRAINED SOILS MORE THAN HALF IS SMALLER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS	ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
		CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
		OL		ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%	MH		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS	
		CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
		OH		ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
HIGHLY ORGANIC SOILS	Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS		

UNIFIED SOIL CLASSIFICATION SYSTEM

Perm	—	Permeability	Shear Strength (psf)	Confining Pressure	
Consol	—	Consolidation	TxUU 3200 (2600)	—	Unconsolidated Undrained Triaxial Shear (field moisture or saturated)
LL	—	Liquid Limit (%)	(FM) or (S)		
PI	—	Plastic Index (%)	TxCU 3200 (2600)	—	Consolidated Undrained Triaxial Shear (with or without pore pressure measurement)
G _s	—	Specific Gravity	(P)		
MA	—	Particle Size Analysis	TxCD 3200 (2600)	—	Consolidated Drained Triaxial Shear
	—	"Undisturbed" Sample	SSCU 3200 (2600)	—	Simple Shear Consolidated Undrained (with or without pore pressure measurement)
	—	Bulk or Classification Sample	(P)		
			SSCD 3200 (2600)	—	Simple Shear Consolidated Drained
			DSCD 2700 (2000)	—	Consolidated Drained Direct Shear
			UC 470	—	Unconfined Compression
			LVS 700	—	Laboratory Vane Shear

KEY TO TEST DATA



Harding Lawson Associates
Engineers, Geologists
& Geophysicists

**SOIL CLASSIFICATION CHART
AND KEY TO TEST DATA**
Sparton Technology, Inc.
Albuquerque, New Mexico

PLATE

DRAWN

28.

JCB NUMBER

6310,023.12

APPROVED

DATE

REVISED

DATE

Appendix A. Field Investigation

1. Geologic Logs
2. Construction of MW-18
3. Particle Size Analysis

Depth (ft) Sample

Equipment Hollow-Stein Auger
 Elevation 5044.6 Date 9/4/85 to 9/6/85

LIGHT BROWN FINE TO MEDIUM SAND (SP)
 dry, grains subangular to rounded, 95% quartz, 3% feldspar, 2% other
 concrete dust 3 to 3.5 feet
 tire fragments 4 to 6 feet

Fill

gravelly 7 to 26 feet, mainly igneous and metamorphic

silty 9 to 10 feet

lost sampler at 18 feet, retrieve and start new boring

sandy gravel 22.3 to 23.7 feet

trace silt 28 to 40 feet

LIGHT BROWN SANDY GRAVEL (GW)
 moist, gravel angular to rounded, mainly quartzite with some igneous gravel

PID Background (ppm)

PID Sample (ppm)

Depth (ft) Sample

(Continuation of Log)

lost sampler shoe at 52 feet, start new boring
 LIGHT BROWN FINE SANDY SILT (ML)
 moist, subangular grains, trace clay

very sandy 57.5 to 59 feet

GRAY GRAVELLY COARSE SAND (SW)
 saturated, grains subangular to rounded, 80% quartz, 12% feldspar, 8% other

End of Boring - 67.5 feet

Note: No PID readings were taken above 52.5 feet.



Harding Lawson Associates
 Engineers, Geologists
 & Geophysicists

LOG OF BORING B001
 Sparton Technology, Inc.
 Albuquerque, New Mexico

PLATE
A1

DRAWN
 Es.

JOB NUMBER
 6310_023.12

APPROVED

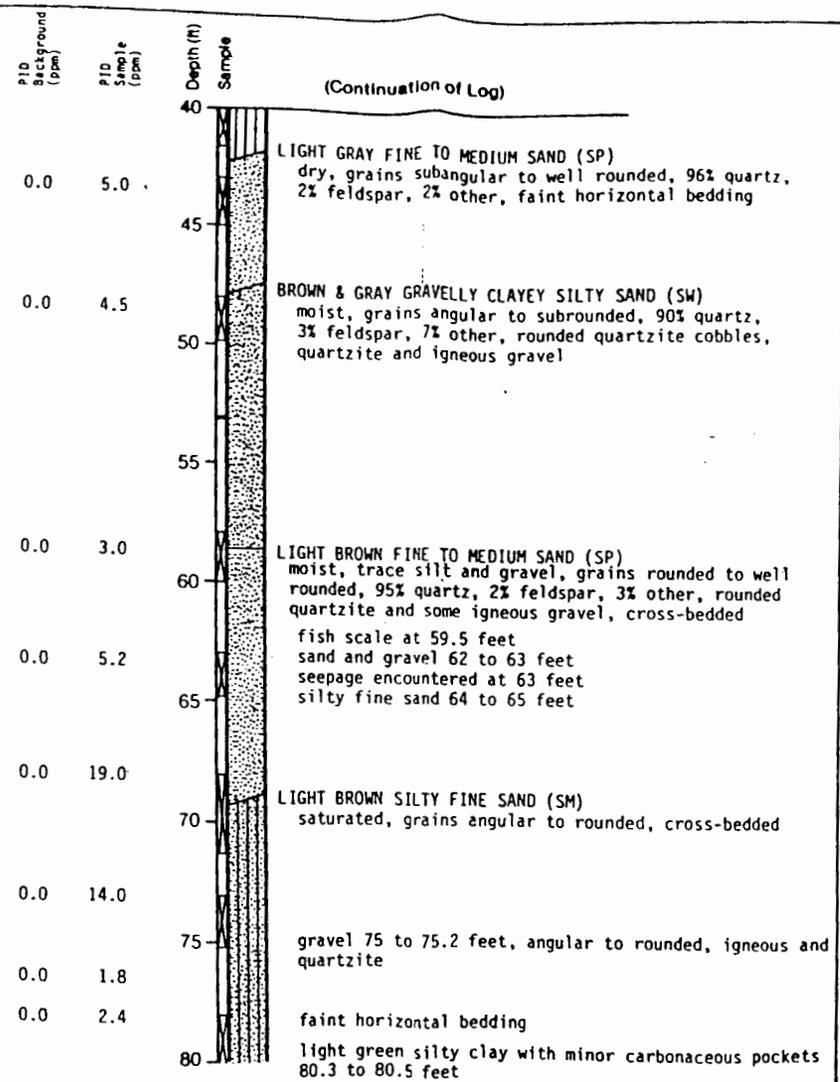
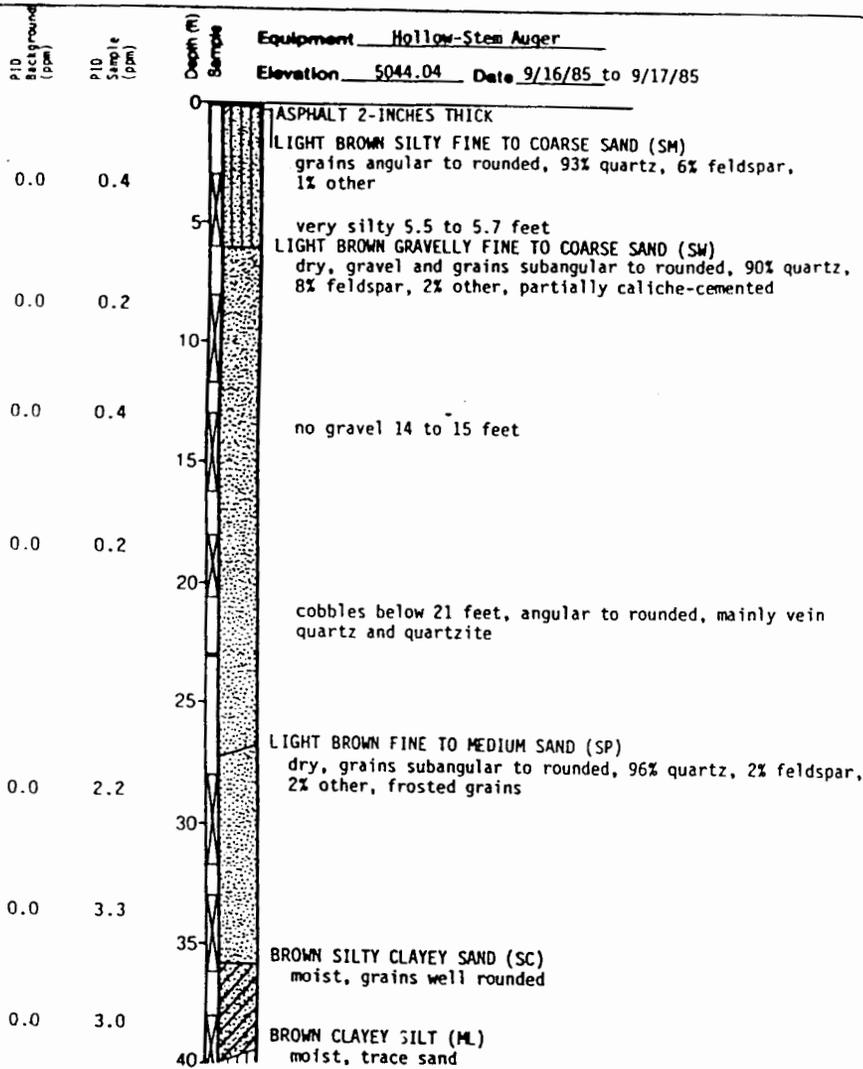
TSB

DATE

6/25/86

REVISED

DATE

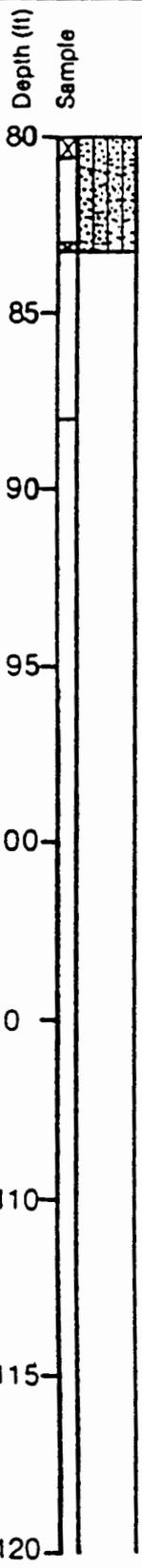


HLA Harding Lawson Associates
 Engineers, Geologists
 & Geophysicists

LOG OF BORING B002
 Sparton Technology, Inc.
 Albuquerque, New Mexico

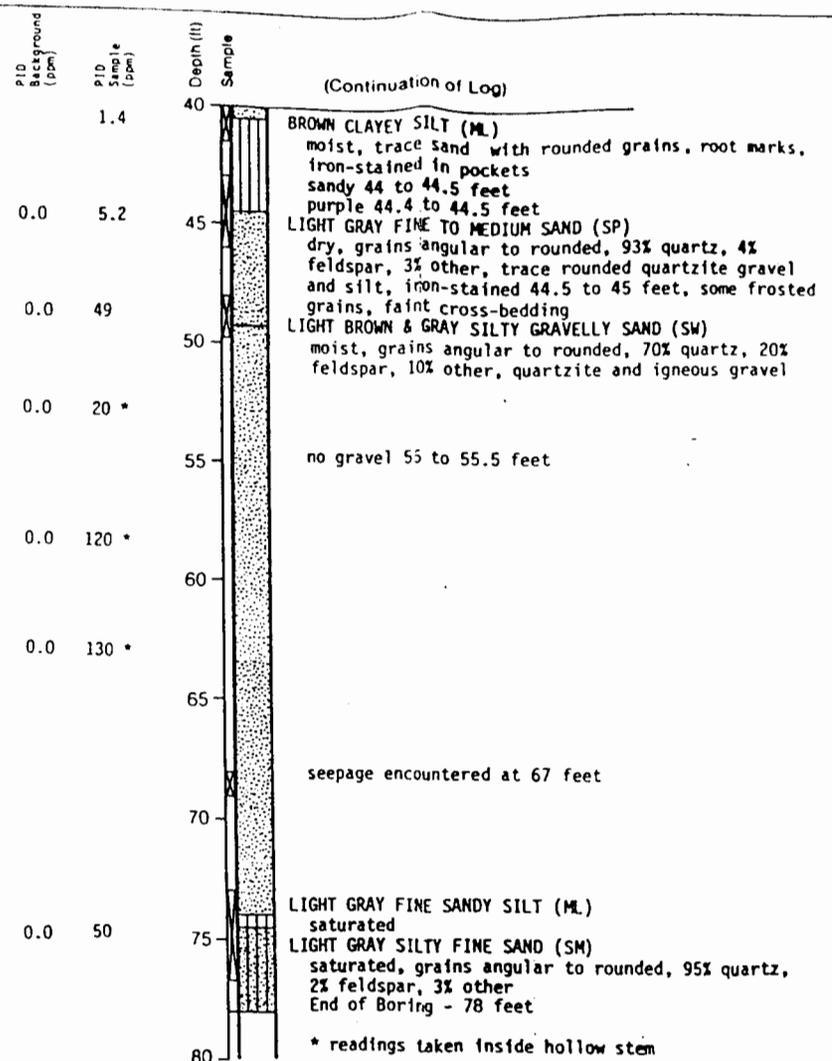
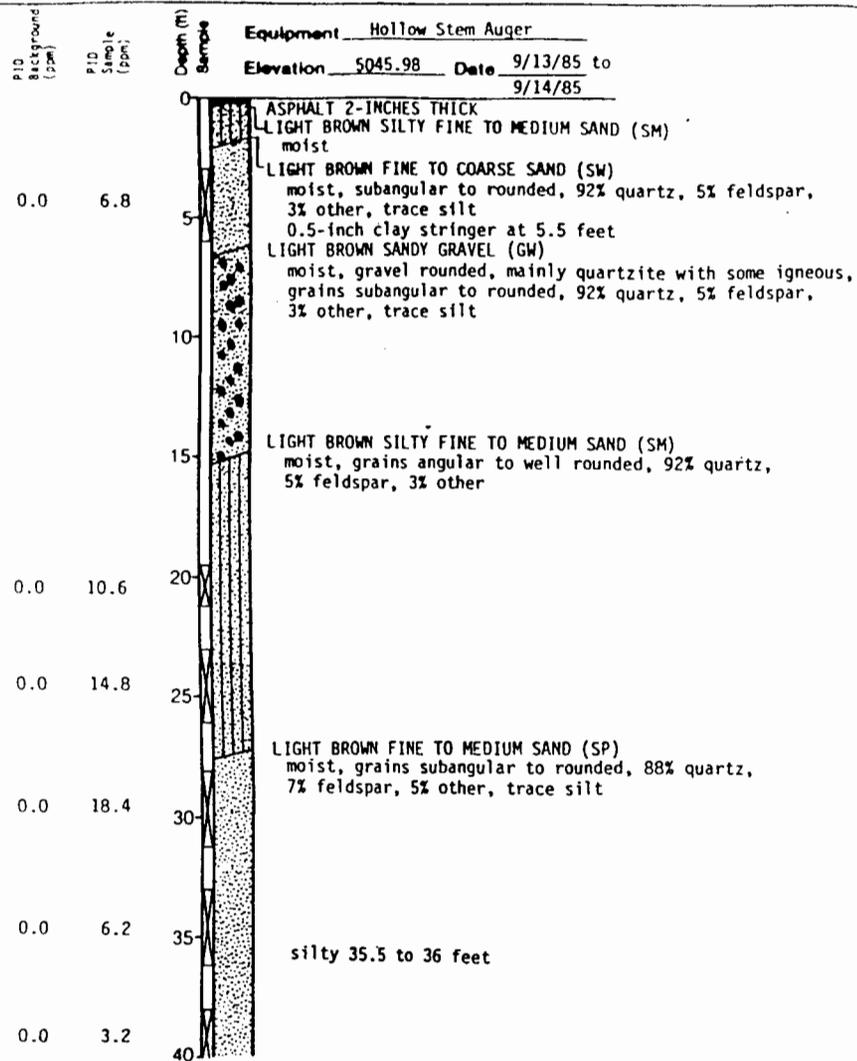
PLATE **A2**

APPROVED: *TSB* DATE: *9/23/85*
 JOB NUMBER: 6310,023.12

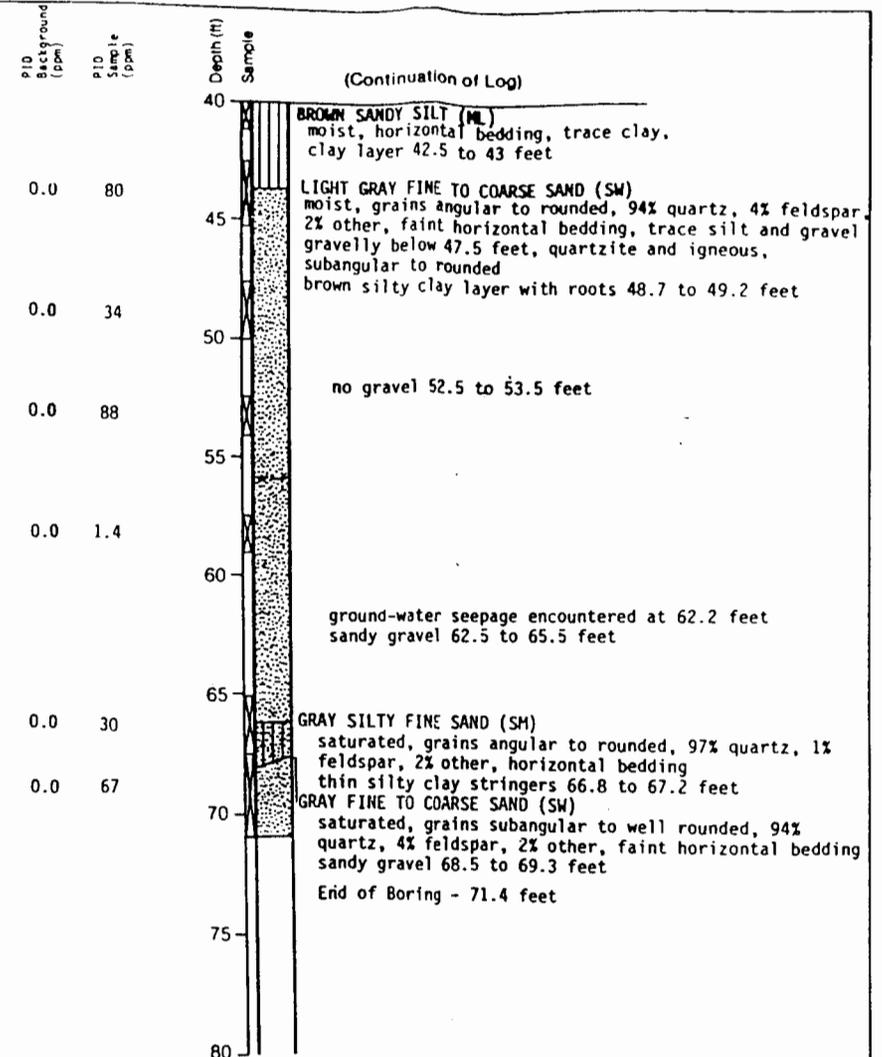
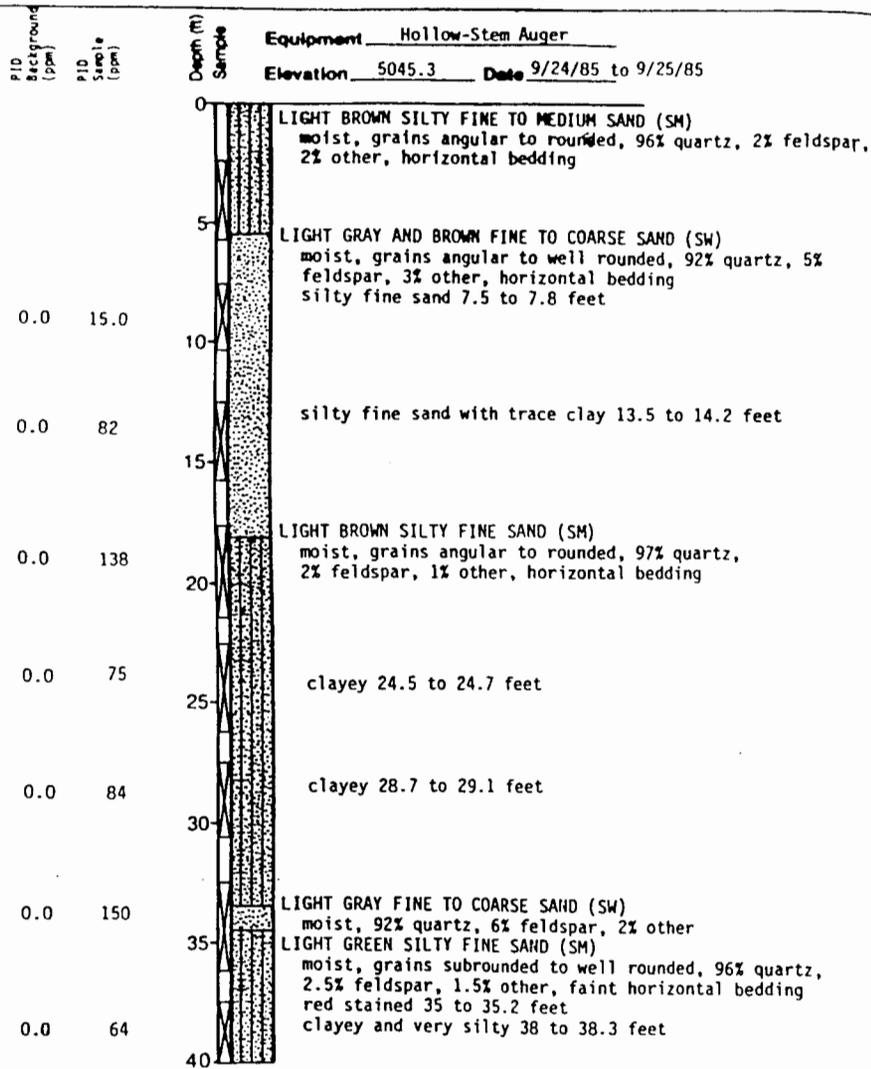


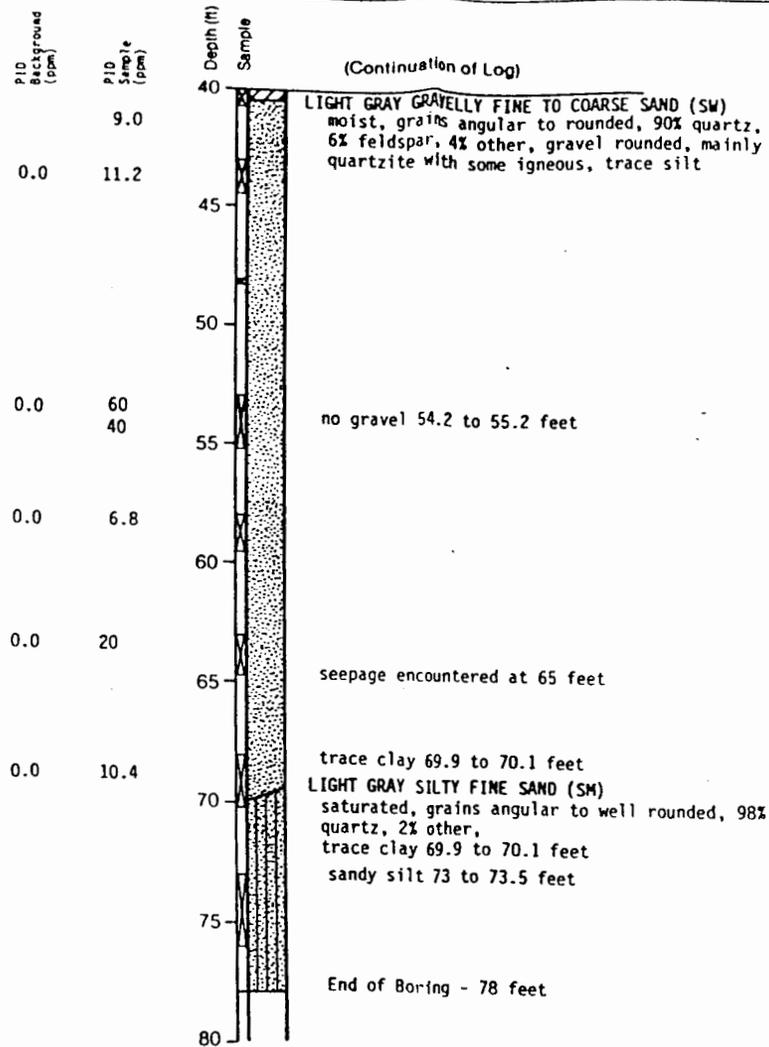
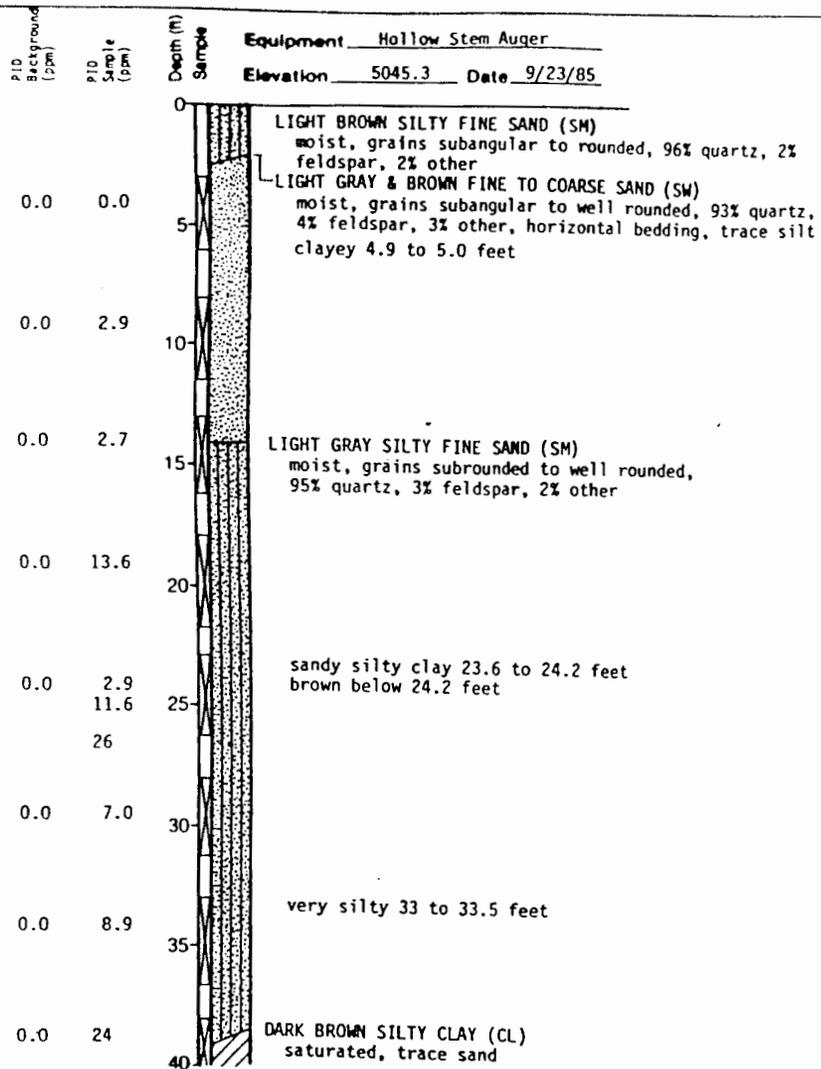
(Continuation of Log)

dark brown silty clay 82 to 83 feet
 End of Boring 83.2 feet



 Harding Lawson Associates Engineers, Geologists & Geophysicists	LOG OF BORING B003 Sparton Technology, Inc. Albuquerque, New Mexico		M 111 A4
	DRAWN: <i>ES</i> JOB NUMBER: 6310,023.12	APPROVED: <i>JSB</i> DATE: 6/28/86	





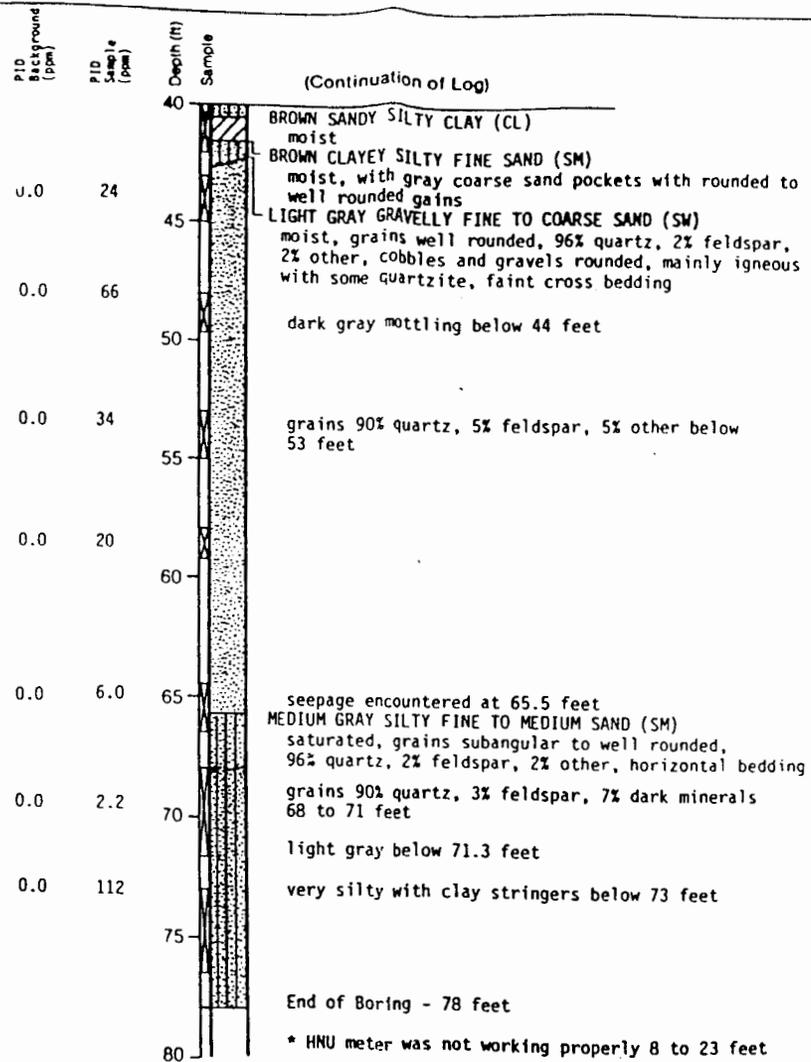
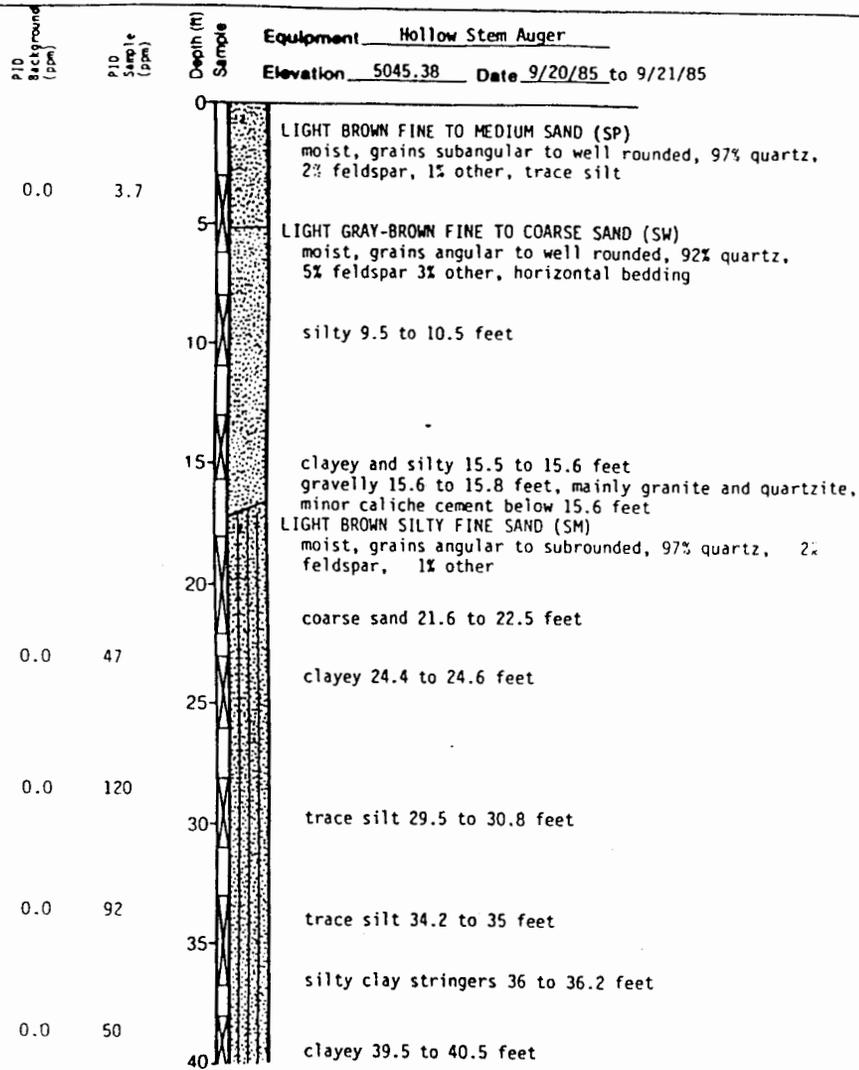
HLA Harding Lawson Associates
Engineers Geologists
& Geophysicists

LOG OF BORING B005
Sparton Technology, Inc.
Albuquerque, New Mexico

A6

Drawn Ed. JOB NUMBER 6310,023.12

APPROVED TJB DATE 6/25/86 REVISION DATE



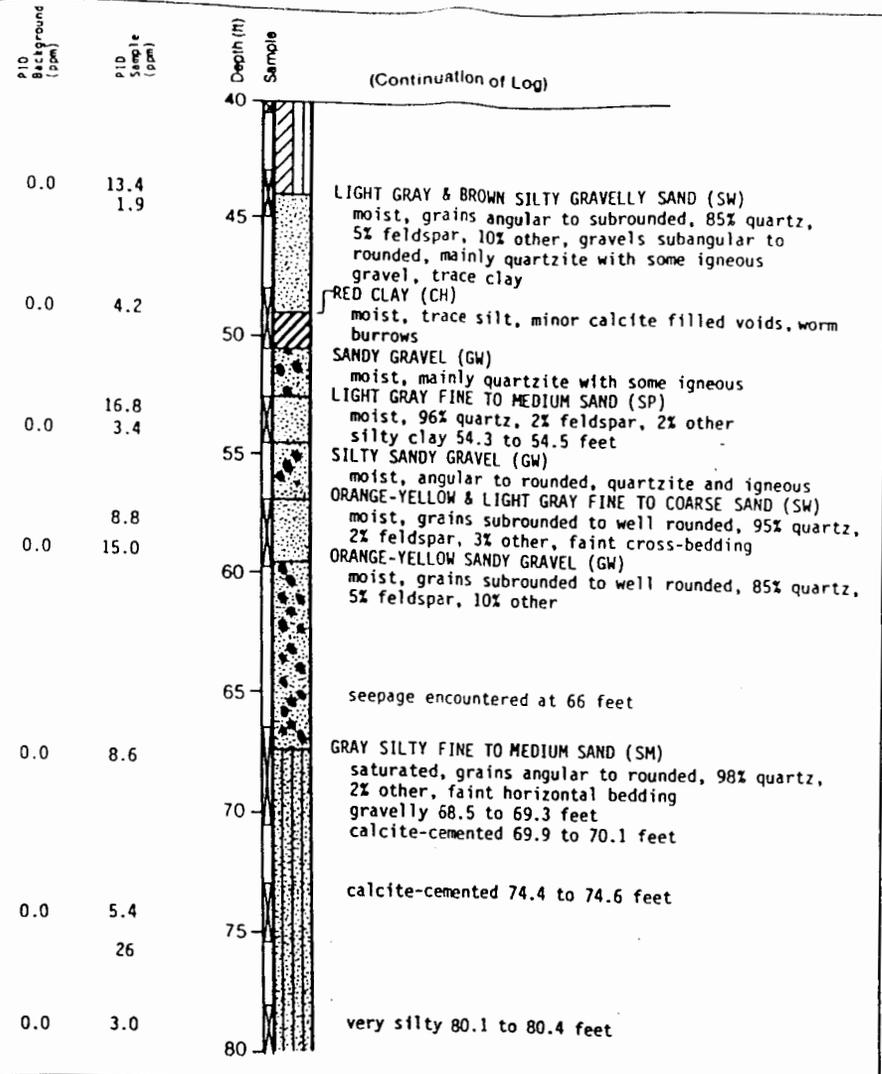
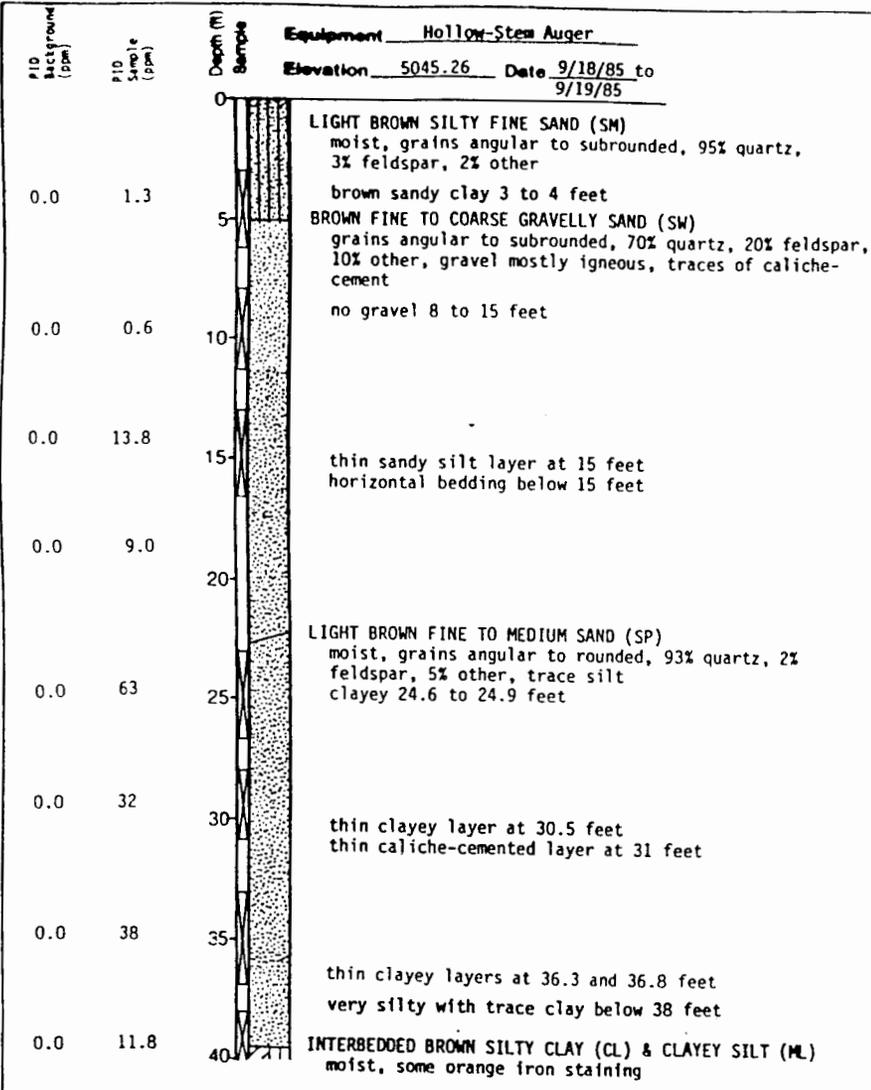
HLA Harding Lawson Associates
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 & Geophysicists

LOG OF BORING B006
 Sparton Technology, Inc.
 Albuquerque, New Mexico

15.411

A7

Drawn: E. J. JOB NUMBER: 6310.023.12 APPROVED: T.S.B. DATE: 6/25/86 REVISION: _____ DATE: _____



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LOG OF BORING B007
 Sparton Technology, Inc.
 Albuquerque, New Mexico

PLATE **A8**

DRAWN: ES JOB NUMBER: 6310,023.12 APPROVED: TSB DATE: 6/25/86 REVISION: DATE:

Depth (ft)
80
85
90
95
100
105
110
115
120

Sample

(Continuation of Log)

End of Boring - 83 feet



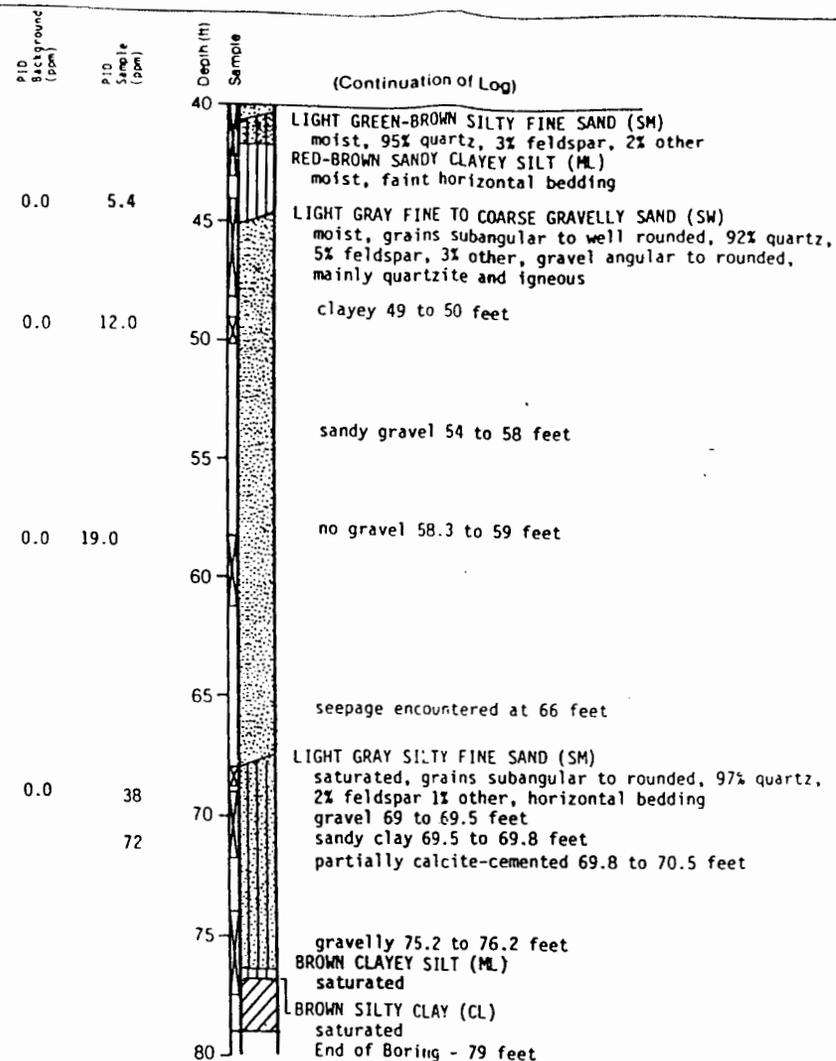
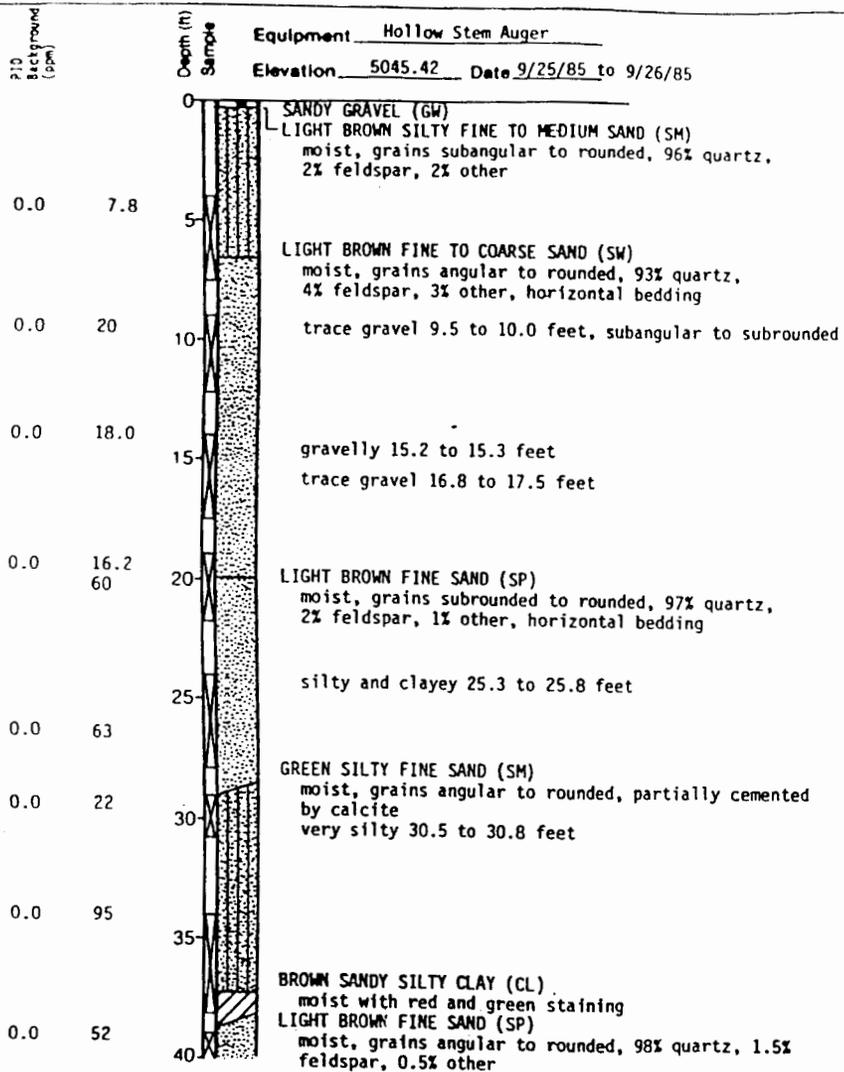
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LOG OF BORING B007 (cont.)
Sparton Technology, Inc.
Albuquerque, New Mexico

PLATE

A9

DRAWN <i>Es.</i>	FIG. NUMBER 6310,023.12	APPROVED <i>TSB</i>	DATE <i>6/25/86</i>	REVISED	DATE
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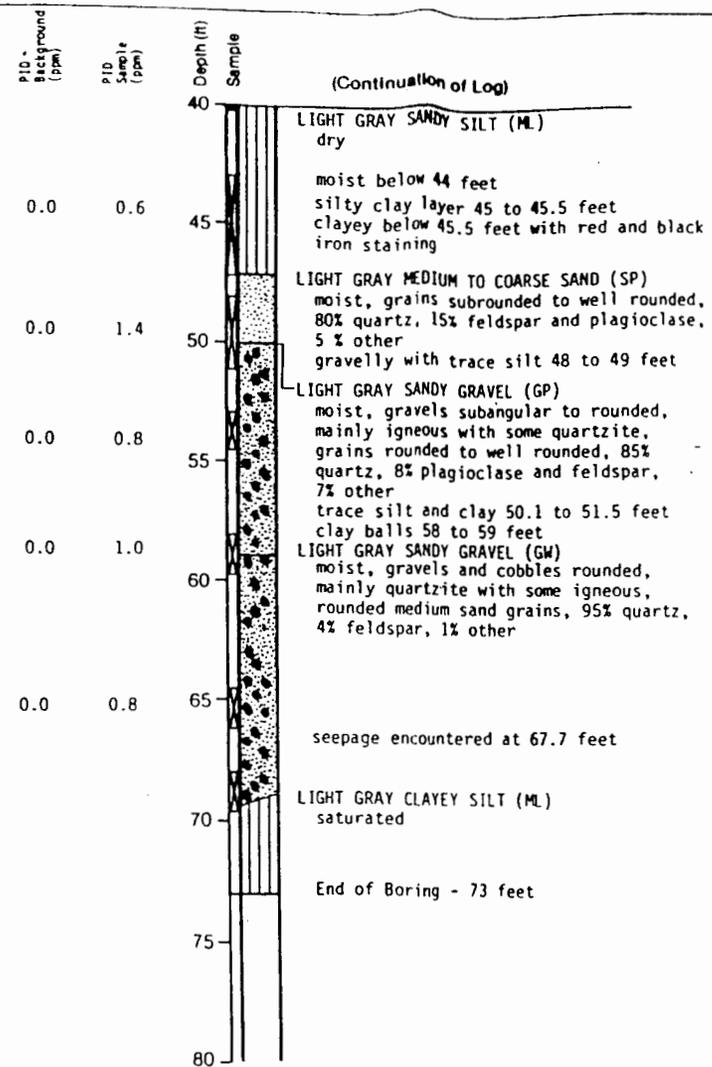
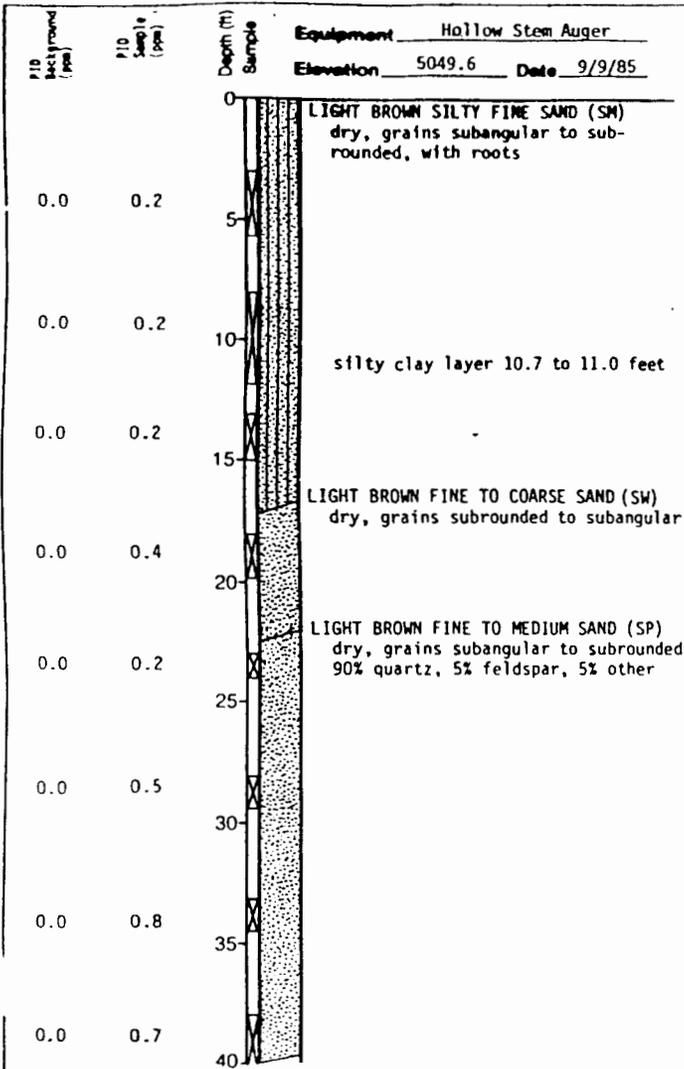
LOG OF BORING B008

Sparton Technology, Inc.
 Albuquerque, New Mexico

A10

Drawn by *ky* JOB NUMBER 6310,023.12

APPROVED *ISB* DATE *6/25/86* REVISION DATE



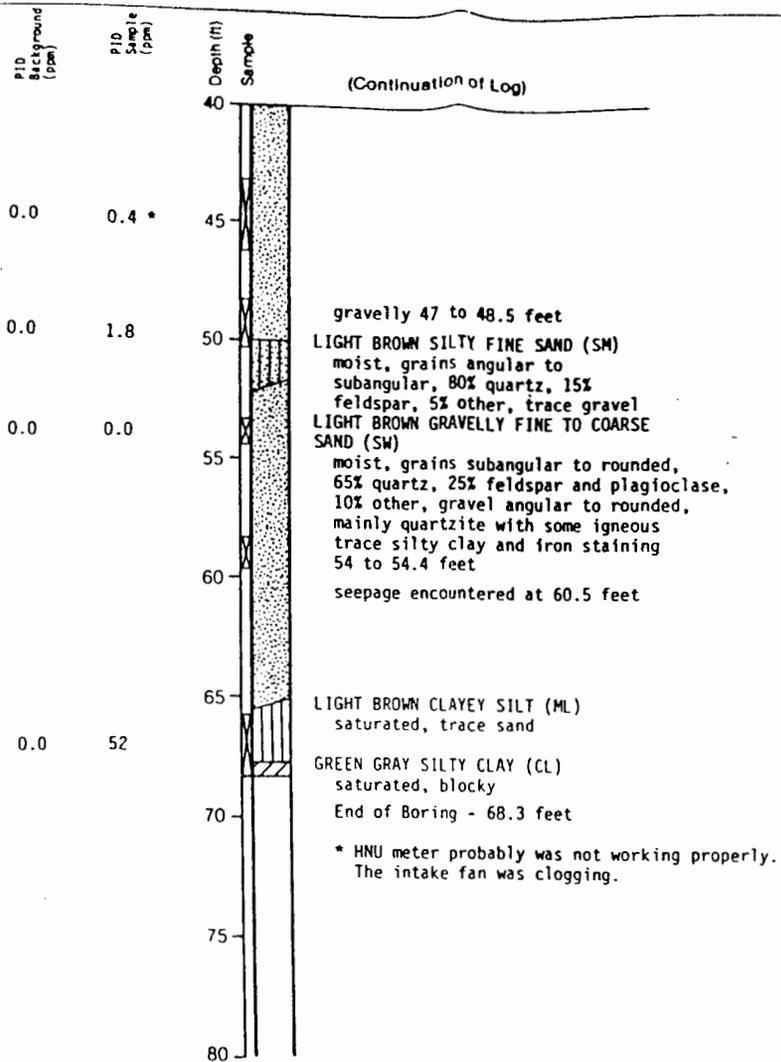
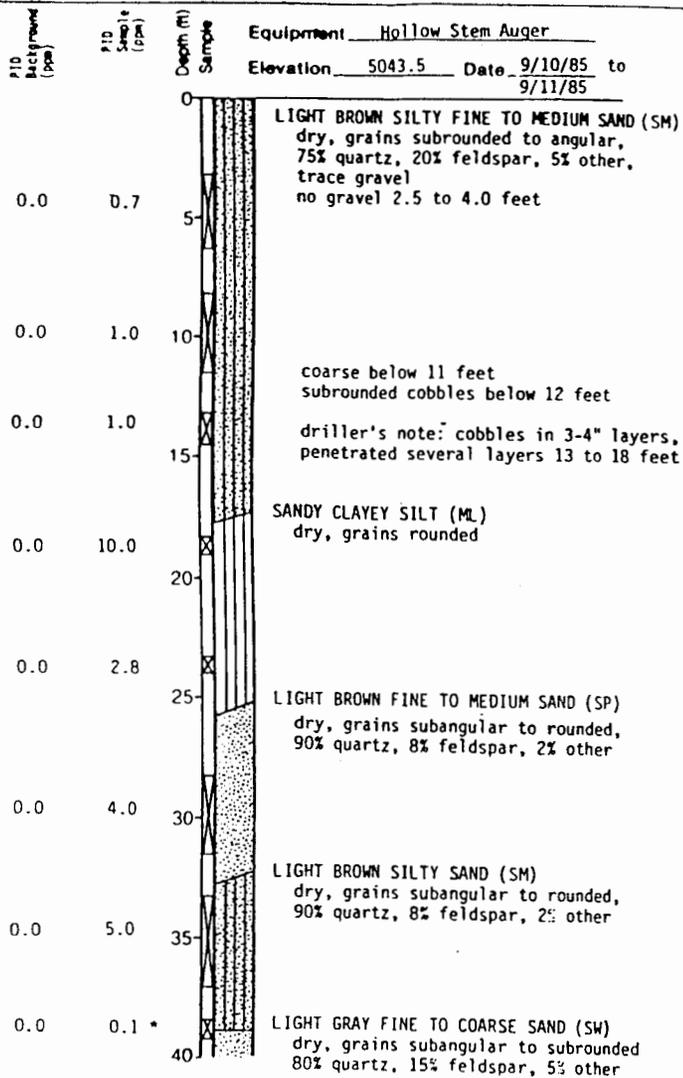
HLA Harding Lawson Associates
Engineers Geologists
& Geophysicists

LOG OF BORING B009
Sparton Technology, Inc.
Albuquerque, New Mexico

PLATE
A11

DRAWN BY *ES* JOB NUMBER 6310,023.12

APPROVED BY *TSB* DATE *6/25/86* REVISIONS DATE



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LOG OF BORING B010
 Sparton Technology, Inc.
 Albuquerque, New Mexico

A12

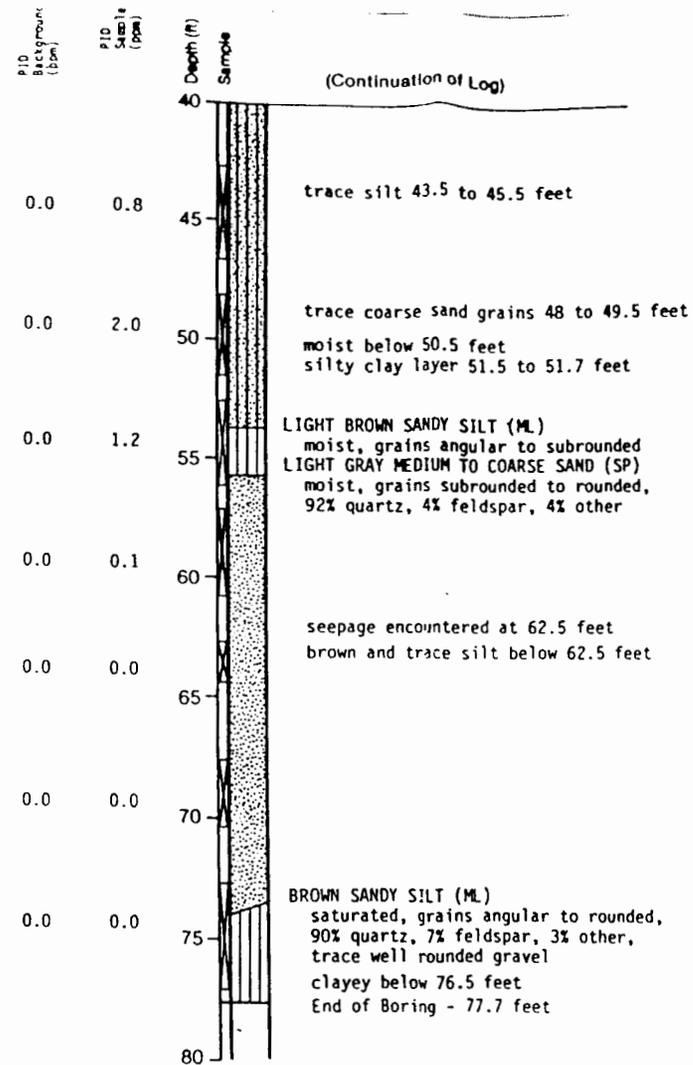
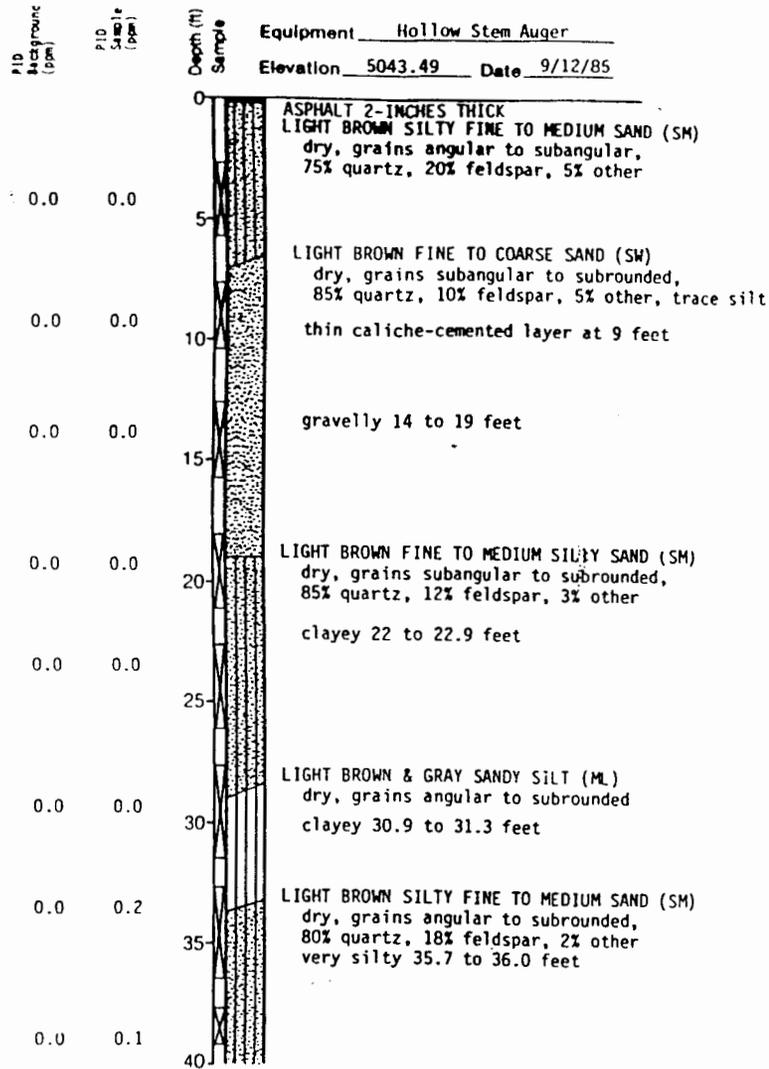
Drawn
 EE

JOB NUMBER
 6310,023.12

APPROVED
 TSB

DATE
 6/25/86

REVISION DATE



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 & Geophysicists

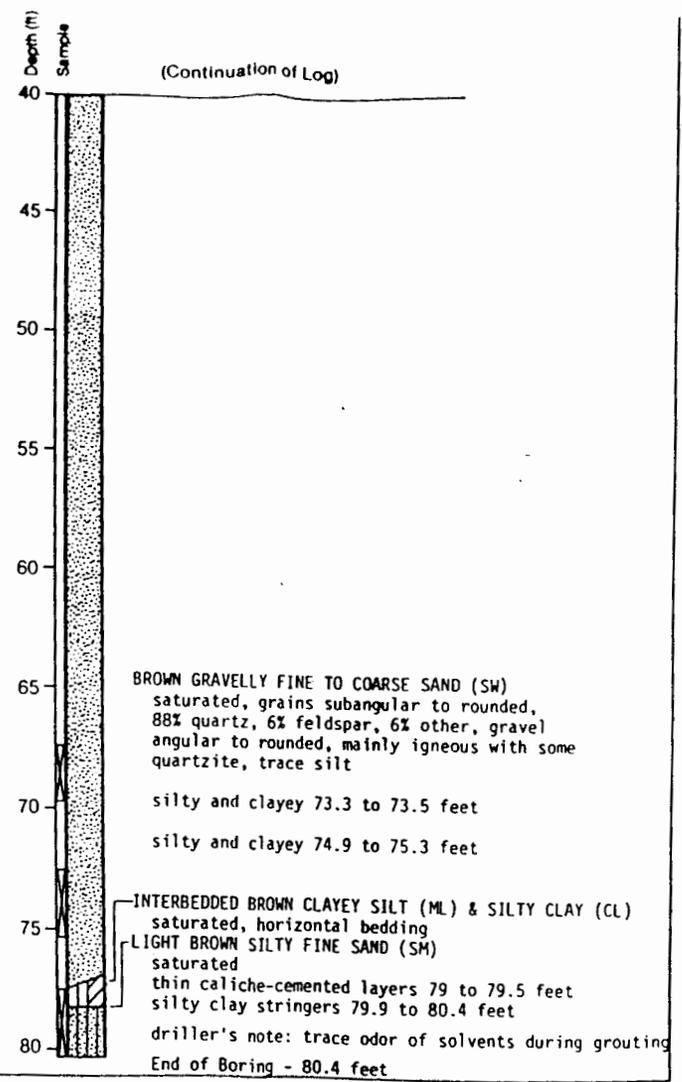
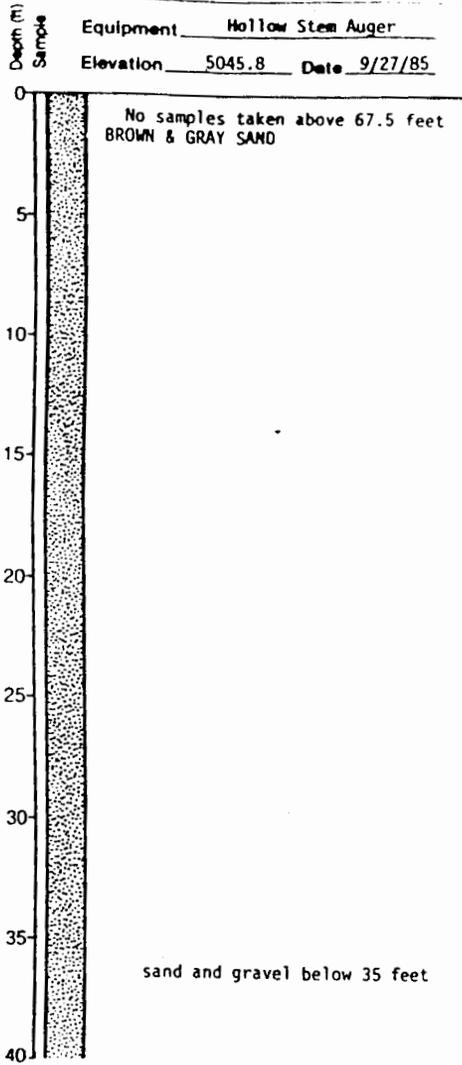
LOG OF BORING B011
 Sparton Technology, Inc.
 Albuquerque, New Mexico

PLATE

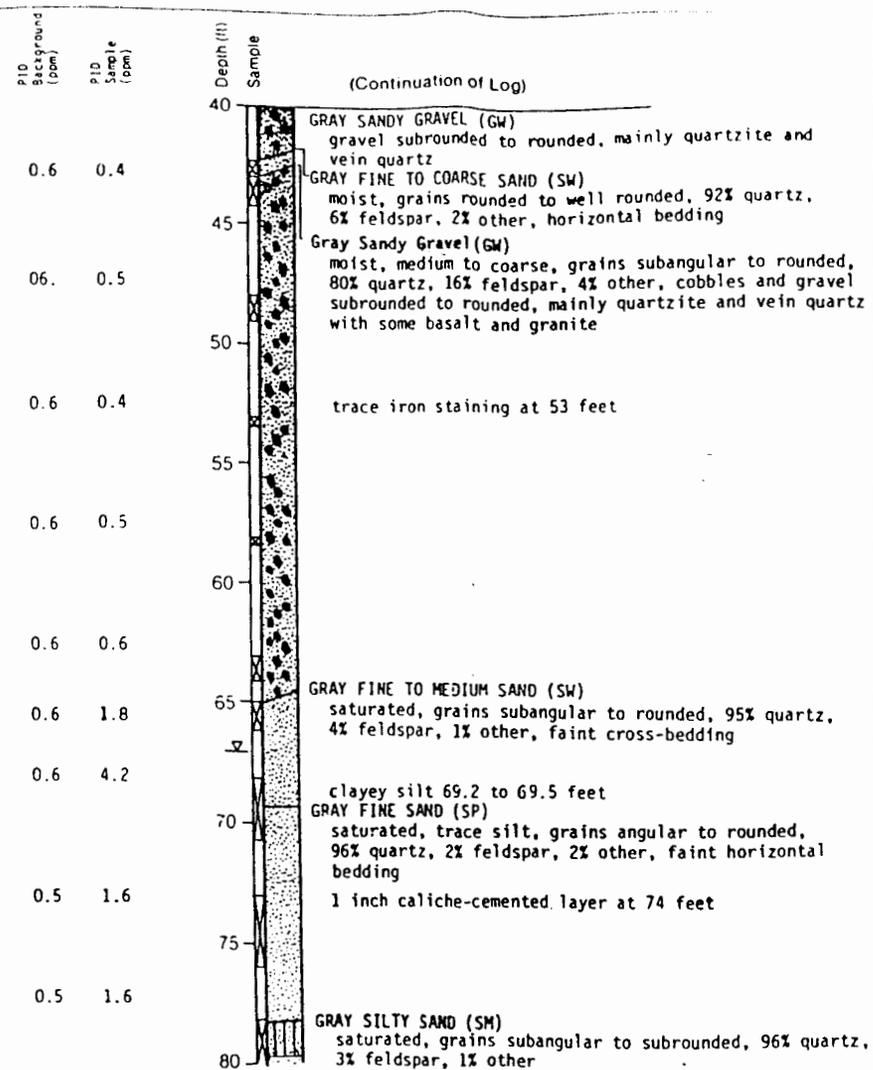
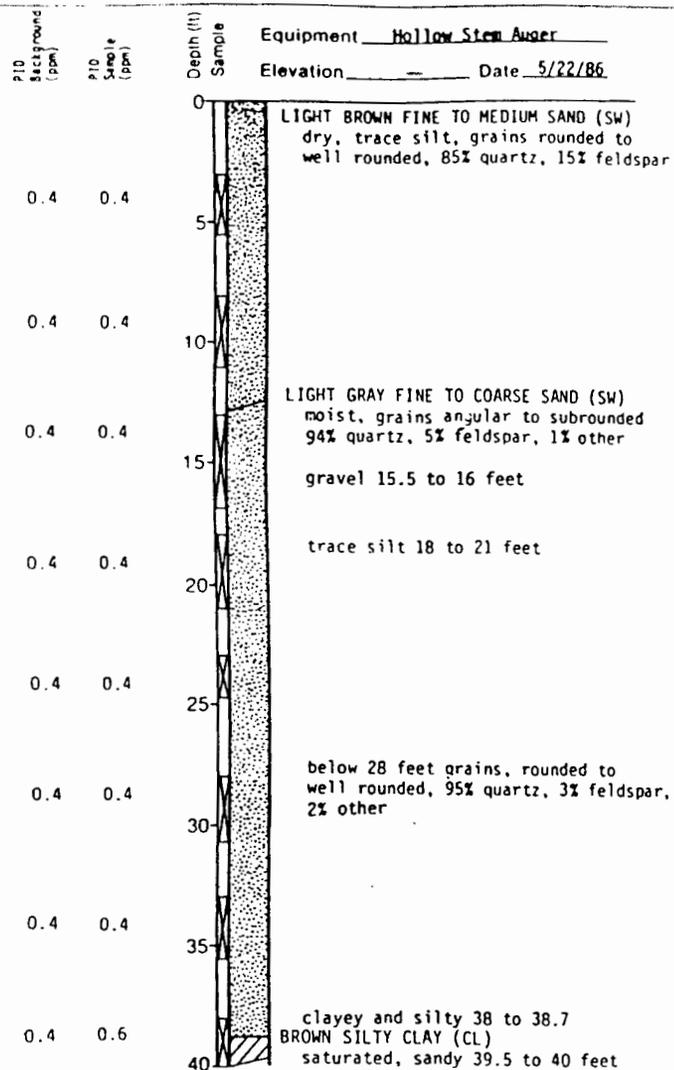
A13

DRAWN EB JOB NUMBER 6310,023.12

APPROVED TJB DATE 6/25/86 REVISION DATE



Harding Lawson Associates Engineers, Geologists & Geophysicists	LOG OF BORING B012 Sparton Technology, Inc. Albuquerque, New Mexico		PLATE A14
	DRAWN <i>ES.</i>	JOB NUMBER 6310,023.12	APPROVED <i>SB</i>
		REVISED	DATE



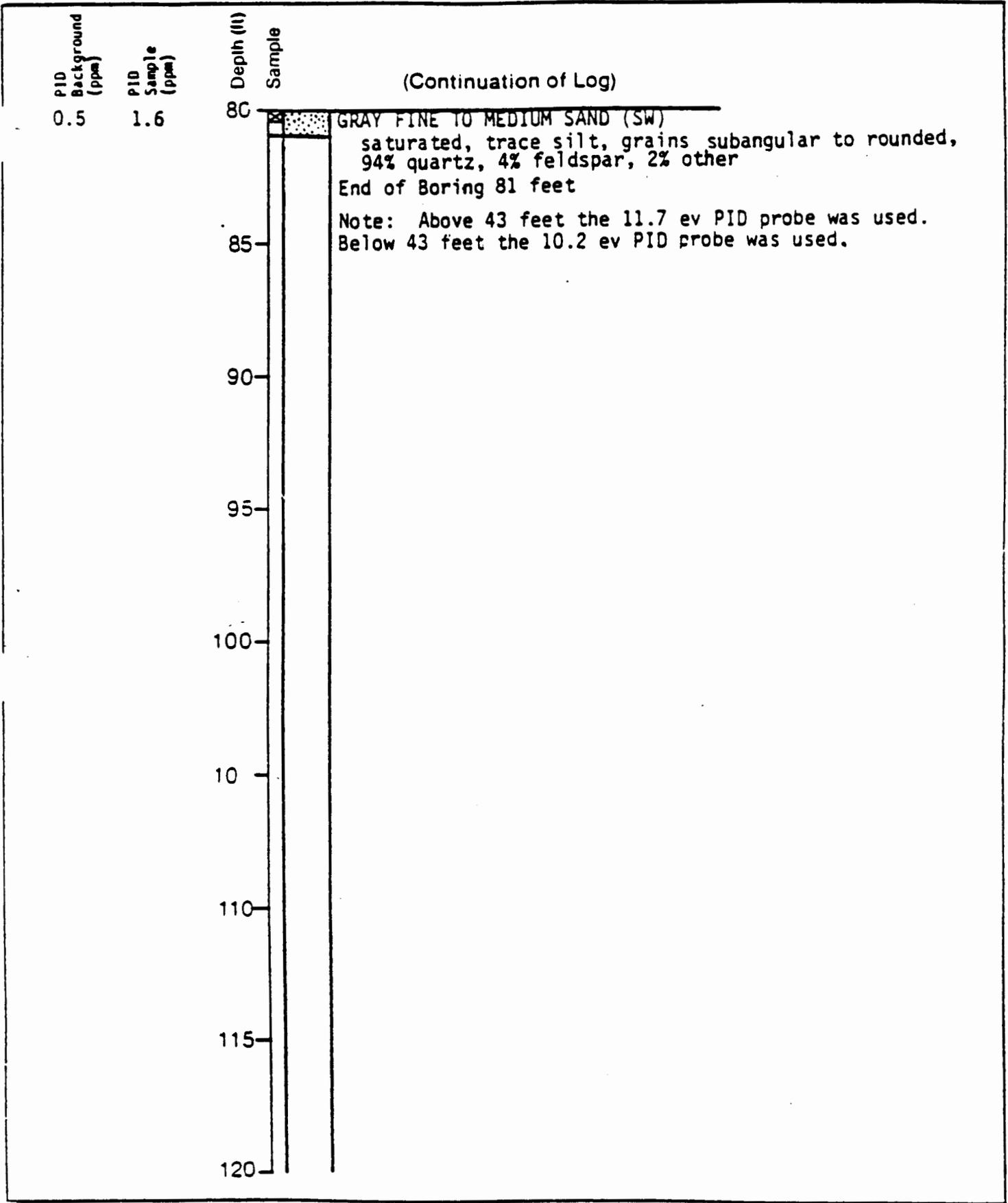
HLA Harding Lawson Associates
 Engineers Geologists
 & Geophysicists

LOG OF BORING MW-18
 Sparton Technology, Inc.
 Albuquerque, New Mexico

PLATE

A15

Drawn ES JOB NUMBER 6310,031.12 APPROVED TJB DATE 6/25/86 REVISIONS _____ DATE _____



Harding Lawson Associates
Engineers, Geologists
& Geophysicists

LOG OF BORING MW-18 (cont.)
Sparton Technology, Inc.
Albuquerque, New Mexico

PLATE

A16

DRAWN
EL

JOB NUMBER
6310,031.12

APPROVED
T.S.B.

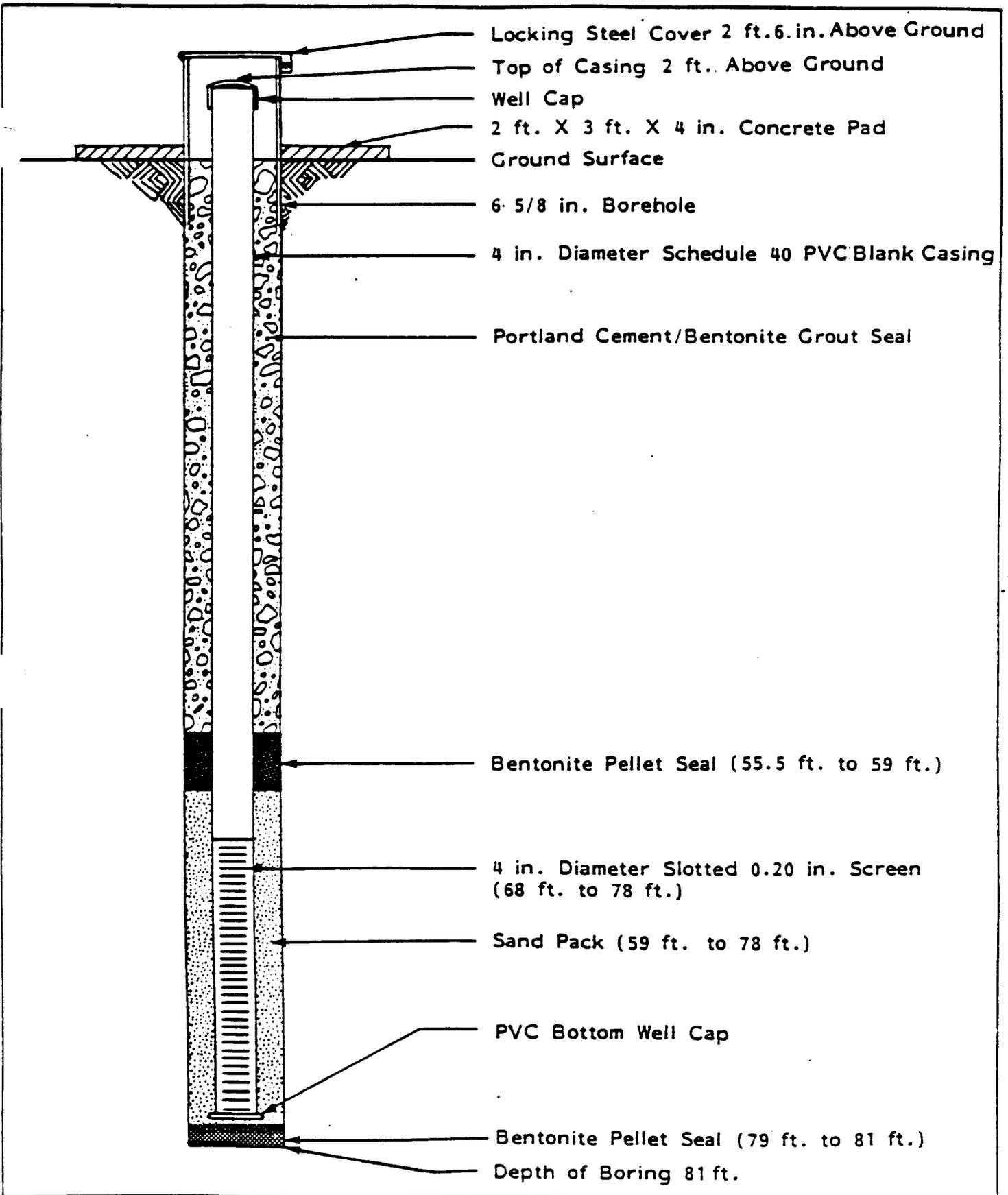
DATE
6/25/86

REVISED

DATE

Appendix A-2

Construction of MW-18



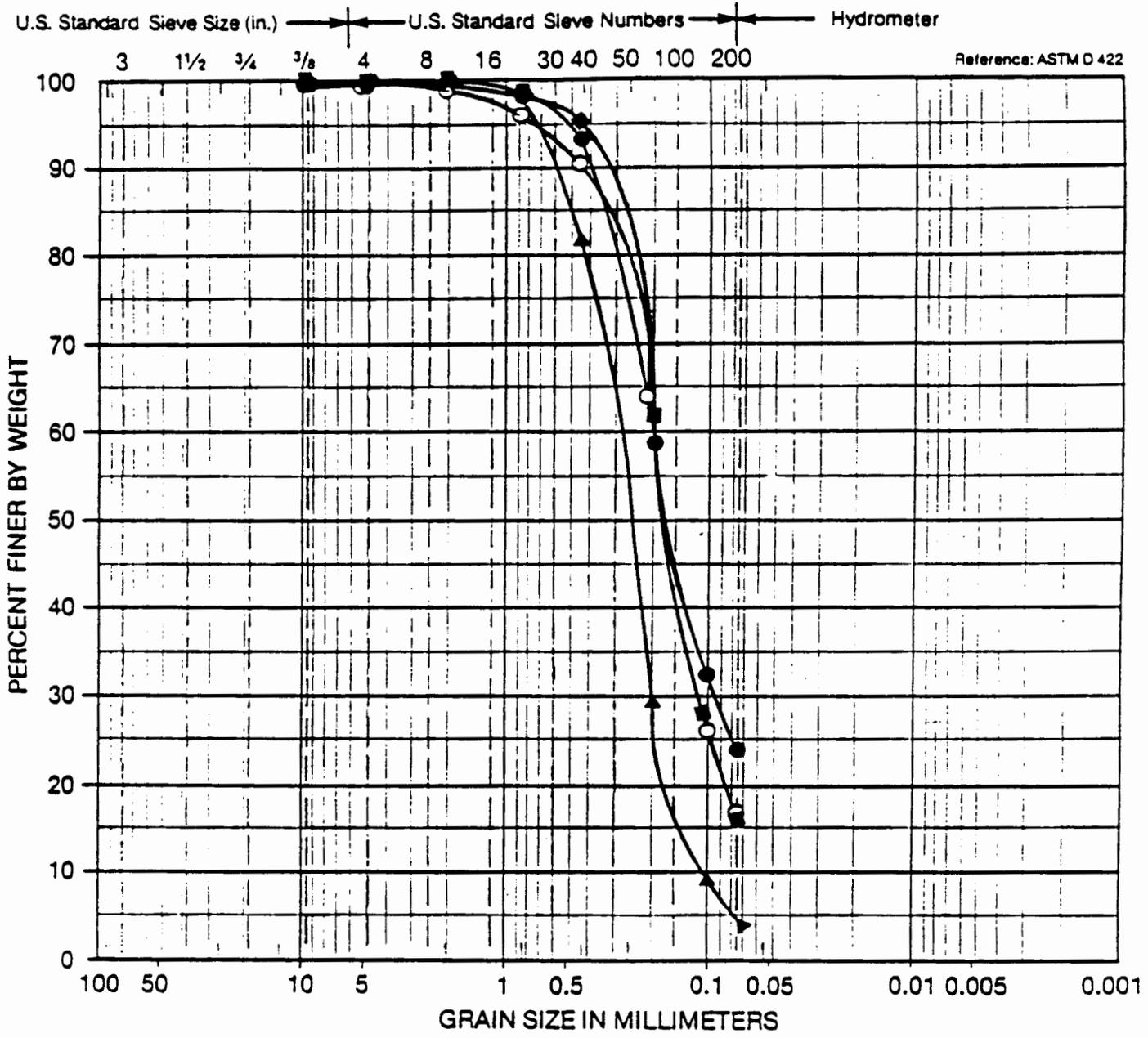
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TYPICAL CONSTRUCTION OF MW-18
 Sparton Technology, Inc.
 Albuquerque, New Mexico

A17

Appendix A-3

Particle Size Analysis



COBBLES	COARSE	FINE	COARSE	MEDIUM	FINE	SILT OR CLAY
	GRAVEL		SAND			

Symbol	Sample Source	Classification
■	B-18 @ 16 - 16.8 feet	BROWN SILTY SAND (SM)
▲	B-18 @ 34 - 35.5 feet	TAN POORLY GRADED SAND (SP)
●	B-18 @ 65 - 65.8 feet	BROWN SILTY SAND (SM)
○	B-18 @ 74 - 75 feet	BROWN SILTY SAND (SM)



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 & Geophysicists

Particle Size Analysis
 Sparton Technology, Inc.
 Albuquerque, New Mexico

PLATE

A18

DRAWN
CL

JOB NUMBER
6310 022 12

APPROVED
[Signature]

DATE
1/2/01

REVISED

DATE

Appendix B. Chemical Laboratory Investigation

1. Sample Identification
2. Analytical Results

Harding Lawson Associates

Appendix B-1

Sample Identification

SAMPLE DESCRIPTION INFORMATION

for

Sparton Technology

<u>RMA Sample No.</u>	<u>Sample Description</u>	<u>Sample Type</u>	<u>Date Sampled</u>	<u>Date Received</u>
51324-01	6310,023.12 4-5' A & B	Soil	9/4/85	9/5/85
51324-02	6310,023.12 9-10' A & B	Soil	9/4/85	9/5/85
51324-03	6310,023.12 14-15' A & B	Soil	9/4/85	9/5/85
51324-04	6310,023.12 18-18.5' A & B	Soil	9/4/85	9/5/85
51324-05	6310,023.12 24-25' A & B	Soil	9/4/85	9/5/85
51324-06	6310,023.12 30.5-31.5' A & B	Soil	9/4/85	9/5/85
51324-07	6310,023.12 35-36' A & B	Soil	9/4/85	9/5/85
51324-08	6310,023.12 39-40' A & B	Soil	9/5/85	9/6/85
51324-09	6310,023.12 44-45' A & B	Soil	9/5/85	9/6/85
51324-10	6310,023.12 47.5-52' A & B	Soil	9/5/85	9/6/85
51324-11	6310,023.12 54.5-55.5' A & B	Soil	9/5/85	9/6/85
51324-12	6310,023.12 58.5-59' A & B	Soil	9/5/85	9/6/85
51324-13	6310,023.12 63-64' A & B	Soil	9/5/85	9/6/85
51324-14	6310,023.12 37.3-52.3; 55.5-56.5'	Soil	9/5/85	9/6/85
51324-15	6310,023.12 5.0-5.5' A & B	Soil	9/9/85	9/10/85
51324-16	6310,023.12 11-11.5' A & B	Soil	9/9/85	9/10/85
51324-17	6310,023.12 13.5-14.5' A & B	Soil	9/9/85	9/10/85
51324-18	6310,023.12 18.5-19.5' A & B	Soil	9/9/85	9/10/85
51324-19	6310,023.12 23-24' A & B	Soil	9/9/85	9/10/85
51324-20	6310,023.12 28-33' A & B	Soil	9/9/85	9/10/85
51324-21	6310,023.12 33.5-34.5' A & B	Soil	9/9/85	9/10/85
51324-22	6310,023.12 39-39.5' A & B	Soil	9/9/85	9/10/85

SAMPLE DESCRIPTION INFORMATION

for

Sparton Technology

<u>RMA Sample No.</u>	<u>Sample Description</u>	<u>Sample Type</u>	<u>Date Sampled</u>	<u>Date Received</u>
51324-23	6310,023.12 44-45' A & B	Soil	9/9/85	9/10/85
51324-24	6310,023.12 49-50' A & B	Soil	9/9/85	9/10/85
51324-25	6310,023.12 53-54.5' A & B	Soil	9/9/85	9/10/85
51324-26	6310,023.12 58-59' A & B	Soil	9/9/85	9/10/85
51324-27	6310,023.12 65-66' A & B	Soil	9/9/85	9/10/85
51324-28	6310,023.12 4.5-5.5' A & B	Soil	9/10/85	9/11/85
51324-29	6310,023.12 10-11' A & B	Soil	9/10/85	9/11/85
51324-30	6310,023.12 13.5-14.5' A & B	Soil	9/10/85	9/11/85
51324-31	6310,023.12 18.3-19' A & B	Soil	9/10/85	9/11/85
51324-32	6310,023.12 30.5-31.5' A & B	Soil	9/10/85	9/11/85
51324-33	6310,023.12 35.5-36.5' A & B	Soil	9/10/85	9/11/85
51324-34	6310,023.12 38.3-39' A & B	Soil	9/11/85	9/12/85
51324-35	6310,023.12 44.5-45.5' A & B	Soil	9/11/85	9/12/85
51324-36	6310,023.12 49-50' A & B	Soil	9/11/85	9/12/85
51324-37	6310,023.12 53.5-54.5' A & B	Soil	9/11/85	9/12/85
51324-38	6310,023.12 58.5-59.5' A & B	Soil	9/11/85	9/12/85
51324-39	6310,023.12 66.3-67' A & B	Soil	9/11/85	9/12/85
51324-40	6310,023.12 4.5-5.5' A & B	Soil	9/12/85	9/13/85
51324-41	6310,023.12 9-10' A & B	Soil	9/12/85	9/13/85
51324-42	6310,023.12 14-15' A & B	Soil	9/12/85	9/13/85
51324-43	6310,023.12 19.5-20.5' A & B	Soil	9/12/85	9/13/85
51324-44	6310,023.12 24.5-25.5' A & B	Soil	9/12/85	9/13/85

SAMPLE DESCRIPTION INFORMATION

for

Sparton Technology

<u>RMA Sample No.</u>	<u>Sample Description</u>	<u>Sample Type</u>	<u>Date Sampled</u>	<u>Date Received</u>
51324-67	6310,023.12 44-44.5' A & B	Soil	9/17/85	9/18/85
51324-68	6310,023.12 49-50' A & B	Soil	9/17/85	9/18/85
51324-69	6310,023.12 59-59.5' A & B	Soil	9/17/85	9/18/85
51324-70	6310,023.12 4.5-5.5' A & B	Soil	9/18/85	9/19/85
51324-71	6310,023.12 10.5-11' A & B	Soil	9/18/85	9/19/85
51324-72	6310,023.12 15-16' A & B	Soil	9/18/85	9/19/85
51324-73	6310,023.12 18.2-18.8' A & B	Soil	9/18/85	9/19/85
51324-74	6310,023.12 25-26' A & B	Soil	9/18/85	9/19/85
51324-75	6310,023.12 30-31' A & B	Soil	9/18/85	9/19/85
51324-76	6310,023.12 35.5-36.5' A & B	Soil	9/18/85	9/19/85
51324-77	6310,023.12 39-40' A & B	Soil	9/19/85	9/20/85
51324-78	6310,023.12 43-44' A & B	Soil	9/19/85	9/20/85
51324-79	6310,023.12 49.5-50.5' A & B	Soil	9/19/85	9/20/85
51324-80	6310,023.12 57-57.5' A & B	Soil	9/19/85	9/20/85
51324-81	6310,023.12 53.5-59.5' A & B	Soil	9/19/85	9/20/85
51324-82	6310,023.12 5-6' A & B	Soil	9/20/85	9/21/85
51324-83	6310,023.12 9-10' A & B	Soil	9/20/85	9/21/85
51324-84	6310,023.12 14.5-15.5' A & B	Soil	9/20/85	9/21/85
51324-85	6310,023.12 20.5-21.5' A & B	Soil	9/20/85	9/21/85
51324-86	6310,023.12 24.5-25.5' A & B	Soil	9/21/85	9/23/85
51324-87	6310,023.12 30-31' A & B	Soil	9/21/85	9/23/85
51324-88	6310,023.12 35-36' A & B	Soil	9/21/85	9/23/85

SAMPLE DESCRIPTION INFORMATION

for

Sparton Technology

<u>RMA Sample No.</u>	<u>Sample Description</u>	<u>Sample Type</u>	<u>Date Sampled</u>	<u>Date Received</u>
51324-89	6310,023.12 40.5-41.5' A & B	Soil	9/21/85	9/23/85
51324-90	6310,023.12 44-44.5' A & B	Soil	9/21/85	9/23/85
51324-91	6310,023.12 48.3-49.3' A & B	Soil	9/21/85	9/23/85
51324-92	6310,023.12 53.5-55' A & B	Soil	9/21/85	9/23/85
51324-93	6310,023.12 58-59.2' A & B	Soil	9/21/85	9/23/85
51324-94	6310,023.12 4.5-5.5' A & B	Soil	9/23/85	9/24/85
51324-95	6310,023.12 10-11' A & B	Soil	9/23/85	9/24/85
51324-96	6310,023.12 15-15.5' A & B	Soil	9/23/85	9/24/85
51324-97	6310,023.12 20.5-21' A & B	Soil	9/23/85	9/24/85
51324-98	6310,023.12 25.5-26' A & B	Soil	9/23/85	9/24/85
51324-99	6310,023.12 30.5-31.5' A & B	Soil	9/23/85	9/24/85
51324-100	6310,023.12 35-36' A & B	Soil	9/23/85	9/24/85
51324-101	6310,023.12 39.5-40.5' A & B	Soil	9/23/85	9/24/85
51324-102	6310,023.12 43.1-44.2' A & B	Soil	9/23/85	9/24/85
51324-103	6310,023.12 54.2-54.7' A & B	Soil	9/23/85	9/24/85
51324-104	6310,023.12 58.2-59.4' A & B	Soil	9/23/85	9/24/85
51324-105*	6310,023.12 4-5' A & B	Soil	9/24/85	9/25/85
51324-106	6310,023.12 9-10' A & B	Soil	9/24/85	9/25/85
51324-107	6310,023.12 13.5-14' A & B	Soil	9/24/85	9/25/85
51324-108	6310,023.12 20-21' A & B	Soil	9/24/85	9/25/85
51324-109	6310,023.12 25.5-26' A & B	Soil	9/24/85	9/25/85
51324-110	6310,023.12 29-30' A & B	Soil	9/24/85	9/25/85

SAMPLE DESCRIPTION INFORMATION

for

Sparton Technology

<u>RMA Sample No.</u>	<u>Sample Description</u>	<u>Sample Type</u>	<u>Date Sampled</u>	<u>Date Received</u>
51324-111	6310,023.12 35-36' A & B	Soil	9/24/85	9/25/85
51324-112	6310,023.12 40-41' A & B	Soil	9/24/85	9/25/85
51324-113	6310,023.12 44-45' A & B	Soil	9/24/85	9/25/85
51324-114	6310,023.12 48.5-49' A & B	Soil	9/25/85	9/26/85
51324-115	6310,023.12 53-53.5' A & B	Soil	9/25/85	9/26/85
51324-116	6310,023.12 5.5-6.5' A & B	Soil	9/26/85	9/27/85
51324-117	6310,023.12 10.5-11.5' A & B	Soil	9/26/85	9/27/85
51324-118	6310,023.12 15.5-16.5' A & B	Soil	9/26/85	9/27/85
51324-119	6310,023.12 20.5-21' A & B	Soil	9/26/85	9/27/85
51324-120	6310,023.12 27-27.5' A & B	Soil	9/26/85	9/27/85
51324-121	6310,023.12 29.5-30.5' A & B	Soil	9/26/85	9/27/85
51324-122	6310,023.12 36.5-37.5' A & B	Soil	9/26/85	9/27/85
51324-123	6310,023.12 41.5-42.5' A & B	Soil	9/26/85	9/27/85
51324-124	6310,023.12 49-49.7' A & B	Soil	9/26/85	9/27/85
51324-125	6310,023.12 58.3-59' A & B	Soil	9/26/85	9/27/85
51324-126	6310,023.12 59.3-60.3' A & B	Soil	9/26/85	9/27/85
51324-127	6310,023.12 26-28', 29-30.5', 34-37.5' A & B	Soil	9/26/85	9/27/85

Appendix B-2

Analytical Results

REPORT OF ANALYTICAL DATA
FOR
HARDING LAWSON ASSOCIATES

Prepared by:

Rocky Mountain Analytical Laboratory
5530 Marshall Street
Arvada, Colorado 80002
(303) 421-6611

January 29, 1986

SPARTON TECHNOLOGY

BORE 001

TABLE 1. TOTAL ORGANIC HALOGEN (TOX) RESULTS - BORE 001

<u>Bore Depth (ft.)</u>	<u>Detection Limit (mg/kg)</u>	<u>TOX Conc. (mg/kg)</u>
4.0-5.0	2	ND
9.0-10.0	2	ND
14.0-15.0	2	ND
18.0-18.5	2	ND
24.0-25.0	2	ND
30.5-31.5	2	ND
35.0-36.0	2	ND
39.0-40.0	2	ND
44.0-45.0	2	ND
47.5-52.0	2	ND
52.5-53.0	2	NR
54.5-56.5	2	ND
58.0-59.0	2	ND
63.0-64.0	2	ND

ND = Not Detected.

NR = Not Received.

TABLE 2. TOTAL METALS RESULTS - BORE 001

<u>Bore Depth (ft.)</u>	<u>Concentration (mg/kg)</u>			
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>
4.0-5.0	ND	1.8	4.0	2.1
9.0-10.0	ND	1.9	3.0	2.2
14.0-15.0	ND	1.8	3.0	1.6
18.0-18.5	ND	2.5	3.0	2.2
24.0-25.0	ND	1.6	4.0	2.0
30.5-31.5	ND	1.7	3.0	2.0
35.0-36.0	ND	2.2	4.0	2.3
39.0-40.0	ND	2.2	3.0	2.3
44.0-45.0	ND	1.6	3.0	2.7
47.5-52.0	ND	2.4	4.0	2.6
52.5-53.0	ND	NR	NR	NR
54.5-56.5	ND	2.4	4.0	2.8
58.0-59.0	ND	1.6	3.0	2.0
63.0-64.0	ND	1.3	3.0	2.0
Detection Limit	1.0	0.5	2.5	1.0
RCRA MCL	1.0	5.0	5.0	NA

ND = Not Detected.

NR = Not Received.

NA = Not Applicable.

MCL = Maximum Contaminant Level.

TABLE 3. EP TOXICITY RCRA METALS - BORE 001

<u>Bore Depth (ft)</u>	<u>Concentration (mg/L)</u>					
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>	<u>Hexavalent Chromium</u>	<u>Trivalent Chromium</u>
4.0-5.0	ND	ND	ND	ND	ND	ND
18.0-18.5	0.005	ND	ND	ND	ND	ND
47.5-52.0	0.005	0.009	ND	0.063	ND	ND
54.5-56.5	ND	ND	ND	ND	ND	ND
Detection Limit	0.004	0.005	0.025	0.01	0.01	0.01
RCRA MCL	1.0	5.0	5.0	NA	NA	NA

ND = Not Detected. NA = Not Applicable.
MCL = Maximum Contaminant Level.

TABLE 4. VOLATILE ORGANICS- BORE 001

<u>Parameter</u>	<u>Concentration (ug/kg)</u>	
	<u>Detection Limit</u>	<u>Bore Depth 58.9-59.0'</u>
Acetone	10	BDL
Benzene	5	BDL
Bromoform	5	BDL
Methyl bromide	10	BDL
2-Butanone	10	BDL
Carbon disulfide	5	BDL
Carbon tetrachloride	5	BDL
Chlorobenzene	5	BDL
Chlorodibromomethane	5	BDL
Chloroethane	10	BDL
2-Chloroethylvinyl ether	10	BDL
Chloroform	5	BDL
Methyl chloride	10	BDL
Dichlorobromomethane	5	BDL
1,1-Dichloroethane	5	BDL
1,2-Dichloroethane	5	BDL
1,1-Dichloroethylene	5	BDL
1,2-Dichloropropane	5	BDL
cis-1,3-Dichloropropylene	5	BDL
trans-1,3-Dichloropropylene	5	BDL
Ethylbenzene	5	BDL
2-Hexanone	10	BDL
Methylene chloride	10	BDL
4-Methyl-2-pentanone	10	BDL
Styrene	5	BDL
1,1,2,2-Tetrachloroethane	5	BDL
Tetrachloroethylene	5	BDL
Toluene	5	BDL
1,2-trans-Dichloroethylene	5	BDL
1,1,1-Trichloroethane	5	BDL
1,1,2-Trichloroethane	5	BDL
Trichloroethylene	5	BDL
Vinyl acetate	10	BDL
Vinyl chloride	10	BDL
Total xylenes	5	BDL
Percent Moisture	0.1	6.2

BDL = Below Detection Limit

SPARTON TECHNOLOGY

BORE 002

TABLE 1. TOTAL ORGANIC HALOGEN (TOX) RESULTS - BORE 002

<u>Bore Depth (ft.)</u>	<u>Detection Limit (mg/kg)</u>	<u>TOX Conc. (mg/kg)</u>
4.5-5.5	2	ND
10.5-11.5	2	ND
14.5-15.5	2	ND
19.5-20.5	2	ND
30.0-31.0	2	ND
35.0-35.5	2	ND
40.0-41.0	2	ND
44.0-44.5	2	ND
49.0-50.0	2	ND
59.0-59.5	2	3

ND = Not Detected.

TABLE 2. PURGEABLE ORGANICS RESULTS - BORE 002

<u>Parameter</u>	<u>Concentration (ug/kg)</u>	
	<u>Detection Limit</u>	<u>TOX 59.0-59.5'</u>
1,1-Dichloroethylene	0.5	ND
1,2-trans-Dichloroethylene	0.5	ND
1,1,1-Trichloroethane	0.5	ND
Trichloroethylene	0.5	ND

ND = Not Detected.

TABLE 3. TOTAL METALS RESULTS - BORE 002

<u>Bore Depth (ft)</u>	<u>Concentration (mg/kg)</u>			
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>
4.5-5.5	ND	2.8	3.0	2.0
10.0-11.5	ND	3.0	5.5	2.6
14.5-15.5	ND	2.9	4.0	2.0
19.5-20.5	ND	2.4	4.0	2.0
30.0-31.0	ND	2.6	ND	2.3
35.0-35.5	ND	6.6	5.7	5.3
40.0-41.0	ND	7.1	7.2	8.2
44.0-44.5	ND	2.2	ND	2.0
49.0-50.0	ND	4.9	4.0	5.3
59.0-59.5	ND	3.1	3.0	3.3
Detection Limits	1.0	0.5	2.5	1.0
RCRA MCL	1.0	5.0	5.0	NA

ND = Not Detected.

NR = Not Received.

NA = Not Applicable.

MCL = Maximum Contaminant Level.

TABLE 4. EP TOXICITY RCRA METALS - BORE 002

<u>Bore Depth (ft)</u>	<u>Concentration (mg/L)</u>					
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>	<u>Hexavalent Chromium</u>	<u>Trivalent Chromium</u>
10.5-11.5	ND	0.026	ND	ND	ND	0.026
35.0-35.5	ND	0.088	ND	ND	0.02	0.068
40.0-41.0	ND	0.011	ND	0.028	ND	0.01
49.0-50.0	ND	0.012	ND	0.029	ND	0.01
59.0-59.5	ND	ND	ND	ND	ND	ND
Detection Limit	0.004	0.005	0.025	0.01	0.01	0.01
RCRA MCL	1.0	5.0	5.0	NA	NA	NA

ND = Not Detected.

NA = Not Applicable.

MCL = Maximum Contaminant Level.

TABLE 5. VOLATILE ORGANICS- BORE 002

<u>Parameter</u>	<u>Concentration (ug/kg)</u>			
	<u>Detection limit</u>	<u>Bore Depth 35.0-35.5'</u>	<u>Bore Depth 40.0-41.0'</u>	<u>Bore Depth 44.0-44.5'</u>
Acetone	10	BDL	BDL	BDL
Benzene	5	BDL	BDL	BDL
Bromoform	5	BDL	BDL	BDL
Methyl bromide	10	BDL	BDL	BDL
2-Butanone	10	BDL	BDL	BDL
Carbon disulfide	5	BDL	BDL	BDL
Carbon tetrachloride	5	BDL	BDL	BDL
Chlorobenzene	5	BDL	BDL	BDL
Chlorodibromomethane	5	BDL	BDL	BDL
Chloroethane	10	BDL	BDL	BDL
2-Chloroethylvinyl ether	10	BDL	BDL	BDL
Chloroform	5	BDL	BDL	BDL
Methyl chloride	10	BDL	BDL	BDL
Dichlorobromomethane	5	BDL	BDL	BDL
1,1-Dichloroethane	5	BDL	BDL	BDL
1,2-Dichloroethane	5	BDL	BDL	BDL
1,1-Dichloroethylene	5	BDL	BDL	BDL
1,2-Dichloropropane	5	BDL	BDL	BDL
cis-1,3-Dichloropropylene	5	BDL	BDL	BDL
trans-1,3-Dichloropropylene	5	BDL	BDL	BDL
Ethylbenzene	5	BDL	BDL	BDL
2-Hexanone	10	BDL	BDL	BDL
Methylene chloride	10	BDL	BDL	BDL
4-Methyl-2-pentanone	10	BDL	BDL	BDL
Styrene	5	BDL	BDL	BDL
1,1,2,2-Tetrachloroethane	5	BDL	BDL	BDL
Tetrachloroethylene	5	BDL	BDL	BDL
Toluene	5	BDL	BDL	BDL
1,2-trans-Dichloroethylene	5	BDL	BDL	BDL
1,1,1-Trichloroethane	5	BDL	BDL	BDL
1,1,2-Trichloroethane	5	BDL	BDL	BDL
Trichloroethylene	5	BDL	BDL	BDL
Vinyl acetate	10	BDL	BDL	BDL
Vinyl chloride	10	BDL	BDL	BDL
Total xylenes	5	BDL	BDL	BDL
Percent Moisture	0.1	12.0	15.5	2.7

BDL = Below Detection Limit

SPARTON TECHNOLOGY

BORE 003

TABLE 1. TOTAL ORGANIC HALOGEN (TOX) RESULTS - BORE 003

<u>Bore Depth (ft.)</u>	<u>Detection Limit (mg/kg)</u>	<u>TOX Conc. (mg/kg)</u>
4.5-5.5	2	2
20.5-21.5	2	ND
25.0-25.5	2	ND
30.0-31.0	2	3
35.5-36.0	2	3
39.4-40.5	2	3
44.0-45.0	2	4
48.5-49.5	2	ND

ND = Not Detected.

TABLE 2. PURGEABLE ORGANICS RESULTS - BORE 003

<u>Parameter</u>	<u>Detection Limit</u>	<u>Concentration (ug/kg)</u>					
		<u>Bore Depth</u>	<u>Bore Depth</u>	<u>Bore Depth</u>	<u>Bore Depth</u>	<u>Bore Depth</u>	<u>Bore Depth</u>
		<u>4.5- 5.5'</u>	<u>30.0- 31.0'</u>	<u>35.5- 36.0'</u>	<u>39.0- 39.4'</u>	<u>44.0- 45.0'</u>	<u>48.5- 49.5'</u>
1,1-Dichloroethylene	1.0	ND	ND	ND	ND	ND	ND
1,2-trans-Dichloroethylene	0.5	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	2.0	ND	ND	ND	ND	ND	ND
Trichloroethylene	1.0	ND	ND	ND	ND	ND	ND

ND = Not Detected.

TABLE 3. TOTAL METALS RESULTS - BORE 003

<u>Bore Depth (ft)</u>	<u>Concentration (mg/kg)</u>			
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>
4.5-5.5	ND	4.3	4.0	4.0
20.5-21.5	ND	2.6	3.0	2.8
25.0-25.5	ND	2.3	3.0	2.5
30.0-31.0	ND	2.6	ND	3.2
35.5-36.0	ND	2.8	3.0	2.7
39.4-40.5	ND	4.3	4.0	4.7
44.0-45.0	ND	4.2	4.0	4.7
48.5-49.5	ND	2.6	ND	2.3
Detection Limits	1.0	0.5	2.5	1.0
RCRA MCL	1.0	5.0	5.0	NA

ND = Not Detected.

NA = Not Applicable.

MCL = Maximum Contaminant Level.

TABLE 4. EP TOXICITY RCRA METALS - BORE 003

<u>Bore Depth (ft)</u>	<u>Concentration (mg/L)</u>					
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>	<u>Hexavalent Chromium</u>	<u>Trivalent Chromium</u>
4.5-5.5	ND	0.005	ND	ND	ND	ND
35.5-36.0	ND	0.007	ND	ND	ND	ND
39.4-40.5	ND	ND	ND	ND	ND	ND
44.0-45.0	ND	ND	ND	0.02	ND	ND
Detection Limit	0.004	0.005	0.025	0.01	0.01	0.01
RCRA MCL	1.0	5.0	5.0	NA	NA	NA

ND = Not Detected. NA = Not Applicable.

MCL = Maximum Contaminant Level.

TABLE 5. VOLATILE ORGANICS- BORE 003

<u>Parameter</u>	<u>Concentration (ug/kg)</u>			
	<u>Detection Limit</u>	<u>Bore Depth 39.5-40.5'</u>	<u>Bore Depth 44.0-45.0'</u>	<u>Bore Depth 48.5-49.0'</u>
Acetone	10	BDL	BDL	BDL
Benzene	5	BDL	BDL	BDL
Bromoform	5	BDL	BDL	BDL
Methyl bromide	10	BDL	BDL	BDL
2-Butanone	10	BDL	BDL	BDL
Carbon disulfide	5	BDL	BDL	BDL
Carbon tetrachloride	5	BDL	BDL	BDL
Chlorobenzene	5	BDL	BDL	BDL
Chlorodibromomethane	5	BDL	BDL	BDL
Chloroethane	10	BDL	BDL	BDL
2-Chloroethylvinyl ether	10	BDL	BDL	BDL
Chloroform	5	BDL	BDL	BDL
Methyl chloride	10	BDL	BDL	BDL
Dichlorobromomethane	5	BDL	BDL	BDL
1,1-Dichloroethane	5	BDL	BDL	BDL
1,2-Dichloroethane	5	BDL	BDL	BDL
1,1-Dichloroethylene	5	BDL	BDL	BDL
1,2-Dichloropropane	5	BDL	BDL	BDL
cis-1,3-Dichloropropylene	5	BDL	BDL	BDL
trans-1,3-Dichloropropylene	5	BDL	BDL	BDL
Ethylbenzene	5	BDL	BDL	BDL
2-Hexanone	10	BDL	BDL	BDL
Methylene chloride	10	BDL	BDL	BDL
4-Methyl-2-pentanone	10	BDL	BDL	BDL
Styrene	5	BDL	BDL	BDL
1,1,2,2-Tetrachloroethane	5	BDL	BDL	BDL
Tetrachloroethylene	5	BDL	BDL	BDL
Toluene	5	BDL	BDL	BDL
1,2-trans-Dichloroethylene	5	BDL	BDL	BDL
1,1,1-Trichloroethane	5	BDL	BDL	BDL
1,1,2-Trichloroethane	5	BDL	BDL	BDL
Trichloroethylene	5	BDL	BDL	BDL
Vinyl acetate	10	BDL	BDL	BDL
Vinyl chloride	10	BDL	BDL	BDL
Total xylenes	5	BDL	BDL	BDL
Percent Moisture	0.1	2.8	8.8	1.8

BDL = Below Detection Limit

SPARTON TECHNOLOGY

BORE 004

TABLE 1. TOTAL ORGANIC HALOGEN (TOX) RESULTS - BORE 004

<u>Bore Depth (ft.)</u>	<u>Detection Limit (mg/kg)</u>	<u>TOX Conc. (mg/kg)</u>
5.0-6.0	2	ND
9.0-10.0	2	ND
13.5-14.0	2	ND
20.0-21.0	2	ND
25.5-26.0	2	ND
29.0-30.0	2	ND
35.0-36.0	2	ND
40.0-41.0	2	ND
44.0-45.0	2	ND
48.5-49.0	2	ND
53.0-53.5	2	ND

ND = Not Detected.

TABLE 2. TOTAL METALS RESULTS - BORE 004

<u>Bore Depth (ft)</u>	<u>Concentration (mg/kg)</u>			
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>
5.0-6.0	ND	4.5	5.0	3.6
9.0-10.0	ND	2.6	5.1	2.5
13.5-14.0	ND	4.0	4.0	3.9
20.0-21.0	ND	3.7	4.0	2.9
25.5-26.0	ND	7.8	7.3	6.0
29.0-30.0	ND	2.8	4.0	2.5
35.0-36.0	ND	3000	5.0	25
40.0-41.0	ND	58	10	9.4
44.0-45.0	ND	12	3.0	2.5
48.5-49.0	ND	40	14	14
53.0-53.5	ND	9.7	5.4	3.2
Detection Limit	1.0	0.5	2.5	1.0
RCRA MCL	1.0	5.0	5.0	NA

ND = Not Detected.

NR = Not Received.

NA = Not Applicable.

MCL = Maximum Contaminant Level.

TABLE 3. EP TOXICITY RCRA METALS - BORE 004

<u>Bore Depth (ft)</u>	<u>Concentration (mg/L)</u>					
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>	<u>Hexavalent Chromium</u>	<u>Trivalent Chromium</u>
5.0-6.0	0.010	0.010	ND	ND	ND	0.01
9.0-10.0	0.004	ND	ND	ND	ND	ND
13.5-14.0	ND	ND	ND	ND	ND	ND
20.0-21.0	ND	ND	ND	ND	ND	ND
25.5-26.0	ND	ND	ND	ND	ND	ND
29.0-30.0	ND	ND	ND	ND	ND	ND
35.0-36.0	ND	8:4	ND	-0.12	8.0	0.35
40.0-41.0	0.007	0.25	ND	0.025	ND	0.25
44.0-45.0	ND	0.008	ND	ND	ND	ND
48.5-49.0	0.005	0.059	ND	0.046	0.02	0.039
53.0-53.5	ND	ND	ND	ND	ND	ND
Detection Limit	0.004	0.005	0.025	0.01	0.01	0.01
RCRA MCL	1.0	5.0	5.0	NA	NA	NA

ND = Not Detected. NA = Not Applicable.
MCL = Maximum Contaminant Level.

TABLE 4. VOLATILE ORGANICS- BORE 004

Parameter	Detection Limit	Concentration (ug/kg)				
		Bore Depth 20.0-21.0'	Bore Depth 35.0-36.0'	Bore Depth 40.0-41.0'	Bore Depth 44.0-45.0'	Bore Depth 53.0-53.5'
Acetone	10	BDL	BDL	BDL	BDL	BDL
Benzene	5	BDL	BDL	BDL	BDL	BDL
Bromoform	5	BDL	BDL	BDL	BDL	BDL
Methyl bromide	10	BDL	BDL	BDL	BDL	BDL
2-Butanone	10	BDL	BDL	BDL	BDL	BDL
Carbon disulfide	5	BDL	BDL	BDL	BDL	BDL
Carbon tetrachloride	5	BDL	BDL	BDL	BDL	BDL
Chlorobenzene	5	BDL	BDL	BDL	BDL	BDL
Chlorodibromomethane	5	BDL	BDL	BDL	BDL	BDL
Chloroethane	10	BDL	BDL	BDL	BDL	BDL
2-Chloroethylvinyl ether	10	BDL	BDL	BDL	BDL	BDL
Chloroform	5	BDL	BDL	BDL	BDL	BDL
Methyl chloride	10	BDL	BDL	BDL	BDL	BDL
Dichlorobromomethane	5	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethane	5	BDL	BDL	BDL	BDL	BDL
1,2-Dichloroethane	5	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethylene	5	BDL	BDL	BDL	BDL	BDL
1,2-Dichloropropane	5	BDL	BDL	BDL	BDL	BDL
cis-1,3-Dichloropropylene	5	BDL	BDL	BDL	BDL	BDL
trans-1,3-Dichloropropylene	5	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	5	BDL	BDL	BDL	BDL	BDL
2-Hexanone	10	BDL	BDL	BDL	BDL	BDL
Methylene chloride	10	BDL	BDL	BDL	BDL	BDL
4-Methyl-2-pentanone	10	BDL	BDL	BDL	BDL	BDL
Styrene	5	BDL	BDL	BDL	BDL	BDL
1,1,2,2-Tetrachloroethane	5	BDL	BDL	BDL	BDL	BDL
Tetrachloroethylene	5	BDL	BDL	BDL	BDL	BDL
Toluene	5	BDL	BDL	BDL	BDL	BDL
1,2-trans-Dichloroethylene	5	BDL	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane	5	BDL	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane	5	BDL	BDL	BDL	BDL	BDL
Trichloroethylene	5	BDL	BDL	BDL	BDL	BDL
Vinyl acetate	10	BDL	BDL	BDL	BDL	BDL
Vinyl chloride	10	BDL	BDL	BDL	BDL	BDL
Total xylenes	5	BDL	BDL	BDL	BDL	BDL
Percent Moisture	0.1	6.4	8.5	15.7	2.9	3.7

BDL = Below Detection Limit

SPARTON TECHNOLOGY

BORE 005

TABLE 1. TOTAL ORGANIC HALOGEN (TOX) RESULTS - BORE 005

<u>Bore Depth (ft.)</u>	<u>Detection Limit (mg/kg)</u>	<u>TOX Conc. (mg/kg)</u>
4.5-5.5	2	ND
10.0-11.0	2	ND
15.0-15.5	2	ND
20.5-21.0	2	ND
25.5-26.0	2	ND
30.5-31.5	2	ND
35.0-36.0	2	8
39.5-40.0	2	ND
43.1-44.2	2	ND
54.2-54.7	2	ND
58.2-59.4	2	ND

ND = Not Detected.

TABLE 2. PURGEABLE ORGANICS RESULTS - BORE 005

<u>Parameter</u>	<u>Concentration (ug/kg)</u>	
	<u>Detection Limit</u>	<u>Bore Depth 35.0-36.0'</u>
1,1-Dichloroethylene	0.5	ND
1,2-trans-Dichloroethylene	0.5	ND
1,1,1-Trichloroethane	0.5	0.8
Trichloroethylene	0.5	1.5

ND = Not Detected.

TABLE 3. TOTAL METALS RESULTS - BORE 005

<u>Bore Depth (ft)</u>	<u>Concentration (mg/kg)</u>			
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>
4.5-5.5	ND	2.8	5.1	2.8
10.0-11.0	ND	2.8	4.0	2.8
15.0-15.5	ND	2.4	4.0	2.4
20.5-21.0	ND	2.8	4.0	2.7
25.5-26.0	ND	3.1	4.0	3.1
30.5-31.5	ND	2.8	4.0	3.2
35.0-36.0	ND	3.0	8.9	3.3
39.5-40.0	ND	9.2	11	11
43.1-44.2	ND	15	4.0	4.9
54.2-54.7	ND	2.7	4.0	2.9
58.2-59.4	ND	7.7	3.0	3.0
Detection Limit	1.0	0.5	2.5	1.0
RCRA MCL	1.0	5.0	5.0	NA

ND = Not Detected. NA = Not Applicable.
MCL = Maximum Contaminant Level.

TABLE 4. EP TOXICITY RCRA METALS - BORE 005

<u>Bore Depth (ft)</u>	<u>Concentration (mg/L)</u>					
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>	<u>Hexavalent Chromium</u>	<u>Trivalent Chromium</u>
4.5-5.5	ND	ND	ND	ND	ND	ND
25.5-26.0	ND	ND	ND	ND	ND	ND
35.0-36.0	ND	ND	ND	ND	ND	ND
39.5-40.0	ND	ND	ND	0.022	ND	ND
43.1-44.2	ND	ND	ND	ND	ND	ND
58.2-59.4	ND	ND	ND	ND	ND	ND
Detection Limit	0.004	0.005	0.025	0.01	0.01	0.01
RCRA MCL	1.0	5.0	5.0	NA	NA	NA

ND = Not Detected. NA = Not Applicable.
MCL = Maximum Contaminant Level.

TABLE 5. VOLATILE ORGANICS- BORE 005

<u>Parameter</u>	<u>Detection Limit</u>	<u>Concentration (ug/kg)</u>			
		<u>Bore Depth 35.0- 36.0'</u>	<u>Bore Depth 39.5- 40.0'</u>	<u>Bore Depth 43.1- 44.2'</u>	<u>Bore Depth 54.2 54.7'</u>
Acetone	10	BDL	22	BDL	BDL
Benzene	5	BDL	BDL	BDL	BDL
Bromoform	5	BDL	BDL	BDL	BDL
Methyl bromide	10	BDL	BDL	BDL	BDL
2-Butanone	10	BDL	BDL	BDL	BDL
Carbon disulfide	5	BDL	BDL	BDL	BDL
Carbon tetrachloride	5	BDL	BDL	BDL	BDL
Chlorobenzene	5	BDL	BDL	BDL	BDL
Chlorodibromomethane	5	BDL	BDL	BDL	BDL
Chloroethane	10	BDL	BDL	BDL	BDL
2-Chloroethylvinyl ether	10	BDL	BDL	BDL	BDL
Chloroform	5	BDL	BDL	BDL	BDL
Methyl chloride	10	BDL	BDL	BDL	BDL
Dichlorobromomethane	5	BDL	BDL	BDL	BDL
1,1-Dichloroethane	5	BDL	BDL	BDL	BDL
1,2-Dichloroethane	5	BDL	BDL	BDL	BDL
1,1-Dichloroethylene	5	BDL	9	BDL	BDL
1,2-Dichloropropane	5	BDL	BDL	BDL	BDL
cis-1,3-Dichloropropylene	5	BDL	BDL	BDL	BDL
trans-1,3-Dichloropropylene	5	BDL	BDL	BDL	BDL
Ethylbenzene	5	BDL	BDL	BDL	BDL
2-Hexanone	10	BDL	BDL	BDL	BDL
Methylene chloride	10	BDL	BDL	BDL	BDL
4-Methyl-2-pentanone	10	BDL	BDL	BDL	BDL
Styrene	5	BDL	BDL	BDL	BDL
1,1,2,2-Tetrachloroethane	5	BDL	BDL	BDL	BDL
Tetrachloroethylene	5	BDL	BDL	BDL	BDL
Toluene	5	BDL	BDL	BDL	BDL
1,2-trans-Dichloroethylene	5	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane	5	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane	5	BDL	50	BDL	BDL
Trichloroethylene	5	BDL	80	BDL	BDL
Vinyl acetate	10	BDL	BDL	BDL	BDL
Vinyl chloride	10	BDL	BDL	BDL	BDL
Total xylenes	5	BDL	BDL	BDL	BDL
Percent Moisture	0.1	7.8	21.5	4.2	4.1

BDL = Below Detection Limit

SPARTON TECHNOLOGY

BORE 006

TABLE 1. TOTAL ORGANIC HALOGEN (TOX) RESULTS - BORE 006

<u>Bore Depth (ft.)</u>	<u>Detection Limit (mg/kg)</u>	<u>TOX Conc. (mg/kg)</u>
5.0-6.0	2	ND
9.0-10.0	2	ND
14.5-15.5	2	ND
20.5-21.5	2	ND
24.5-25.5	2	ND
30.0-31.0	2	ND
35.0-36.0	2	ND
40.5-41.5	2	ND
44.0-44.5	2	ND
48.3-49.3	2	ND
53.5-55.0	2	ND
58.0-59.2	2	ND

ND = Not Detected.

TABLE 2. TOTAL METALS RESULTS - BORE 006

<u>Bore Depth (ft)</u>	<u>Concentration (mg/kg)</u>			
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>
5.0-6.0	ND	4.8	5.0	3.7
9.0-10.0	ND	2.5	4.0	2.6
14.5-15.5	ND	1.9	4.0	2.2
20.5-21.5	ND	4.2	5.4	4.5
24.5-25.5	ND	5.1	7.3	5.4
30.0-31.0	ND	2.8	5.0	3.4
35.0-36.0	ND	2.7	5.0	2.7
40.5-41.5	ND	8.5	9.7	9.3
44.0-44.5	ND	2.4	4.0	2.7
48.3-49.3	ND	2.1	4.0	2.4
53.5-55.0	ND	3.4	4.0	3.0
58.0-59.2	ND	5.9	4.0	2.9
Detection Limit	1.0	0.5	2.5	1.0
RCRA MCL	1.0	5.0	5.0	NA

ND = Not Detected. NA = Not Applicable.
MCL = Maximum Contaminant Level.

TABLE 3. EP TOXICITY RCRA METALS - BORE 006

<u>Bore Depth (ft)</u>	<u>Concentration (mg/L)</u>					
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>	<u>Hexavalent Chromium</u>	<u>Trivalent Chromium</u>
5.0-6.0	ND	0.011	ND	ND	ND	0.01
20.5-21.5	ND	ND	ND	ND	ND	ND
24.5-25.5	ND	ND	ND	ND	ND	ND
40.5-41.5	0.007	ND	ND	0.028	ND	ND
53.5-55.0	0.004	ND	ND	ND	ND	ND
58.0-59.2	0.004	ND	ND	0.042	ND	ND
Detection Limit	0.004	0.005	0.025	0.01	0.01	0.01
RCRA MCL	1.0	5.0	5.0	NA	NA	NA

ND = Not Detected. NA = Not Applicable.
MCL = Maximum Contaminant Level.

TABLE 4. VOLATILE ORGANICS- BORE 006

<u>Parameter</u>	<u>Concentration (ug/kg)</u>				
	<u>Detection Limit</u>	<u>Bore Depth 30.0-31.0'</u>	<u>Bore Depth 35.0-36.0'</u>	<u>Bore Depth 40.5-41.5'</u>	<u>Bore Depth 44.0-44.5'</u>
Acetone	10	BDL	BDL	BDL	BDL
Benzene	5	BDL	BDL	BDL	BDL
Bromoform	5	BDL	BDL	BDL	BDL
Methyl bromide	10	BDL	BDL	BDL	BDL
2-Butanone	10	BDL	BDL	BDL	BDL
Carbon disulfide	5	BDL	BDL	BDL	BDL
Carbon tetrachloride	5	BDL	BDL	BDL	BDL
Chlorobenzene	5	BDL	BDL	BDL	BDL
Chlorodibromomethane	5	BDL	BDL	BDL	BDL
Chloroethane	10	BDL	BDL	BDL	BDL
2-Chloroethylvinyl ether	10	BDL	BDL	BDL	BDL
Chloroform	5	BDL	BDL	BDL	BDL
Methyl chloride	10	BDL	BDL	BDL	BDL
Dichlorobromomethane	5	BDL	BDL	BDL	BDL
1,1-Dichloroethane	5	BDL	BDL	BDL	BDL
1,2-Dichloroethane	5	BDL	BDL	BDL	BDL
1,1-Dichloroethylene	5	BDL	BDL	BDL	BDL
1,2-Dichloropropane	5	BDL	BDL	BDL	BDL
cis-1,3-Dichloropropylene	5	BDL	BDL	BDL	BDL
trans-1,3-Dichloropropylene	5	BDL	BDL	BDL	BDL
Ethylbenzene	5	BDL	BDL	BDL	BDL
2-Hexanone	10	BDL	BDL	BDL	BDL
Methylene chloride	10	BDL	BDL	BDL	BDL
4-Methyl-2-pentanone	10	BDL	BDL	BDL	BDL
Styrene	5	BDL	BDL	BDL	BDL
1,1,2,2-Tetrachloroethane	5	BDL	BDL	BDL	BDL
Tetrachloroethylene	5	BDL	BDL	BDL	BDL
Toluene	5	BDL	BDL	BDL	BDL
1,2-trans-Dichloroethylene	5	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane	5	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane	5	BDL	BDL	BDL	BDL
Trichloroethylene	5	BDL	BDL	BDL	BDL
Vinyl acetate	10	BDL	BDL	BDL	BDL
Vinyl chloride	10	BDL	BDL	BDL	BDL
Total xylenes	5	BDL	BDL	BDL	BDL
Percent Moisture	0.1	4.1	3.2	14.6	2.5

BDL = Below Detection Limit

SPARTON TECHNOLOGY

BORE 007

TABLE 1. TOTAL ORGANIC HALOGEN (TOX) RESULTS - BORE 007

<u>Bore Depth (ft.)</u>	<u>Detection Limit (mg/kg)</u>	<u>TOX Conc. (mg/kg)</u>
4.5-5.5	2	ND
10.5-11.0	2	ND
15.0-16.0	2	ND
18.2-18.8	2	ND
25.0-26.0	2	ND
30.0-31.0	2	ND
35.5-36.5	2	ND
39.0-40.0	2	ND
43.0-44.0	2	3
49.5-50.5	2	2
57.0-57.5	2	ND
58.5-59.5	2	ND

ND = Not Detected.

TABLE 2. PURGEABLE ORGANICS RESULTS - BORE 007

<u>Parameter</u>	<u>Concentration (ug/kg)</u>		
	<u>Detection Limit</u>	<u>Bore Depth 43.0-44.0'</u>	<u>Bore Depth 49.5-50.5'</u>
1,1-Dichloroethylene	6	ND	ND
1,2-trans-Dichloroethylene	6	ND	ND
1,1,1-Trichloroethane	6	140	530
Trichloroethylene	6	380	990

ND = Not Detected.

TABLE 3. TOTAL METALS RESULTS - BORE 007

<u>Bore Depth (ft)</u>	<u>Concentration (mg/kg)</u>			
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>
4.5-5.5	ND	3.1	3.0	2.2
10.5-11.0	ND	2.2	ND	2.0
15.0-16.0	ND	2.7	ND	2.0
18.2-18.8	ND	1.8	ND	2.0
25.0-26.0	ND	3.2	5.0	3.7
30.0-31.0	ND	2.5	5.0	3.3
35.5-36.5	ND	3.6	5.0	4.6
39.0-40.0	ND	4.7	5.6	4.9
43.0-44.0	ND	21	12	13
49.5-50.5	ND	19	12	14
57.0-57.5	ND	4.2	4.0	3.5
58.5-59.5	ND	4.7	4.0	2.7
Detection Limit	1.0	0.5	2.5	1.0
RCRA MCL	1.0	5.0	5.0	NA

ND = Not Detected. NA = Not Applicable.
MCL = Maximum Contaminant Level.

TABLE 4. EP TOXICITY RCRA METALS - BORE 007

<u>Bore Depth (ft)</u>	<u>Concentration (mg/L)</u>					
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>	<u>Hexavalent Chromium</u>	<u>Trivalent Chromium</u>
4.5-5.5	ND	ND	ND	ND	ND	ND
35.5-36.5	ND	ND	ND	ND	ND	ND
39.0-40.0	ND	ND	ND	0.012	ND	ND
43.0-44.0	ND	ND	ND	0.060	ND	ND
49.5-50.5	ND	0.062	ND	0.063	0.03	0.032
57.0-57.5	ND	0.011	ND	ND	ND	0.01
58.5-59.5	ND	0.013	ND	ND	ND	0.01
Detection Limit	0.004	0.005	0.025	0.01	0.01	0.01
RCRA MCL	1.0	5.0	5.0	NA	NA	NA

ND = Not Detected. NA = Not Applicable.
MCL = Maximum Contaminant Level.

TABLE 5. VOLATILE ORGANICS- BORE 007

Parameter	Concentration (ug/kg)					
	Detection Limit	Bore Depth 25.0-26.0'	Bore Depth 35.5-38.5'	Bore Depth 39.0-40.0'	Bore Depth 43.0-44.0'	Bore 49.5
Acetone	10	22	BDL	14	17	B
Benzene	5	BDL	BDL	BDL	BDL	B
Bromoform	5	BDL	BDL	BDL	BDL	B
Methyl bromide	10	BDL	BDL	BDL	BDL	B
2-Butanone	10	BDL	BDL	BDL	BDL	B
Carbon disulfide	5	BDL	BDL	BDL	BDL	B
Carbon tetrachloride	5	BDL	BDL	BDL	BDL	B
Chlorobenzene	5	BDL	BDL	BDL	BDL	B
Chlorodibromomethane	5	BDL	BDL	BDL	BDL	B
Chloroethane	10	BDL	BDL	BDL	BDL	B
2-Chloroethylvinyl ether	10	BDL	BDL	BDL	BDL	B
Chloroform	5	BDL	BDL	BDL	BDL	B
Methyl chloride	10	BDL	BDL	BDL	BDL	B
Dichlorobromomethane	5	BDL	BDL	BDL	BDL	B
1,1-Dichloroethane	5	BDL	BDL	BDL	BDL	B
1,2-Dichloroethane	5	BDL	BDL	BDL	BDL	B
1,1-Dichloroethylene	5	BDL	BDL	BDL	BDL	B
1,2-Dichloropropane	5	BDL	BDL	BDL	BDL	B
cis-1,3-Dichloropropylene	5	BDL	BDL	BDL	BDL	B
trans-1,3-Dichloropropylene	5	BDL	BDL	BDL	BDL	B
Ethylbenzene	5	BDL	BDL	BDL	BDL	B
2-Hexanone	10	BDL	BDL	BDL	BDL	B
Methylene chloride	10	BDL	BDL	BDL	BDL	B
4-Methyl-2-pentanone	10	BDL	BDL	BDL	BDL	B
Styrene	5	BDL	BDL	BDL	BDL	B
1,1,2,2-Tetrachloroethane	5	BDL	BDL	BDL	9	2
Tetrachloroethylene	5	BDL	BDL	BDL	BDL	B
Toluene	5	BDL	BDL	BDL	BDL	5
1,2-trans-Dichloroethylene	5	BDL	BDL	BDL	BDL	B
1,1,1-Trichloroethane	5	BDL	BDL	BDL	BDL	B
1,1,2-Trichloroethane	5	BDL	BDL	BDL	BDL	B
Trichloroethylene	5	BDL	BDL	BDL	BDL	B
Vinyl acetate	10	BDL	BDL	BDL	BDL	B
Vinyl chloride	10	BDL	BDL	BDL	BDL	B
Total xylenes	5	BDL	BDL	BDL	BDL	B
Percent Moisture	0.1	5.4	3.3	4.4	6.6	21.

BDL = Below Detection Limit

SPARTON TECHNOLOGY

BORE 008

TABLE 1. TOTAL ORGANIC HALOGEN (TOX) RESULTS - BORE 008

<u>Bore Depth (ft.)</u>	<u>Detection Limit (mg/kg)</u>	<u>TOX Conc. (mg/kg)</u>
5.5-6.5	2	ND
10.5-11.5	2	ND
15.5-16.5	2	ND
20.5-21.0	2	ND
27.0-27.5	2	ND
29.5-30.3	2	3
36.5-37.5	2	3
41.5-42.5	2	2
49.0-49.7	2	2
58.3-59.0	2	ND
59.3-60.3	2	ND

ND = Not Detected.

TABLE 2. PURGEABLE ORGANICS RESULTS - BORE 008

<u>Parameter</u>	<u>Concentration (ug/kg)</u>				
	<u>Detection Limit</u>	<u>Bore Depth 29.5-30.3'</u>	<u>Bore Depth 36.5-37.5'</u>	<u>Bore Depth 41.5-42.5</u>	<u>Bore Dept 49.0-49.7</u>
1,1-Dichloroethylene	0.5	ND	ND	ND(2.5)	ND(2.0)
1,2-trans-Dichloroethylene	0.5	ND	ND	ND(2.5)	ND(2.0)
1,1,1-Trichloroethane	0.5	ND	1.1	22(2.5)	ND(10)
Trichloroethylene	0.5	ND	0.7	140(2.5)	21(2.0)

ND = Not Detected.

Values in parentheses represent adjusted detection limits.

TABLE 3. TOTAL METALS RESULTS - BORE 008

<u>Bore Depth (ft)</u>	<u>Concentration (mg/kg)</u>			
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>
5.5-6.5	ND	3.7	4.0	2.1
10.5-11.5	ND	7.3	4.0	2.4
15.5-16.5	ND	15	5.7	5.0
20.5-21.5	ND	41	5.0	14
27.0-27.5	ND	44	6.6	6.4
29.5-30.3	ND	850	9.5	45
36.5-37.5	ND	3300	ND	9.6
41.5-42.5	4.0	100	12	62
49.0-49.7	ND	51	11	23
58.3-59.0	ND	29	4.0	5.0
59.3-60.3	ND	15	5.0	4.1
Detection Limit	1.0	0.5	2.5	1.0
RCRA MCL	1.0	5.0	5.0	NA

ND = Not Detected. NA = Not Applicable. MCL = Maximum Contaminant Level.

TABLE 4. EP TOXICITY RCRA METALS - BORE 008

<u>Bore Depth (ft)</u>	<u>Concentration (mg/L)</u>					
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>	<u>Hexavalent Chromium</u>	<u>Trivalent Chromium</u>
5.5-6.5	ND	0.008	ND	ND	ND	ND
10.5-11.5	ND	0.007	ND	ND	ND	ND
15.5-16.5	ND	0.055	ND	0.027	ND	0.055
20.5-21.0	0.006	0.32	ND	0.095	ND	0.32
27.0-27.5	ND	0.18	ND	0.069	0.02	0.16
29.5-30.3	0.018	8.1	ND	0.33	7.1	1.0
36.5-37.5	ND	4.2	ND	0.12	3.1	1.1
41.5-42.5	0.094	0.093	ND	0.33	0.06	0.033
49.0-49.7	ND	0.087	ND	0.17	ND	0.087
58.3-59.0	ND	0.018	ND	0.086	0.02	ND
59.3-60.3	ND	0.054	ND	0.025	0.03	0.024
Detection Limit	0.004	0.005	0.025	0.01	0.01	0.01
RCRA MCL	1.0	5.0	5.0	NA	NA	NA

ND = Not Detected. NA = Not Applicable. MCL = Maximum Contaminant Level.

TABLE 5. VOLATILE ORGANICS- BORE 008

Parameter	Detection Limit	Concentration (ug/kg)				
		Bore Depth 27.0-27.5'	Bore Depth 36.5-37.5'	Bore Depth 41.5-42.5'	Bore Depth 49.0-49.7'	Bore Depth 59.3-60.3'
Acetone	10	BDL	44	1200	25	BDL
Benzene	5	BDL	BDL	BDL	BDL	BDL
Bromoform	5	BDL	BDL	BDL	BDL	BDL
Methyl bromide	10	BDL	BDL	BDL	BDL	BDL
2-Butanone	10	BDL	BDL	BDL	BDL	BDL
Carbon disulfide	5	BDL	BDL	BDL	BDL	BDL
Carbon tetrachloride	5	BDL	BDL	BDL	BDL	BDL
Chlorobenzene	5	BDL	BDL	BDL	BDL	BDL
Chlorodibromomethane	5	BDL	BDL	BDL	BDL	BDL
Chloroethane	10	BDL	BDL	BDL	BDL	BDL
2-Chloroethylvinyl ether	10	BDL	BDL	BDL	BDL	BDL
Chloroform	5	BDL	BDL	BDL	BDL	BDL
Methyl chloride	10	BDL	BDL	BDL	BDL	BDL
Dichlorobromomethane	5	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethane	5	BDL	BDL	BDL	BDL	BDL
1,2-Dichloroethane	5	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethylene	5	BDL	BDL	BDL	BDL	BDL
1,2-Dichloropropane	5	BDL	BDL	BDL	BDL	BDL
cis-1,3-Dichloropropylene	5	BDL	BDL	BDL	BDL	BDL
trans-1,3-Dichloropropylene	5	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	5	BDL	BDL	BDL	BDL	BDL
2-Hexanone	10	BDL	BDL	BDL	BDL	BDL
Methylene chloride	10	BDL	BDL	BDL	BDL	BDL
4-Methyl-2-pentanone	10	BDL	BDL	BDL	BDL	BDL
Styrene	5	BDL	BDL	BDL	BDL	BDL
1,1,2,2-Tetrachloroethane	5	BDL	BDL	BDL	7	BDL
Tetrachloroethylene	5	BDL	BDL	BDL	BDL	BDL
Toluene	5	BDL	BDL	BDL	BDL	BDL
1,2-trans-Dichloroethylene	5	BDL	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane	5	BDL	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane	5	BDL	BDL	BDL	BDL	BDL
Trichloroethylene	5	BDL	BDL	BDL	BDL	BDL
Vinyl acetate	10	BDL	BDL	BDL	BDL	BDL
Vinyl chloride	10	BDL	BDL	BDL	BDL	BDL
Total xylenes	5	BDL	BDL	BDL	BDL	BDL
Percent Moisture	0.1	7.1	9.5	15.4	22.2	3.0

BDL = Below Detection Limit

SPARTON TECHNOLOGY

BORE 009

TABLE 1. TOTAL ORGANIC HALOGEN (TOX) RESULTS - BORE 009

<u>Bore Depth (ft.)</u>	<u>Detection Limit (mg/kg)</u>	<u>TOX Conc. (mg/kg)</u>
5.0-5.5	2	ND
11.0-11.5	2	ND
13.5-14.5	2	ND
18.5-19.5	2	ND
23.0-24.0	2	ND
28.0-33.0	2	ND
33.5-34.5	2	ND
39.0-39.5	2	ND
44.0-45.0	2	ND
49.0-50.0	2	ND
53.0-54.5	2	ND
58.0-59.0	2	ND
65.0-66.0	2	ND

ND = Not Detected.

TABLE 2. TOTAL METALS RESULTS - BORE 009

<u>Bore Depth (ft)</u>	<u>Concentration (mg/kg)</u>			
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>
5.0-5.5	ND	4.1	5.6	4.9
11.0-11.5	ND	2.9	4.0	3.9
13.5-14.5	ND	1.9	4.0	2.6
18.5-19.5	ND	1.8	4.0	2.6
23.0-24.0	ND	2.6	5.0	3.3
28.0-33.0	ND	1.7	4.0	2.2
33.5-34.5	ND	1.6	3.0	2.1
39.0-39.5	ND	1.3	3.0	2.3
44.0-45.0	ND	6.0	7.4	7.0
49.0-50.0	ND	2.1	3.0	2.1
53.0-54.5	ND	1.8	4.0	2.0
58.0-59.0	ND	2.6	ND	2.6
65.0-66.0	ND	1.8	ND	2.4
Detection Limit	1.0	0.5	2.5	1.0
RCRA MCL	1.0	5.0	5.0	NA

ND = Not Detected.

NR = Not Received.

NA = Not Applicable.

MCL = Maximum Contaminant Level.

TABLE 3. EP TOXICITY RCRA METALS - BORE 009

<u>Bore Depth (ft)</u>	<u>Concentration (mg/L)</u>					
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>	<u>Hexavalent Chromium</u>	<u>Trivalent Chromium</u>
5.0-5.5	ND	ND	ND	ND	ND	ND
11.0-11.5	ND	ND	ND	ND	ND	ND
23.0-24.0	ND	ND	ND	ND	ND	ND
44.0-45.0	ND	ND	ND	ND	ND	ND
58.0-59.0	ND	ND	ND	0.044	ND	ND
Detection Limit	0.004	0.005	0.025	0.01	0.01	0.01
RCRA MCL	1.0	5.0	5.0	NA	NA	NA

ND = Not Detected. NA = Not Applicable.
MCL = Maximum Contaminant Level.

TABLE 4. VOLATILE ORGANICS- BORE 009

<u>Parameter</u>	<u>Concentration(ug/kg)</u>		
	<u>Detection Limit</u>	<u>Bore Depth 49.0-50.0'</u>	<u>Bore Depth 65.0-66.0'</u>
Acetone	10	BDL	BDL
Benzene	5	BDL	BDL
Bromoform	5	BDL	BDL
Methyl bromide	10	BDL	BDL
2-Butanone	10	BDL	BDL
Carbon disulfide	5	BDL	BDL
Carbon tetrachloride	5	BDL	BDL
Chlorobenzene	5	BDL	BDL
Chlorodibromomethane	5	BDL	BDL
Chloroethane	10	BDL	BDL
2-Chloroethylvinyl ether	10	BDL	BDL
Chloroform	5	BDL	BDL
Methyl chloride	10	BDL	BDL
Dichlorobromomethane	5	BDL	BDL
1,1-Dichloroethane	5	BDL	BDL
1,2-Dichloroethane	5	BDL	BDL
1,1-Dichloroethylene	5	BDL	BDL
1,2-Dichloropropane	5	BDL	BDL
cis-1,3-Dichloropropylene	5	BDL	BDL
trans-1,3-Dichloropropylene	5	BDL	BDL
Ethylbenzene	5	BDL	BDL
2-Hexanone	10	BDL	BDL
Methylene chloride	10	BDL	BDL
4-Methyl-2-pentanone	10	BDL	BDL
Styrene	5	BDL	BDL
1,1,2,2-Tetrachloroethane	5	BDL	BDL
Tetrachloroethylene	5	BDL	BDL
Toluene	5	BDL	BDL
1,2-trans-Dichloroethylene	5	BDL	BDL
1,1,1-Trichloroethane	5	BDL	BDL
1,1,2-Trichloroethane	5	BDL	BDL
Trichloroethylene	5	BDL	BDL
Vinyl acetate	10	BDL	BDL
Vinyl chloride	10	BDL	BDL
Total xylenes	5	BDL	BDL
Percent Moisture	0.1	4.0	1.8

BDL = Below Detection Limit

SPARTON TECHNOLOGY

BORE 010

TABLE 1. TOTAL ORGANIC HALOGEN (TOX) RESULTS - BORE 010

<u>Bore Depth (ft.)</u>	<u>Detection Limit (mg/kg)</u>	<u>TOX Conc. (mg/kg)</u>
4.5-5.5	2	ND
10.0-11.0	2	ND
13.5-14.5	2	6
18.3-19.0	2	5
30.5-31.5	2	10
35.5-36.5	2	4
38.3-39.0	2	ND
44.5-45.5	2	ND
49.0-50.0	2	ND
53.5-54.5	2	ND
58.5-59.5	2	4
66.3-67.0	2	ND

ND = Not Detected.

Table 2. PURGEABLE ORGANICS RESULTS - BORE 010

<u>Parameter</u>	<u>Detection Limit</u>	<u>Concentration (ug/kg)</u>				
		<u>Bore Depth 13.5- 14.5'</u>	<u>Bore Depth 18.3- 19.0'</u>	<u>Bore Depth 30.5- 31.5'</u>	<u>Bore Depth 35.5- 36.5'</u>	<u>Bore Depth 58.5- 59.5'</u>
1,1-Dichloroethylene	1.0	ND	ND	ND	ND	ND
1,2-trans-Dichloroethylene	0.5	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	2.0	ND	ND	ND	ND	ND
Trichloroethylene	1.0	ND	ND	ND	ND	ND

ND = Not Detected.

TABLE 3. TOTAL METALS RESULTS - BORE 010

<u>Bore Depth (ft)</u>	<u>Concentration (mg/kg)</u>			
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>
4.5-5.5	ND	1.9	ND	2.0
10.0-11.0	ND	2.5	4.0	2.4
13.5-14.5	ND	1.6	4.0	2.0
18.3-19.0	ND	2.8	4.0	3.0
30.5-31.5	ND	1.8	3.0	2.0
35.5-36.5	ND	4.1	3.0	4.1
38.3-39.0	ND	2.8	3.0	2.8
44.5-45.5	ND	3.0	3.0	3.5
49.0-50.0	ND	2.0	3.0	2.9
53.5-54.5	ND	2.3	3.0	2.6
58.5-59.5	ND	2.8	ND	2.5
66.3-67.0	ND	7.0	5.9	5.3
Detection Limit	1.0	0.5	2.5	1.0
RCRA MCL	1.0	5.0	5.0	NA

ND = Not Detected. NA = Not Applicable.
MCL = Maximum Contaminant Level.

TABLE 4. EP TOXICITY RCRA METALS - BORE 010

<u>Bore Depth (ft)</u>	<u>Concentration (mg/L)</u>					
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>	<u>Hexavalent Chromium</u>	<u>Trivalent Chromium</u>
13.5-14.5	ND	ND	ND	ND	ND	ND
18.3-19.0	ND	ND	ND	ND	ND	ND
30.5-31.5	ND	ND	ND	ND	ND	ND
35.5-36.5	ND	ND	ND	ND	ND	ND
58.5-59.5	ND	ND	ND	ND	ND	ND
66.3-67.0	ND	ND	ND	ND	ND	ND
Detection Limit	0.004	0.005	0.025	0.01	0.01	0.01
RCRA MCL	1.0	5.0	5.0	NA	NA	NA

ND = Not Detected. NA = Not Applicable.
MCL = Maximum Contaminant Level.

TABLE 5. VOLATILE ORGANICS- BORE 010

Parameter	Detection Limit	Concentration (ug/kg)					
		Bore Depth 13.5-14.5'	Bore Depth 18.3-19.0'	Bore Depth 30.5-31.5'	Bore Depth 35.5-36.5'	Bore Depth 58.5-59.5'	Bore Depth 66.3-67.0'
Acetone	10	BDL	BDL	BDL	3	BDL	500
Benzene	5	BDL	BDL	BDL	BDL	BDL	BDL
Bromoform	5	BDL	BDL	BDL	BDL	BDL	BDL
Methyl bromide	10	BDL	BDL	BDL	BDL	BDL	BDL
2-Butanone	10	BDL	BDL	BDL	BDL	BDL	BDL
Carbon disulfide	5	BDL	BDL	BDL	BDL	BDL	BDL
Carbon tetrachloride	5	BDL	BDL	BDL	BDL	BDL	BDL
Chlorobenzene	5	BDL	BDL	BDL	BDL	BDL	BDL
Chlorodibromomethane	5	BDL	BDL	BDL	BDL	BDL	BDL
Chloroethane	10	BDL	BDL	BDL	BDL	BDL	BDL
2-Chloroethylvinyl ether	10	BDL	BDL	BDL	BDL	BDL	BDL
Chloroform	5	BDL	BDL	BDL	BDL	BDL	BDL
Methyl chloride	10	BDL	BDL	BDL	BDL	BDL	BDL
Dichlorobromomethane	5	BDL	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethane	5	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichloroethane	5	BDL	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethylene	5	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichloropropane	5	BDL	BDL	BDL	BDL	BDL	BDL
cis-1,3-Dichloropropylene	5	BDL	BDL	BDL	BDL	BDL	BDL
trans-1,3-Dichloropropylene	5	BDL	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	5	BDL	BDL	BDL	BDL	BDL	BDL
2-Hexanone	10	BDL	BDL	BDL	BDL	BDL	BDL
Methylene chloride	10	BDL	BDL	BDL	BDL	BDL	BDL
4-Methyl-2-pentanone	10	BDL	BDL	BDL	BDL	BDL	BDL
Styrene	5	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2,2-Tetrachloroethane	5	BDL	BDL	BDL	BDL	BDL	BDL
Tetrachloroethylene	5	BDL	BDL	BDL	BDL	BDL	BDL
Toluene	5	BDL	BDL	BDL	BDL	BDL	BDL
1,2-trans-Dichloroethylene	5	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane	5	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane	5	BDL	BDL	BDL	BDL	BDL	BDL
Trichloroethylene	5	BDL	BDL	BDL	BDL	BDL	BDL
Vinyl acetate	10	BDL	BDL	BDL	BDL	BDL	BDL
Vinyl chloride	10	BDL	BDL	BDL	BDL	BDL	BDL
Total xylenes	5	BDL	BDL	BDL	BDL	BDL	BDL
Percent Moisture	0.1	2.1	3.6	2.8	3.0	3.2	16.3

BDL = Below Detection Limit

SPARTON TECHNOLOGY

BORE 011

TABLE 1. TOTAL ORGANIC HALOGEN (TOX) RESULTS - BORE 011

<u>Bore Depth (ft.)</u>	<u>Detection Limit (mg/kg)</u>	<u>TOX Conc. (mg/kg)</u>
4.5-5.5	2	ND
9.0-10.0	2	ND
14.0-15.0	2	ND
19.5-20.5	2	2
24.5-25.5	2	ND
30.0-31.0	2	ND
35.0-36.0	2	ND
38.0-39.0	2	ND
45.0-46.0	2	ND
50.0-51.0	2	4
54.5-55.5	2	4
60.0-61.0	2	ND

ND = Not Detected.

TABLE 2. PURGEABLE ORGANICS RESULTS - BORE 011

<u>Parameter</u>	<u>Concentration (ug/kg)</u>			
	<u>Detection Limit</u>	<u>Bore Depth 19.5-20.5'</u>	<u>Bore Depth 50.0-51.0'</u>	<u>Bore Depth 54.5-55.5'</u>
1,1-Dichloroethylene	1.0	ND	ND	ND
1,2-trans-Dichloroethylene	0.5	ND	ND	ND
1,1,1-Trichloroethane	2.0	ND	ND	ND
Trichloroethylene	1.0	ND	ND	ND

ND = Not Detected.

TABLE 3. TOTAL METALS RESULTS - BORE 011

<u>Bore Depth (ft)</u>	<u>Concentration (mg/kg)</u>			
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>
4.5-5.5	ND	3.8	5.0	3.8
9.0-10.0	ND	2.5	3.0	2.4
14.0-15.0	ND	2.3	5.4	4.0
19.5-20.5	ND	3.3	4.0	3.7
24.5-25.5	ND	2.5	4.0	2.8
30.0-31.0	ND	5.4	5.5	6.5
35.0-36.0	ND	3.7	5.0	4.2
38.0-39.0	ND	3.5	4.0	3.5
45.0-46.0	ND	3.0	5.0	3.0
50.0-51.0	ND	7.2	5.7	8.4
54.5-55.5	ND	3.7	3.0	3.7
60.0-61.0	ND	3.4	3.0	3.6
Detection Limit	1.0	0.5	2.5	1.0
RCRA MCL	1.0	5.0	5.0	NA

ND = Not Detected. NA = Not Applicable.
MCL = Maximum Contaminant Level.

TABLE 4. EP TOXICITY RCRA METALS - BORE 011

<u>Bore Depth (ft)</u>	<u>Concentration (mg/L)</u>					
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Nickel</u>	<u>Hexavalent Chromium</u>	<u>Trivalent Chromium</u>
19.5-20.5	ND	ND	ND	ND	ND	ND
30.0-31.0	ND	ND	ND	ND	ND	ND
35.0-36.0	ND	ND	ND	ND	ND	ND
50.0-51.0	ND	ND	ND	ND	ND	ND
54.5-55.5	ND	ND	ND	ND	ND	ND
Detection Limit	0.004	0.005	0.025	0.01	0.01	0.01
RCRA MCL	1.0	5.0	5.0	NA	NA	NA

ND = Not Detected. NA = Not Applicable.
MCL = Maximum Contaminant Level.

TABLE 5. VOLATILE ORGANICS- BORE 011

Parameter	Detection Limit	Concentration (ug/kg)			
		Bore Depth 19.5-20.5'	Bore Depth 24.5-25.5'	Bore Depth 54.5-55.5'	Bore Depth 60.0-61.0'
Acetone	10	BDL	BDL	BDL	BDL
Benzene	5	BDL	BDL	BDL	BDL
Bromoform	5	BDL	BDL	BDL	BDL
Methyl bromide	10	BDL	BDL	BDL	BDL
2-Butanone	10	BDL	BDL	BDL	BDL
Carbon disulfide	5	BDL	BDL	BDL	BDL
Carbon tetrachloride	5	BDL	BDL	BDL	BDL
Chlorobenzene	5	BDL	BDL	BDL	BDL
Chlorodibromomethane	5	BDL	BDL	BDL	BDL
Chloroethane	10	BDL	BDL	BDL	BDL
2-Chloroethylvinyl ether	10	BDL	BDL	BDL	BDL
Chloroform	5	BDL	BDL	BDL	BDL
Methyl chloride	10	BDL	BDL	BDL	BDL
Dichlorobromomethane	5	BDL	BDL	BDL	BDL
1,1-Dichloroethane	5	BDL	BDL	BDL	BDL
1,2-Dichloroethane	5	BDL	BDL	BDL	BDL
1,1-Dichloroethylene	5	BDL	BDL	BDL	BDL
1,2-Dichloropropane	5	BDL	BDL	BDL	BDL
cis-1,3-Dichloropropylene	5	BDL	BDL	BDL	BDL
trans-1,3-Dichloropropylene	5	BDL	BDL	BDL	BDL
Ethylbenzene	5	BDL	BDL	BDL	BDL
2-Hexanone	10	BDL	BDL	BDL	BDL
Methylene chloride	10	BDL	BDL	BDL	BDL
4-Methyl-2-pentanone	10	BDL	BDL	BDL	BDL
Styrene	5	BDL	BDL	BDL	BDL
1,1,2,2-Tetrachloroethane	5	BDL	BDL	BDL	BDL
Tetrachloroethylene	5	BDL	BDL	BDL	BDL
Toluene	5	BDL	BDL	BDL	BDL
1,2-trans-Dichloroethylene	5	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane	5	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane	5	BDL	BDL	BDL	BDL
Trichloroethylene	5	BDL	BDL	BDL	BDL
Vinyl acetate	10	BDL	BDL	BDL	BDL
Vinyl chloride	10	BDL	BDL	BDL	BDL
Total xylenes	5	BDL	BDL	BDL	BDL
Percent Moisture	0.1	2.3	2.3	9.7	5.6

BDL = Below Detection Limit

**REPORT OF ANALYTICAL DATA
FOR
HARDING LAWSON ASSOCIATES**

Prepared by:

**Rocky Mountain Analytical Laboratory
5530 Marshall Street
Arvada, CO 80002
(303) 421-6611**

May 5, 1986

SPARTON TECHNOLOGY

BORE 001

TABLE 1. PERCENT MOISTURE RESULTS — BORE 001

Bore Depth (ft.)	Detection Limit (%)	Moisture Content (%)
4.0 - 5.0	0.1	0.7
9.0 - 10.0	0.1	0.9
14.0 - 15.0	0.1	0.9
18.0 - 18.5	0.1	1.1
24.0 - 25.0	0.1	0.9
30.5 - 31.5	0.1	2.1
35.0 - 36.0	0.1	0.8
39.0 - 40.0	0.1	1.8
44.0 - 45.0	0.1	1.0
47.5 - 52.0	0.1	1.7
54.5 - 55.5	0.1	4.0
63.0 - 64.0	0.1	10.6

SPARTON TECHNOLOGY

BORE 002

TABLE 2. PERCENT MOISTURE RESULTS — BORE 002

Bore Depth (ft.)	Detection Limit (%)	Moisture Content (%)
4.5 - 5.5	0.1	2.0
10.5 - 11.5	0.1	1.7
14.5 - 15.5	0.1	2.9
19.5 - 20.5	0.1	2.9
30.0 - 31.0	0.1	5.8
49.0 - 50.0	0.1	3.1
59.0 - 59.5	0.1	6.0

SPARTON TECHNOLOGY

BORE 003

TABLE 3. PERCENT MOISTURE RESULTS — BORE 003

Bore Depth (ft.)	Detection Limit (%)	Moisture Content (%)
4.5 - 5.5	0.1	3.4
20.5 - 21.5	0.1	3.7
25.0 - 25.5	0.1	3.4
30.0 - 31.0	0.1	3.9
35.5 - 36.0	0.1	3.7

SPARTON TECHNOLOGY

BORE 004

TABLE 4. PERCENT MOISTURE RESULTS — BORE 004

Bore Depth (ft.)	Detection Limit (%)	Moisture Content (%)
4.0 - 5.0	0.1	7.6
9.0 - 10.0	0.1	4.5
13.5 - 14.0	0.1	12.0
25.5 - 26.0	0.1	4.9
29.0 - 30.0	0.1	4.4
48.5 - 49.0	0.1	21.3

SPARTON TECHNOLOGY

BORE 005

TABLE 5. PERCENT MOISTURE RESULTS — BORE 005

Bore Depth (ft.)	Detection Limit (%)	Moisture Content (%)
4.5 - 5.5	0.1	5.4
10.0 - 11.0	0.1	3.5
15.0 - 15.5	0.1	3.7
20.5 - 21.0	0.1	4.8
25.5 - 26.0	0.1	5.3
30.5 - 31.5	0.1	6.3
58.2 - 59.4	0.1	3.0

SPARTON TECHNOLOGY

BORE 006

TABLE 6. PERCENT MOISTURE RESULTS — BORE 006

Bore Depth (ft.)	Detection Limit (%)	Moisture Content (%)
5.0 - 6.0	0.1	5.2
9.0 - 10.0	0.1	9.8
14.5 - 15.5	0.1	4.1
20.5 - 21.5	0.1	9.5
24.5 - 25.5	0.1	8.4
48.3 - 49.3	0.1	2.7
53.5 - 55.0	0.1	2.7
58.0 - 59.2	0.1	3.7

SPARTON TECHNOLOGY

BORE 007

TABLE 7. PERCENT MOISTURE RESULTS — BORE 007

<u>Bore Depth (ft.)</u>	<u>Detection Limit (%)</u>	<u>Moisture Content (%)</u>
4.5 - 5.5	0.1	3.7
10.5 - 11.0	0.1	2.6
15.0 - 16.0	0.1	4.4
18.2 - 18.8	0.1	5.0
30.0 - 31.0	0.1	5.0
57.0 - 57.5	0.1	4.5
58.5 - 59.5	0.1	3.4

SPARTON TECHNOLOGY

BORE 008

TABLE 8. PERCENT MOISTURE RESULTS — BORE 008

Bore Depth (ft.)	Detection Limit (%)	Moisture Content (%)
5.5 - 6.5	0.1	14.1
10.5 - 11.5	0.1	3.0
15.5 - 16.5	0.1	3.1
20.5 - 21.0	0.1	5.1
29.5 - 30.5	0.1	15.3
58.3 - 59.0	0.1	4.1

SPARTON TECHNOLOGY

BORE 009

TABLE 9. PERCENT MOISTURE RESULTS — BORE 009

Bore Depth (ft.)	Detection Limit (%)	Moisture Content (%)
5.0 - 5.5	0.1	3.2
11.0 - 11.5	0.1	3.0
13.5 - 14.5	0.1	1.1
18.5 - 19.5	0.1	0.9
23.0 - 24.0	0.1	0.8
28.0 - 33.0	0.1	0.7
33.5 - 34.5	0.1	0.9
39.0 - 39.5	0.1	0.3
44.0 - 45.0	0.1	12.9
53.0 - 54.5	0.1	2.2
58.0 - 59.0	0.1	16.0

SPARTON TECHNOLOGY

BORE 010

SPARTON TECHNOLOGY

BORE 011

TABLE 11. PERCENT MOISTURE RESULTS — BORE 011

Bore Depth (ft.)	Detection Limit (%)	Moisture Content (%)
4.5 - 5.5	0.1	3.0
9.0 - 10.0	0.1	1.3
14.0 - 15.0	0.1	1.7
30.0 - 31.0	0.1	5.5
35.0 - 36.0	0.1	2.6
38.0 - 39.0	0.1	3.3
45.0 - 46.0	0.1	1.3
50.0 - 51.0	0.1	12.8



ATTACHMENT 7

Off-Site Investigation

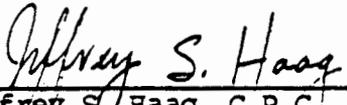
Report Prepared for

Sparton Corporation
2400 East Ganson Street
Jackson, Michigan 49202

OFF-SITE INVESTIGATION
SPARTON TECHNOLOGY, INC.
COORS ROAD PLANT
ALBUQUERQUE, NEW MEXICO

HLA Job No. 6310,036.12

by



Jeffrey S. Haag, C.P.G.
Senior Hydrogeologist



Stephen D. Phillips, C.P.G.
Associate Hydrogeologist

Harding Lawson Associates
6220 Westpark Drive, Suite 100
Houston, Texas 77057
Telephone: (713) 789-8050

October 19, 1987

TABLE OF CONTENTS

	<u>PAGE</u>
LIST OF TABLES	iii
LIST OF PLATES	iii
EXECUTIVE SUMMARY	iv
I INTRODUCTION	1
A. Background	1
B. Objectives	2
II 1987 SOIL GAS INVESTIGATION	3
A. Preinvestigation Plan	3
B. Soil Gas Methodology	3
C. Field Procedure	5
III DISCUSSION	9
A. Soil Gas Concentration	9
B. Groundwater Concentration	10
C. Groundwater Velocity	10
D. Transport Mechanisms	12
E. Possible Outside Influences on 1987 Soil Gas Investigation	14
IV CONCLUSIONS	15
V REFERENCES	17
APPENDICES	
A Tracer Research Corporation Report - 1987	
B Tracer Research Corporation Report - 1984	
C Data Analysis	

LIST OF TABLES

Table 1	Background Ambient Air Samples for TCA and TCE
Table 2	Ground Level Elevations for Soil Gas Sampling Sites

LIST OF PLATES

Plate 1	Proposed Sampling Plan Transects
Plate 2	Actual Sampling Plan Transects
Plate 3	TCA Concentration Contours
Plate 4	TCE Concentration Contours
Plate 5	TCA Soil Gas Concentration - Facility South Boundary
Plate 6	TCE Soil Gas Concentration - Facility South Boundary
Plate 7	TCA Soil Gas Concentration - Irving Boulevard
Plate 8	TCE Soil Gas Concentration - Irving Boulevard
Plate 9	TCA Quarterly Sampling - 1983 to 1987, MW-6
Plate 10	TCE Quarterly Sampling - 1983 to 1987, MW-6
Plate 11	TCA Quarterly Sampling - 1983 to 1987, MW-8
Plate 12	TCA Quarterly Sampling - 1983 to 1987, MW-8
Plate 13	TCE Quarterly Sampling - 1983 to 1987, MW-9
Plate 14	TCA Quarterly Sampling - 1983 to 1987, MW-9
Plate 15	TCA and TCE Quarterly Sampling - 1986 to 1987, MW-14
Plate 16	TCA and TCE Quarterly Sampling - 1986 to 1987, MW-15
Plate 17	Well Locations
Plate 18	Range of Groundwater Velocities at Sparton Facility
Plate 19	Idealized Flow Patterns

EXECUTIVE SUMMARY

This report presents an evaluation of contaminant magnitude and migration associated with Sparton Technology, Inc., at their Albuquerque, New Mexico facility and at designated surrounding off-site locations. This task was accomplished by conducting a soil gas study (July 20 to August 7, 1987) to determine the extent and magnitude of the contaminant plume using trichloroethane (TCA) and trichloroethylene (TCE) as indicator parameters. The collection of soil gas data was performed by Tracer Research Corporation (TRC) under subcontract to Harding Lawson Associates (HLA). Values obtained during the field effort were plotted and concentration isopleths were generated for the two constituents. The data from the 1987 study was compared to a soil gas study conducted at the facility by TRC in 1984.

Additional evaluations indicate that (1) there has been substantial decrease in contaminant levels from 1983 to 1987; (2) the groundwater velocity ranges between approximately 6 feet per year and 83 feet per year; (3) the dissemination of the plume appears to be primarily by dispersion with low velocity influence; and (4) that concentrations of TCA and TCE that are in excess of the state standards are in relatively close proximity to the site.

Based on the 1987 soil gas isopleths, and using the "worst case" TCA concentrations plotted to 0.01 micrograms per liter, the areal extent of the soil gas plume is approximately 100 feet east of Coors Road, 500 feet west of the facility's northwest corner, 900 feet west of the intersection of Eagle Ranch Road and Irving Boulevard, 2,000 feet south of the facility (downgradient), and 1,100 feet north of the site (upgradient).

I INTRODUCTION

A. Background

Sparton Technology, Inc. (Sparton) operates an electronics manufacturing facility at 9621 Coors Road, NW, in Albuquerque, New Mexico. Past waste management practices may have resulted in contamination of groundwater beneath the site. Subsequent contaminant migration to off-site areas via natural flow mechanisms was suspected. Sparton reached an agreement with the New Mexico Environmental Improvement Division (EID) for Sparton to authorize a soil gas investigation both on and off site to estimate the areal extent of the suspected plume (see Appendix A, Tracer Research Corporation Report, 1987). Harding Lawson Associates (HLA) was contracted and directed by Sparton to accomplish this task. HLA contracted Tracer Research Corporation (TRC) to conduct the nondestructive in situ testing program. Metric Corporation (Metric), a subconsultant to HLA, provided access clearance and utility location for off-site locations. Metric also assisted in the review and analysis of the resulting data and preparation of this report.

A limited soil gas study was conducted at the Sparton facility in 1984. The 1984 soil gas study was also performed by TRC under the supervision of HLA, and used soil gas values of trichloroethane (TCA)

and trichloroethylene (TCE) as indicator parameters of the suspected plume. A report describing the 1984 soil gas investigation is included as Appendix B.

B. Objectives

The objective of this study was to evaluate TCA and TCE contaminant magnitude and migration associated with the subsurface hydrologic regime at the Sparton facility. This goal was accomplished by completing the following tasks:

- (1) Conducting a soil gas study, and from those results estimating:
 - the lateral extent of the plume, and
 - the upgradient and downgradient limit of the plume;
- (2) Comparing the 1984 soil gas study to the 1987 study to identify any changes or trends with time;
- (3) Reviewing various transport mechanisms with respect to site-specific hydrogeologic conditions and current mapping of soil gas contours (isopleths); and
- (4) Reviewing existing quarterly chemical analyses for TCA and TCE from on-site monitoring wells to identify any changes or trends with time in the upper flow zone.

II 1987 SOIL GAS FIELD INVESTIGATION

A. Preinvestigation Plan

Prior to the field sampling activity, HLA presented a proposed location sampling plan (see Plate 1). This plan was composed of several longitudinal and latitudinal transects. Sample locations at the facility were spaced at 100-foot intervals; off-site locations were to be spaced at 200-foot intervals. With respect to off-site locations, interval spacing would increase or decrease as the data points were evaluated in the field. This flexibility was necessary to allow for maximum coverage of the area of investigation. Actual transects and spacing of data points for this investigation are presented on Plate 2.

B. Soil Gas Methodology (Refer to Appendix A)

The procedure used by TRC for the Sparton investigation involved gas chromatographic analysis of soil gas extracted from the ground. Prior to removal of the soil gas sample, the equipment was standardized with known pure laboratory samples, specifically, TCA, TCE, and perchloroethylene (PCE). Once the gas chromatograph was calibrated, a small diameter, hollow probe was either driven or hydraulically advanced into the soil at the designated sample location. This depth was usually between five and six feet below ground surface. A pump was used to draw soil gas into the probe. A syringe was placed into

the pump tubing and a small volume of soil gas was extracted. The gas sample was injected into the gas chromatograph and analyzed. Each value of TCA and TCE was plotted in the field on a 1-inch to 200-foot scale aerial photograph of the area provided by Metric.

PCE values were not plotted because PCE was not considered to be an indicator parameter for the contouring of the contaminant plume. PCE is an impurity related to the manufacturing of TCE. PCE was recorded by TRC because their computer analyzes certain chemicals in suites, and this portion of the computer program could not be deleted without deleting values of TCA and TCE. Recorded values of PCE were typically one to two orders of magnitude below measured values for TCA and TCE.

As a control check, ambient air samples were taken during the day. Generally, an early morning, a mid-day, and an end-of-shift sample were collected to serve as background quality samples. From July 20 to July 24, 1987, maximum values of ambient air samples for TCA and TCE ranged from 0.00007 to 0.00124 micrograms per liter (ug/l) and from less than 0.0001 to 0.00031 ug/l, respectively. Table 1 presents all ambient air sample values obtained during the referenced time period.

TRC advised HLA that based on their empirical experience with similar projects, the 0.01 ug/l contour would be the relevant limit of potential contamination attributable to a source. Although TRC has a

post-manufacturing modification (patent pending) which allows detection of volatile constituents to 0.0001 ug/l, according to TRC values below 0.01 ug/l could not unequivocally be interpreted as related to the source in question. HLA has presented TCA and TCE contours to 0.01 ug/l based on TRC's input. All data points have been reported, but the 0.01 contour limit was established as the lower limit of concern for the investigation. It should be noted that within the area of investigation, the maximum ground surface elevational difference is approximately 157 feet. Therefore, there is some potential for various data values to be masked or altered by excessive overburden or discontinuities within the overburden.

C. Field Procedure

The proposed transects for the project are presented on Plate 1. Plate 2 presents the actual transects and data collection points. The areal extent of this investigation was slightly under one square mile, and extends downgradient of the site approximately 3,200 feet. Data points were sampled from July 20 through July 24, 1987. Additional vertical profile data points were collected in the vicinity of SGB₂-07* on August 7, 1987. All data point values are included in Appendix A.

* SGB₂-07 = Soil Gas Transect B₂, sample location point No. 7.

Plates 1 through 4, and Figures 1 and 2 of Appendix A present a "true north" and a "facility north," which is actually to the northeast. For the purposes of this report, all directions stated are referenced to "facility north."

Data points for Transect A were collected on 100-foot intervals along the site boundaries from the southeast to northwest corners of the facility. From the northwest corner of the Sparton site, Transect A proceeded northward on 200-foot intervals and terminated at the edge of Calabacillas Arroyo. Data point SGA-17 was located on the east side of Coors Road in the right-of-way. Data point SGA-16 was located at the base of the hill at the bend in the canal east of Coors Road.

The western limit of the investigation for transects B, B₂, C, and C₂ was determined by either physical limits of accessible property or by soil gas limits at or below 10^{-3} ug/l, based on the advice of TRC. These transects generally arced eastward to Coors Road (Exception: Transect C₂ ended approximately 1,000 feet west of Coors Road due to 10^{-4} ug/l or below detection limit values). East of Coors Road, data collection points for each transect did not follow a spacing pattern due to the lack of right-of-way access or the inability of equipment to traverse rugged terrain. The major portion of Transect D was sampled at 400-foot intervals beginning approximately

800 feet west of Coors Road and continuing in a west-northwest arc to the western limit of accessible property. East of Coors Road, data points were collected where access was granted and where sample locations were accessible to the truck-mounted equipment.

Transect E extended at 200-foot intervals from the northwest (off site) to the northwest corner of the facility. Data points were collected at 100-foot intervals along the northern property line of the facility and east to Coors Road. At that point, the E Transect consisted of SGE-08 on the east side of Coors Road in the right-of-way and SGE-09, approximately midway between the northeast and southeast corners of the property.

Transect F consisted of three data points on the east side of Coors Road. They were collected at 200-foot intervals starting at approximately 200 feet north of SGE-08 and proceeding northward to the Calabacillas Arroyo.

Transect G consisted of four data points along the centerline of the Calabacillas Arroyo. These points began north of SGA-21 and proceeded in an easterly direction, terminating at the west edge of the culverts underlying Coors Road. Heavy rains and lightning curtailed any further study of the arroyo on July 24, 1987.

All data points collected during this investigation are contoured no lower than 0.01 ug/l for TCA and TCE on Plates 3 and 4, respectively. Specific values for TCA and TCE along the nine transects of this investigation are presented in the TRC report (see Appendix A).

All data collection points were staked, numbered, and flagged. Vertical and horizontal control was established by Metric. A copy of the sample location map with horizontal control was provided to TRC to plot the TCA and TCE contours (see Appendix A). Table 2 presents the ground levels elevations, referenced to mean sea level (MSL), for the data sampling points.

III DISCUSSION

In order to assess contaminant magnitude and migration at the Sparton facility, it is necessary to review existing data and evaluate the interrelationships of these data. Applicable information from various select and phased studies at and around the facility include:

- Evaluation of soil gas graphs and isopleths as an indication of the extent of groundwater contaminant migration (see Plates 5 through 8, and Appendix A, Figures 1 and 2);
- comparison of groundwater concentrations versus time from selected wells screened in the upper flow zone (see Plates 9 through 17);
- evaluation of plume velocity (see Plate 18, case 1 and 2); and
- Evaluation of plume transport mechanism(s) (see Plate 19, Figures A through E).

A. Soil Gas Concentration

Soil gas investigations were conducted at the facility in May 1984 and July 1987. Figures 1 and 2 of Appendix A (1987 study) present soil gas contour maps for TCA and TCE, respectively. Figures 1 and 2 of Appendix B (1984 study) present soil gas contour maps for TCE and TCA, respectively. Plates 5, 6, 7, and 8 present graphs of soil gas values along the south boundary of the facility and along Irving Boulevard for TCA and TCE, respectively. Each graph presents soil gas values collected during the 1984 and 1987 studies. Comparison of the

figures indicates that there has been a decrease in soil gas concentrations by approximately one order of magnitude from 1984 to 1987 for the constituents investigated, and there is a decrease in soil gas concentration levels with distance from the source.

B. Groundwater Concentration

Monitoring wells MW-6, MW-8, MW-9, MW-14, and MW-15 were chosen to assess groundwater concentration levels of TCA and TCE in the upper flow zone. Quarterly sampling data for these constituents are plotted for the years 1983 through 1987. The only exceptions to this are wells MW-14 and MW-15. These two wells only have data plotted after 1985 as it was not until that time that packers were installed to separate the upper and lower flow zones in the screened area.

Although all referenced wells currently exceed state standards as of the third sampling quarter of 1987, a review of the data indicates that most have displayed a decrease in constituent level with time.

C. Groundwater Velocity

To determine the rate of groundwater flow in the upper flow zone throughout the site, the particle velocity is calculated using the equation (Driscoll 1986, page 83):

$$v = \frac{ck_i}{n}$$

Where: V = velocity, in feet/year
K = hydraulic conductivity, in feet/day
i = hydraulic gradient, in feet/foot
n = porosity, nondimensional
c = conversion factor, 365 days/year

Based on permeability data (Metric Corporation 1987, Table 1) obtained from monitoring wells MW-16, MW-18, and MW-24, a range of hydraulic conductivities (K) from 0.92 feet per day (feet/day) to 13.0 feet/day was used. The hydraulic gradient (i) was calculated as 0.007 based upon site-specific groundwater elevation data (HLA 1986), and represents a "worst case" condition as opposed to a regional hydraulic gradient of 0.0016. The porosity (n) of the formation was estimated as 0.40 (Todd 1959, Table 2-6).

Plate 18 presents the calculations for groundwater velocity for the given range of hydraulic conductivities. Based on these calculations, it appears that the groundwater velocity in the upper flow zone ranges between 5.88 feet/year and 83.04 feet/year.

It is important to note that previous calculations of groundwater velocity were based on an aquifer pump test of PW-1 at the facility. However, the well is constructed with 68 feet of screen in the lower

flow zone and 10 feet of screen in the upper flow zone. Therefore, a high velocity calculated from this pump test data is not indicative of the groundwater velocity in the upper flow zone where the bulk of the contamination is located.

D. Transport Mechanisms

The two major mechanisms of solute (dissolved substance) transport are advection and dispersion. Advection is the transportation of solutes by the flowing groundwater (Freeze and Cherry 1979, pages 75 and 76). Solutes typically move in a longitudinal direction and downgradient with the natural flow of groundwater. As solutes move longitudinally, there is also lateral spreading of contaminant concentration. This process is referred to as dispersion, and is a consequence of both mechanical fluid mixing and molecular diffusion (ibid). Longitudinal dispersion in the direction of bulk flow is more common than lateral, or transverse, dispersion except when the groundwater flow is very low. Some sources note that depending on the exact nature of the aquifer, the dispersion may be a greater influence than advection (Driscoll 1986, page 710).

The upgradient distance from the facility for the 0.01 contour for TCA and TCE is approximately 1,110 feet. The downgradient distance is approximately 2,000 feet. Review of the TCA and TCE soil gas contour

maps (see Appendix A, Figures 1 and 2) reflect a similar pattern as that of the dispersion pattern with low groundwater velocity influence as presented on Plate 19, Figure E.

Soil gas data taken in close proximity to on-site monitoring wells along the property line were compared to groundwater monitoring results from samples taken from those wells in the same time period as the soil gas survey was being conducted. For each well, the ratio of groundwater concentration/soil gas concentration was calculated, and these ratios were examined using standard statistical techniques.

The results of this analysis indicate that the worst case horizontal limits of the groundwater plume containing TCE concentrations at or above the state standard coincides approximately with the 0.1 ug/l soil gas contour. Similarly, using the worst case for TCA, the 0.01 ug/l soil gas contour is appropriate. This supports the premise that the plume is still in relatively close proximity to the Sparton site (see Appendix C for calculations).

The transport mechanism associated with soil gas movement is dispersion. Given that the groundwater velocity is low (see Section IV.C) and contaminant migration is dispersive, it would be reasonable to conclude that the soil gas isopleths reflect a general pattern for the lateral extent of TCA and TCE contamination in the groundwater.

E. Possible Outside Influences on 1987 Soil Gas Investigation

The area of the 1987 investigation has been subject to extensive earth-moving and road building activities. It is possible that some of the off-site soil gas values for TCA and TCE have been affected by (1) in-field repair of heavy equipment, (2) solvents used in transport vehicles hauling asphalt material, and (3) placement of asphalt pavement or asphalt stockpile areas.

Approximately 400 feet south of Irving Boulevard, on the east side of Eagle Ranch Road, is a localized increase of TCA values. In an attempt to further understand this apparent anomaly, a soil gas vertical profile was performed. Results indicate that the concentrations of TCA and TCE increase with depth; however, data collection did not extend to groundwater. It is not clear at this time if the pattern is attributable to upward movement of soil gases from the phreatic zone, or downward migration of an alternate surface source. An alternate surface source is highly suspect based on a review of an aerial photograph of the early construction phases of Eagle Ranch Road. In this photograph, there appears to be a tank structure in the exact location where the increased soil gas values were obtained.

IV CONCLUSIONS

In order to accurately assess the current extent and magnitude of TCA and TCE concentration levels associated with the Sparton facility, an evaluation of several relevant factors has been completed. These data include the 1984 and 1987 soil gas investigation, the presentation of solute transport mechanisms and plume patterns, the review of concentration level trends for TCA and TCE at wells that monitor the upper flow zone at the facility, and the calculation of a probable range of groundwater velocities that exist in the vicinity of the facility.

Based on the evaluation of these data and HLA's understanding of the site, the following conclusions are warranted:

- Using the field criteria of 0.01 ug/l, the upgradient limit of the TCA soil gas plume appears to be at the edge of the Calabacillas Arroyo. The downgradient limit occurs about 2,000 feet south of the facility property. The upgradient limit of the TCE soil gas plume appears to be approximately 50 feet south of the Calabacillas Arroyo. The downgradient limit occurs about 2,000 feet south of the facility property;
- Using the same criteria as above, the basic lateral extent of the TCA soil gas plume is approximately 200 feet east of Coors Road, approximately 500 feet west of the northwest corner of the facility, and 900 feet west of the Irving Boulevard and Eagle Ranch Road intersection. The lateral extent of the TCE soil gas plume is approximately 30 feet east of Coors Road and 1,000 feet west of the facility's southwest corner;

- Correlation of soil gas and groundwater data tend to support the relative close proximity of the plume to the facility site;
- There has been a substantial decrease in concentration levels of TCA and TCE in the groundwater at monitoring wells MW-9, MW-14, and MW-15, from 1983 to 1987. There is a decrease in soil concentration levels with distance from the facility that reflects a dispersive pattern;
- The major solute transport mechanism appears to be that of dispersion with a minor component of advection from regional flow. This is evidenced by the presence of TCA and TCE soil gas values approximately 1,100 feet upgradient of the facility; and
- The probable range of groundwater velocities in the area of the facility is between 6 feet per year and 83 feet per year. This range is based upon site-specific pump test data, from the upper flow zone, and a higher hydraulic gradient than is found in the regional environment. Using the upper limit of this range and assuming a 20 year time frame, a "worst case" distance of contamination from the source would be approximately 1,660 feet. Other sources have previously suggested that the rate of migration may be two orders of magnitude or greater than this referenced upper limit based on data collected at well PW-1. This well, however, is screened primarily in the lower flow zone. This higher velocity is therefore not considered to be representative of upper flow zone conditions.

REFERENCES

Driscoll, F.G. Groundwater and Wells. 1986, p. 83.

Freeze, R., and J. Cherry. Groundwater. 1979, pp. 75 and 76.

Harding Lawson Associates. "Vertical Profiling Program, Sparton Technology, Inc., Albuquerque, New Mexico." October 1986.

Metric Corporation. "Aquifer Testing at the Sparton Technology, Inc. Coors Road Plant, Albuquerque, New Mexico." April 1987.

Todd. Groundwater Hydrology. 1956, Table 2.6.

DISTRIBUTION

1 copy to: Mr. Blair Thompson
Sparton Corporation
2400 East Ganson Street
Jackson, Michigan 49202

1 copy to: Mr. Richard Mico
Sparton Technology, Inc.
4901 Rockaway Boulevard, SW
Rio Rancho, New Mexico 87214

1 copy to: Mr. Jon F. DeWitt
Attorney at Law
Varnum, Riddering, Schmidt & Howlett
174 Monroe Avenue, NW
Grand Rapids, Michigan 49503

1 copy to: Mr. Cleoves Martinez
Sparton Technology, Inc.
9621 Coors Road, NW
Albuquerque, New Mexico 87114

1 copy to: Mr. Gary L. Richardson, P.E.
Metric Corporation
8429 Washington Place, N.E., Suite A
Albuquerque, New Mexico 87109

JSE/SDP:kmr/sve

QUALITY CONTROL REVIEWER:


Jay E. Mabrey, P.E.
Associate Engineer

TABLES

TABLE 1

Background Ambient Air Samples
for TCA and TCE

<u>Date</u>	<u>Air Sample TCA (ug/l)</u>	<u>Air Sample TCE (ug/l)</u>	<u>Time</u>
7/20/87	0.00078	0.00015	1043
	0.00124	0.00015	1305
	0.00067	0.00031	1613
	0.00082	0.00015	1719
7/21/87	0.00039	0.00015	0756
	0.00062	0.00015	1132
	0.00032	0.00015	1456
	0.00046	0.00015	1639
7/22/87	0.00031	0.00015	0838
	0.00065	0.00015	1141
	0.00034	0.00015	1259
	0.00007	0.00015	1619
	0.00007	0.00015	1708
7/23/87	0.00035	0.00016	0840
	0.00029	0.00016	1119
	0.00031	0.00016	1301
7/24/87	0.00026	0.00011	0815
	0.00021	0.00011	0920
	0.00050	0.00011	1112
	0.00025	0.00011	1532
	0.00031	0.00011	1647

TABLE 2

Ground Level (G.L.) Elevations for
Soil Gas Sampling Sites (Feet, MSL)

<u>Site Label</u>	<u>G.L. Elevation</u>
A- 1	5039
A- 2	5041
A- 3	5041
A- 4	5041
A- 5	5043
A- 6	5042
A- 7	5042
A- 8	5041
A- 9	5040
A-10	5042
A-11	5043
A-12	5045
A-13	5048
A-14	5045
A-15	5055
A-16	4996
A-17	5037
A-18	5059
A-19	5060
A-20	5060
A-21	5058
B- 1	5028
B- 2	5030
B- 3	5034
B- 4	5036
B- 5	5040
B- 6	5046
B- 7	5057
B- 8	5064
B- 9	5074
B-10	5085
B-11	5099
B-12	5110
B-13	5119

TABLE 2 (Continued)

Ground Level (G.L.) Elevations for
Soil Gas Sampling Sites (Feet, MSL)

<u>Site Label</u>	<u>G.L. Elevation</u>
B2- 1	5150
B2- 2	5153
B2- 3	5088
B2- 4	5069
B2- 5	5065
B2- 6	5053
B2- 7	5047
B2- 8	5053
B2- 9	5064
B2-10	5042
B2-11	5028
B2-12	5023
B2-13	5025
B2-14	5024
C- 1	4999
C- 2	5069
C- 3	5064
C- 4	5042
C- 5	5032
C- 6	5017
C- 7	5011
C- 8	5011
C- 9	5075
C-10	5081
C-11	5085
C-12	5109
C-13	5094
C-14	5079
C-15	5088
C-16	5100
C2- 1	5060
C2- 2	5066
C2- 3	5082
C2- 4	5100
C2- 5	5123
C2- 6	5119
C2- 7	5108
C2- 8	5120

TABLE 2 (Continued)

Ground Level (G.L.) Elevations for
Soil Gas Sampling Sites (Feet, MSL)

<u>Site Label</u>	<u>G.L. Elevation</u>
C2- 9	5111
C2-10	5089
C2-11	5087
D- 1	4996
D- 2	4998
D- 3	5032
D- 4	5037
D- 5	5047
D- 6	5061
D- 7	5088
D- 8	5099
D- 9	5153
D-10	5155
D-11	5121
D-12	5108
E -1	5055
E- 2	5052
E- 3	5052
E- 4	5051
E- 5	5048
E- 6	5046
E- 7	5043
E- 8	5042
E- 9	5040
E-10	5059
E-11	5068
E-12	5061
E-13	5071
F- 1	5039
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F- 3	5042
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G- 3	5024
G- 4	5020

PLATES

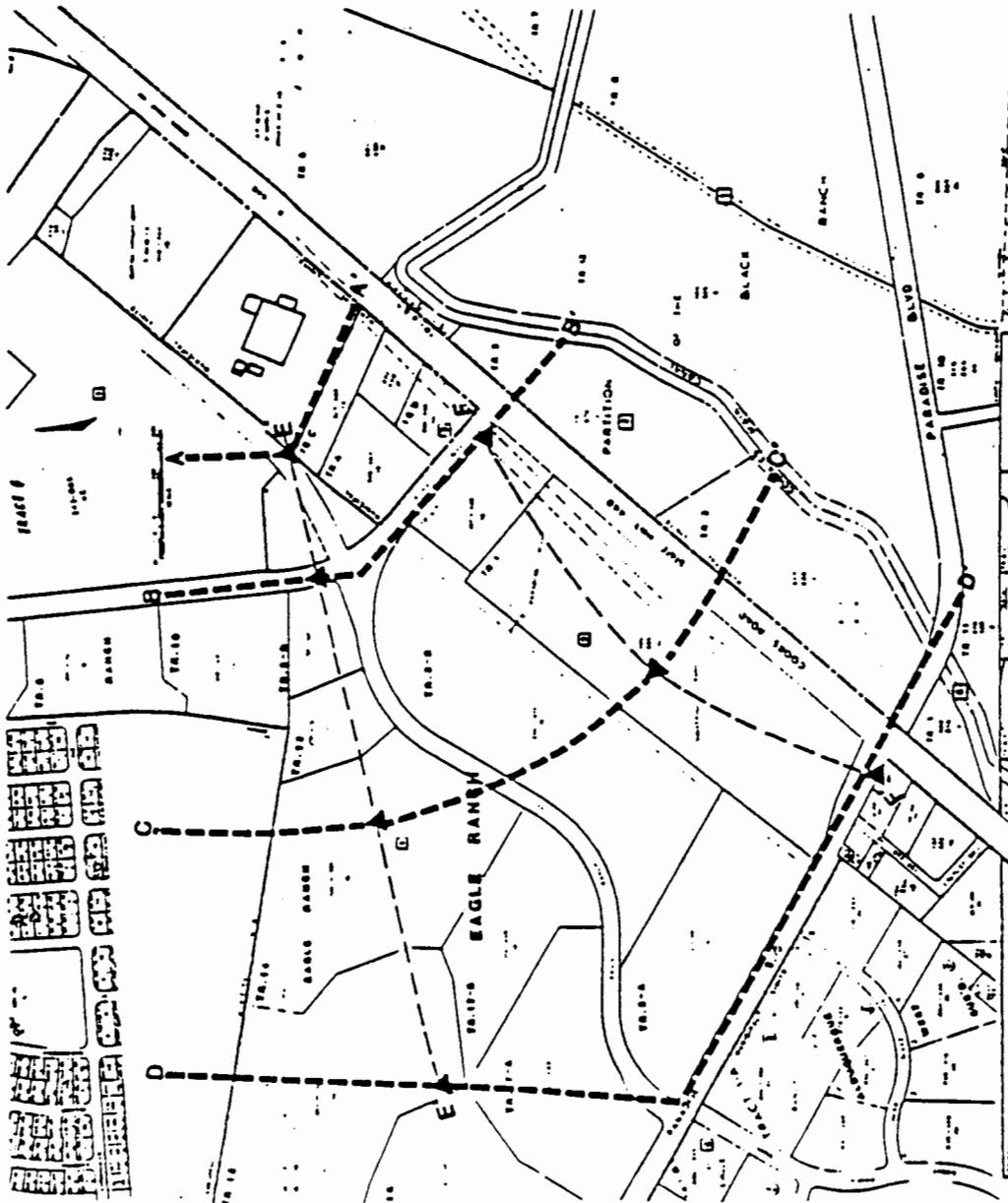


LEGEND:

- A --- RADIAL TRANSECT
- B --- LONGITUDINAL TRANSECT
- ▲ PEAK SOIL GAS VALUE

NOTE:

SOIL GAS SAMPLES WILL BE COLLECTED AT 100 FT. TO 300 FT. INTERVALS. SAMPLE LOCATIONS WILL BE FLAGGED, SURVEYED AND PLOTTED ON A MAP.

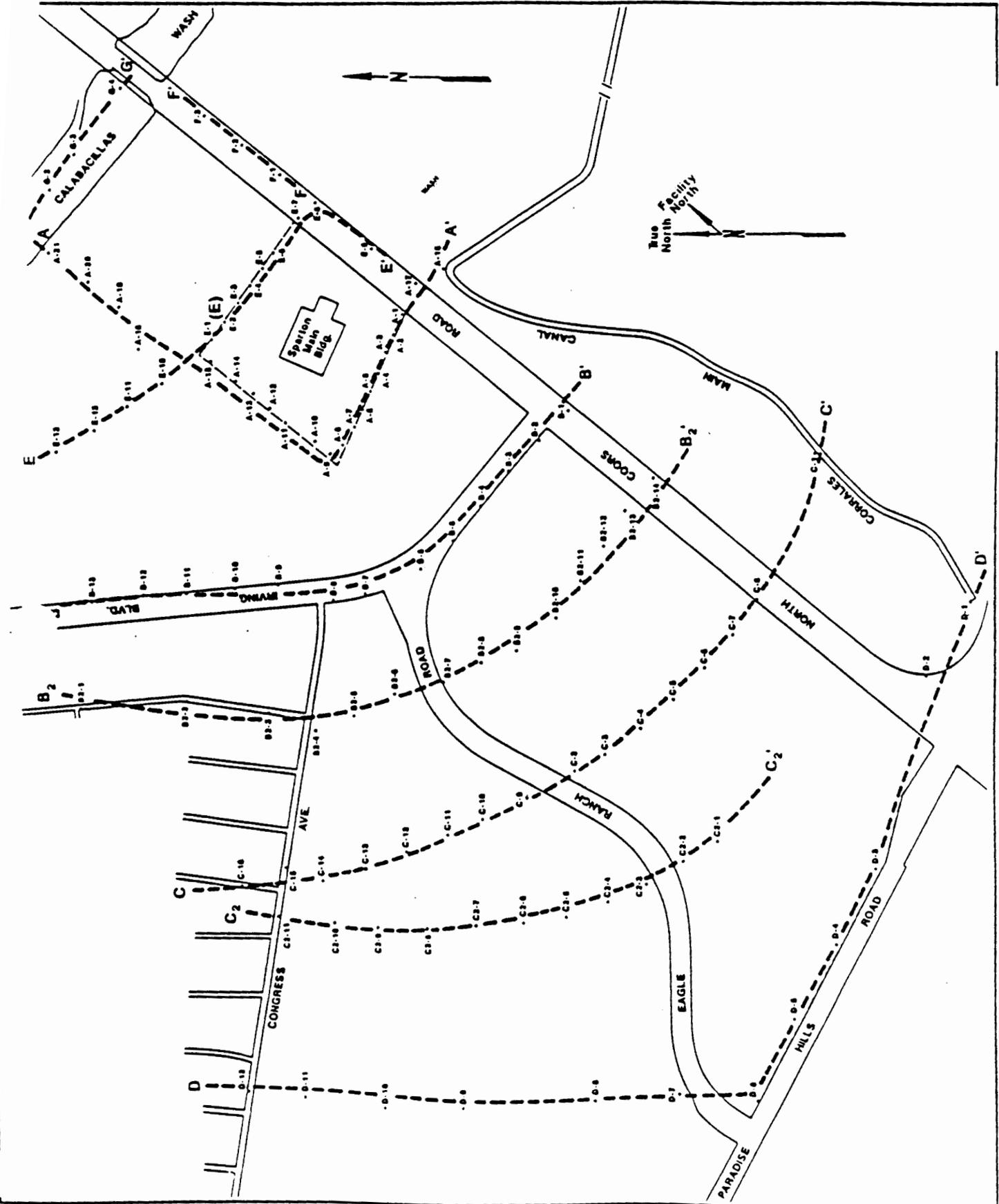


Harding Lawson Associates
 Engineers, Geologists
 & Geophysicists

**PROPOSED SAMPLING
 PLAN TRANSECTS**
 SPARTON TECHNOLOGY, INC.
 ALBUQUERQUE, NEW MEXICO

PLATE

1

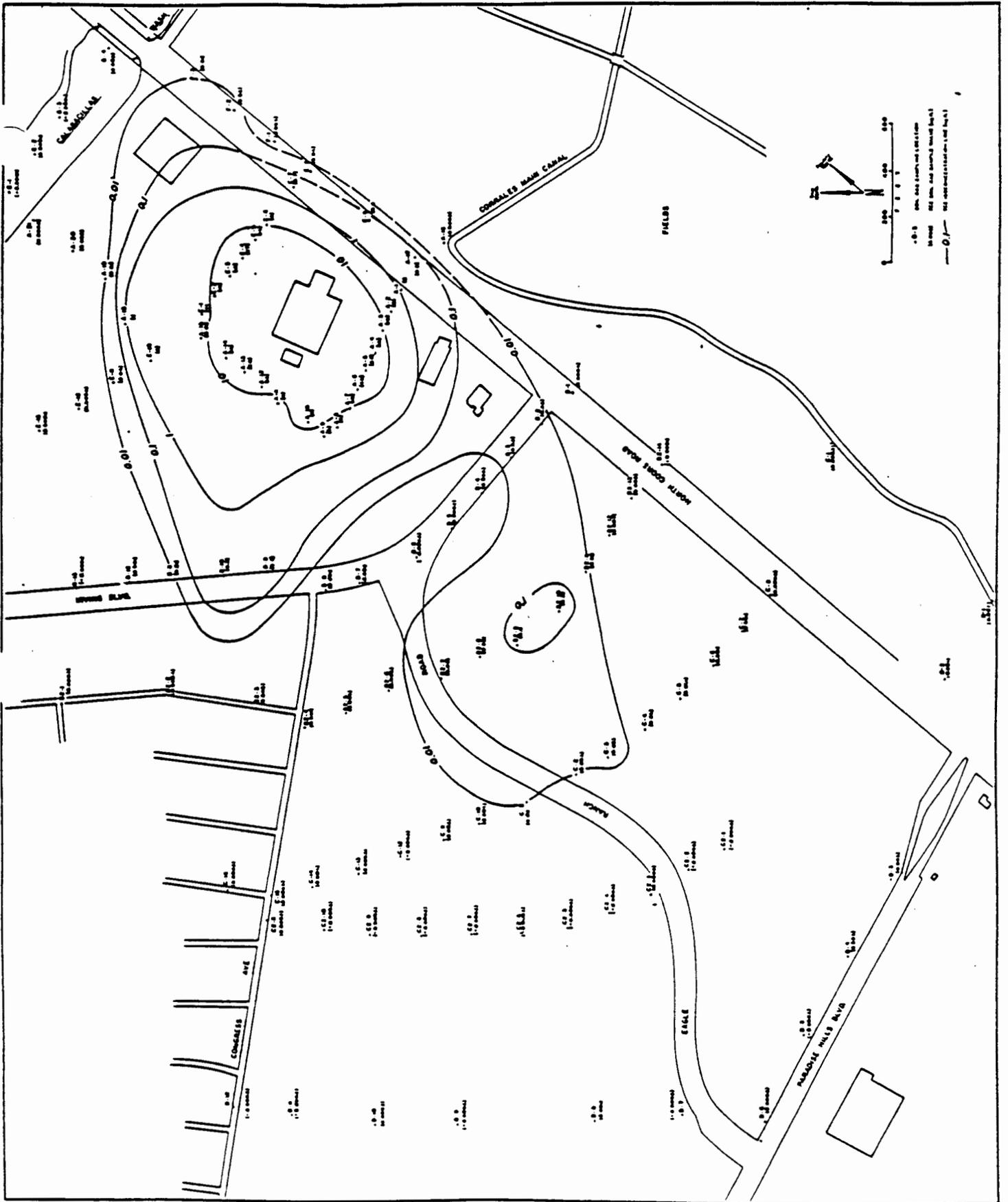


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 & Geophysicists

**ACTUAL SAMPLING
 PLAN TRANSECTS**
 SPARTON TECHNOLOGY, INC.
 ALBUQUERQUE, NEW MEXICO

PLATE

2

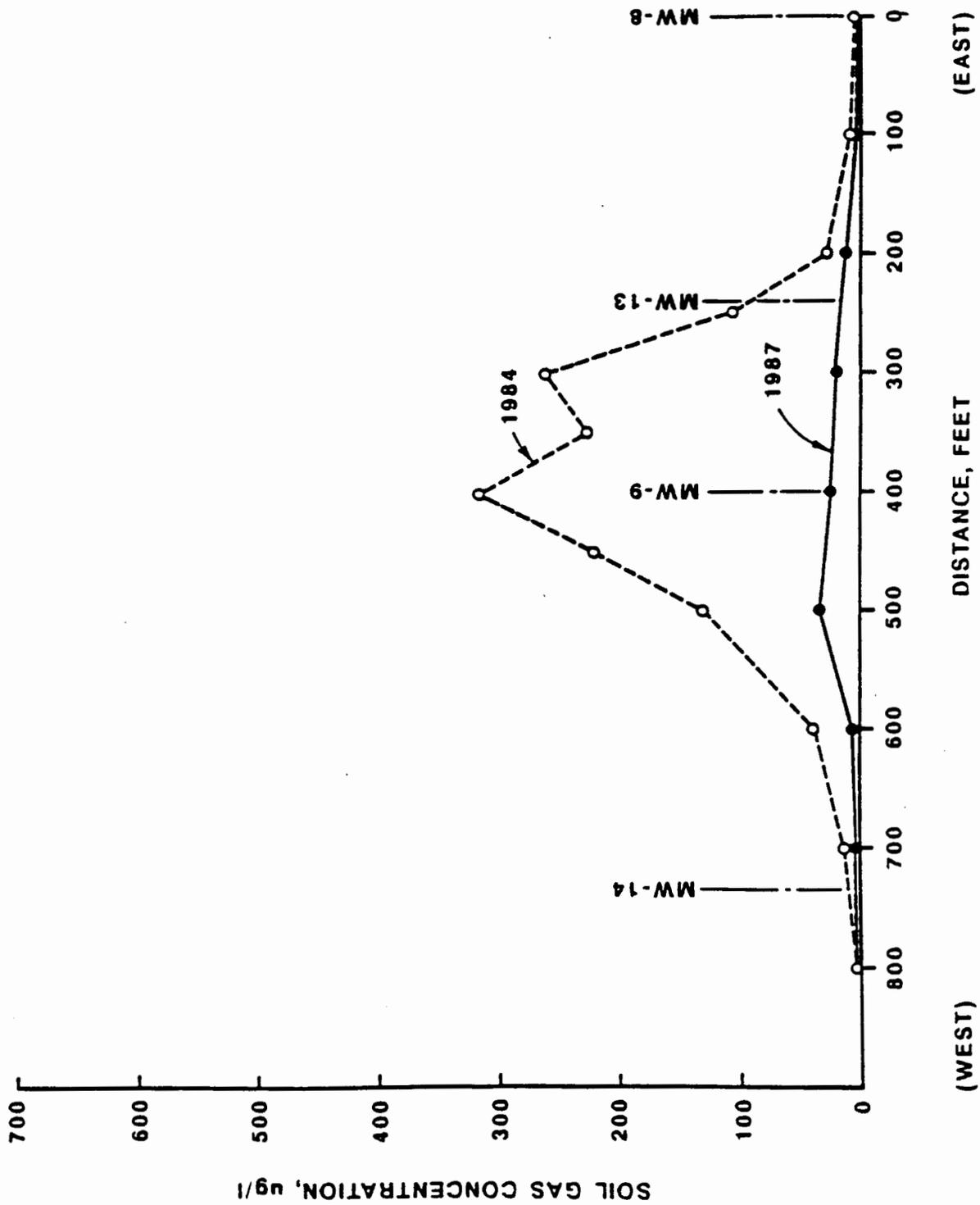


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TCE CONCENTRATION CONTOURS
SPARTON TECHNOLOGY, INC.
ALBUQUERQUE, NEW MEXICO

PLATE
4

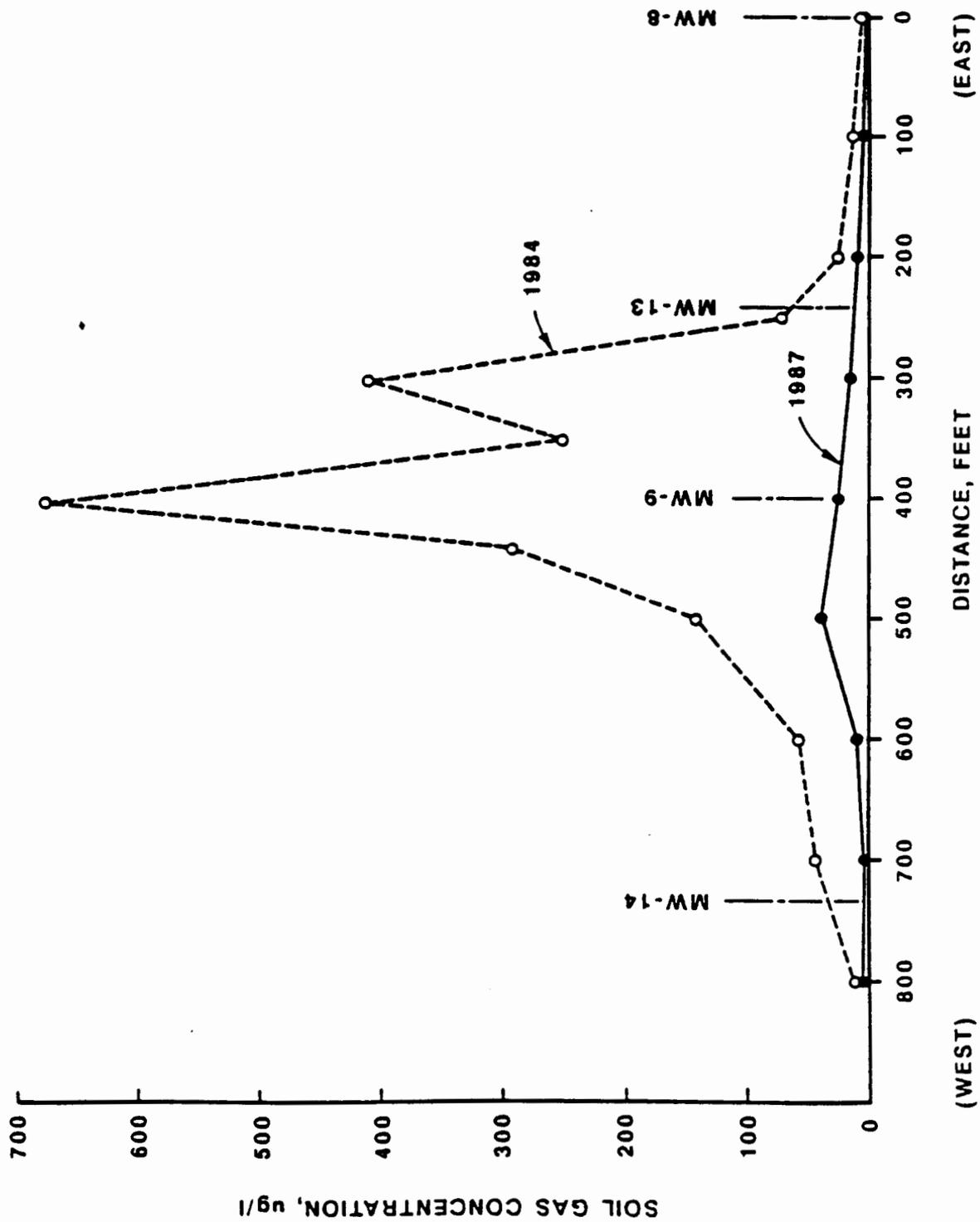
DRAWN S.K.	JOB NUMBER 6310,036.12	APPROVED J.S.H.	DATE 9/10/87	REVISED	DATE
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 & Geophysicists

**TCA SOIL GAS CONCENTRATIONS
 FACILITY SOUTH BOUNDARY**

PLATE
5



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 Engineers, Geologists
 & Geophysicists

**TCE SOIL GAS CONCENTRATIONS
 FACILITY SOUTH BOUNDARY**

PLATE

6

DRAWN
 S.K.

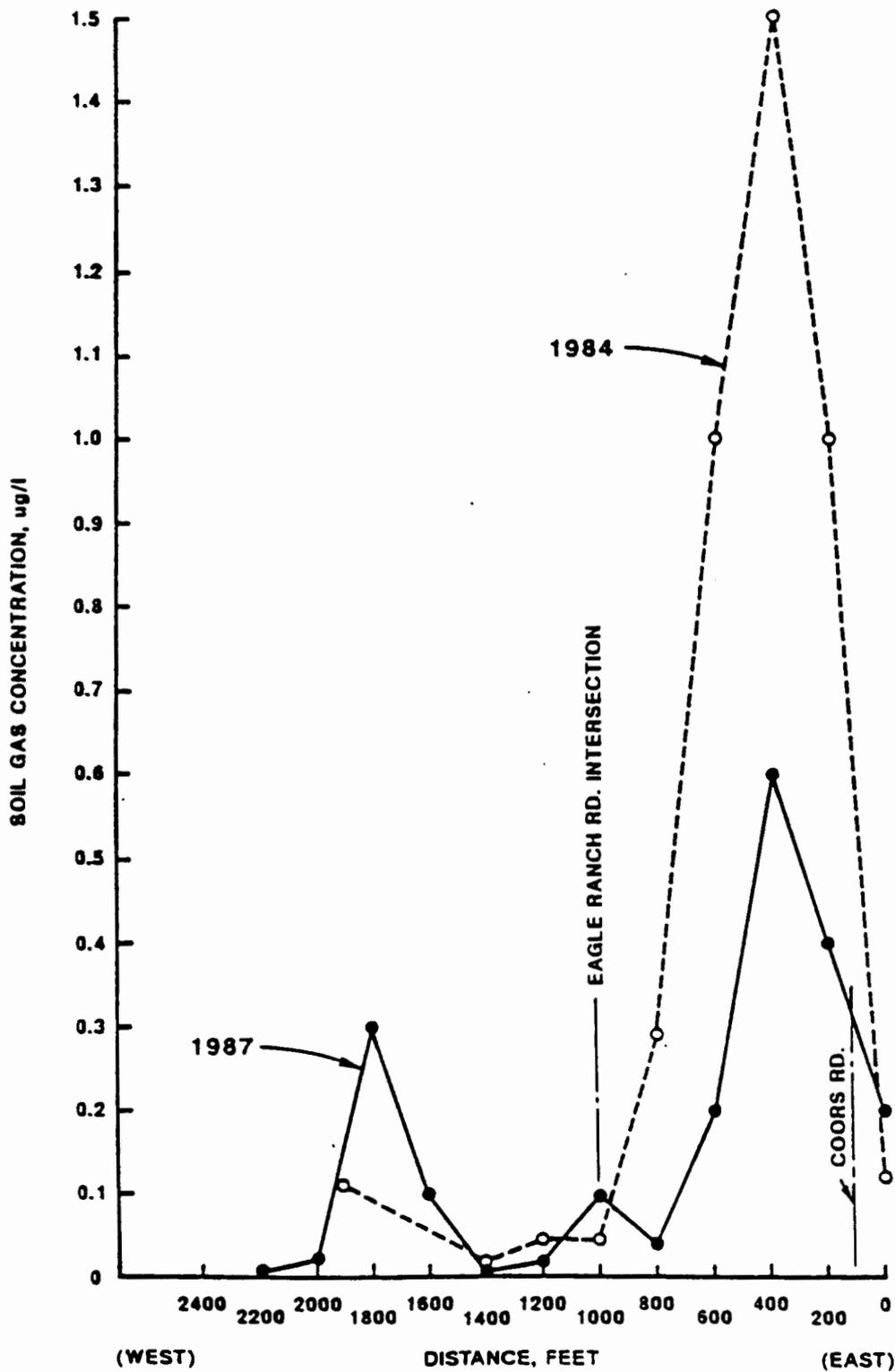
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DATE

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DATE



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**TCA SOIL GAS CONCENTRATIONS
 IRVING BLVD.**

PLATE

7

DRAWN
 S.K.

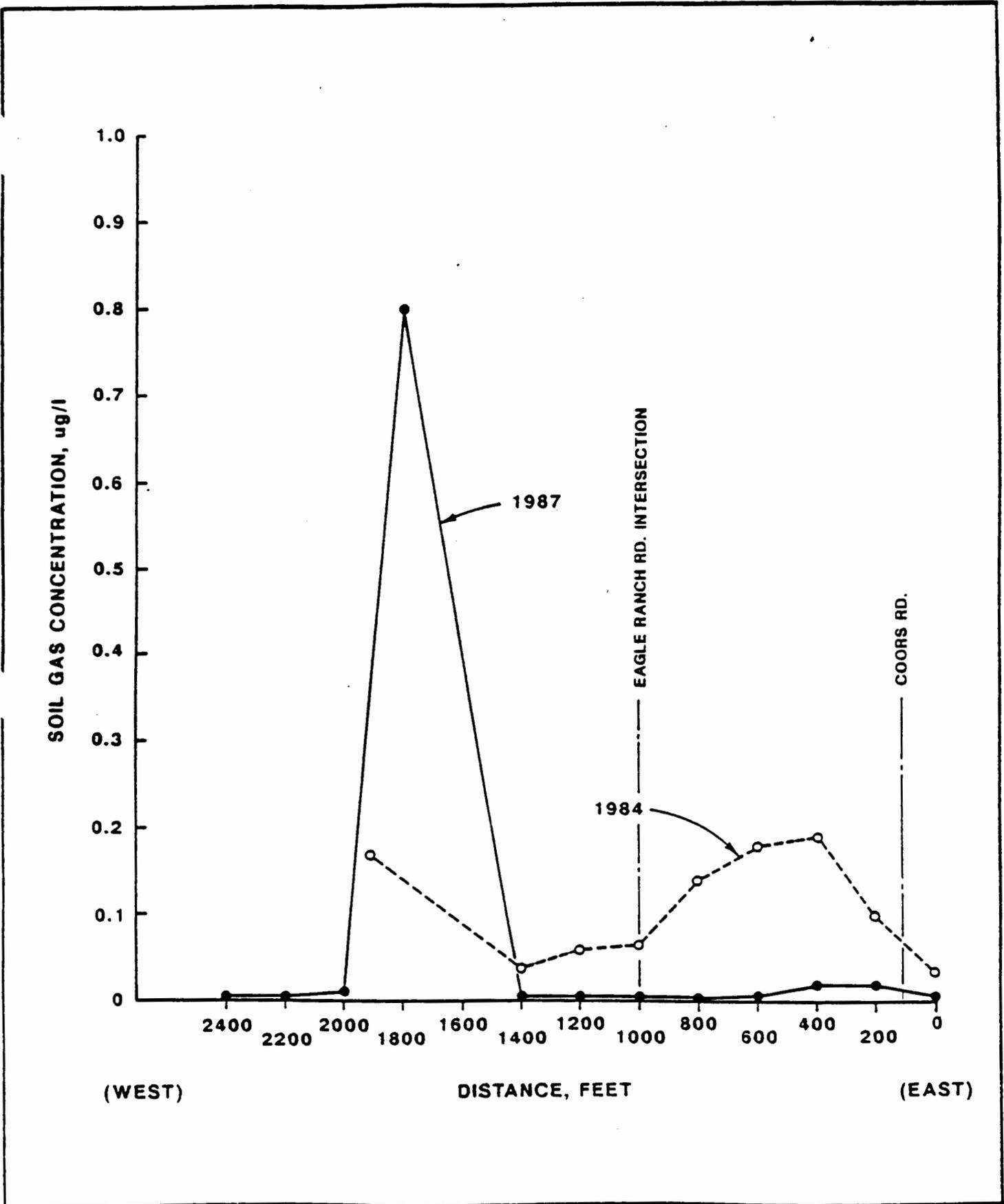
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**TCE SOIL GAS CONCENTRATIONS
 IRVING BLVD.**

PLATE

8

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S.K.

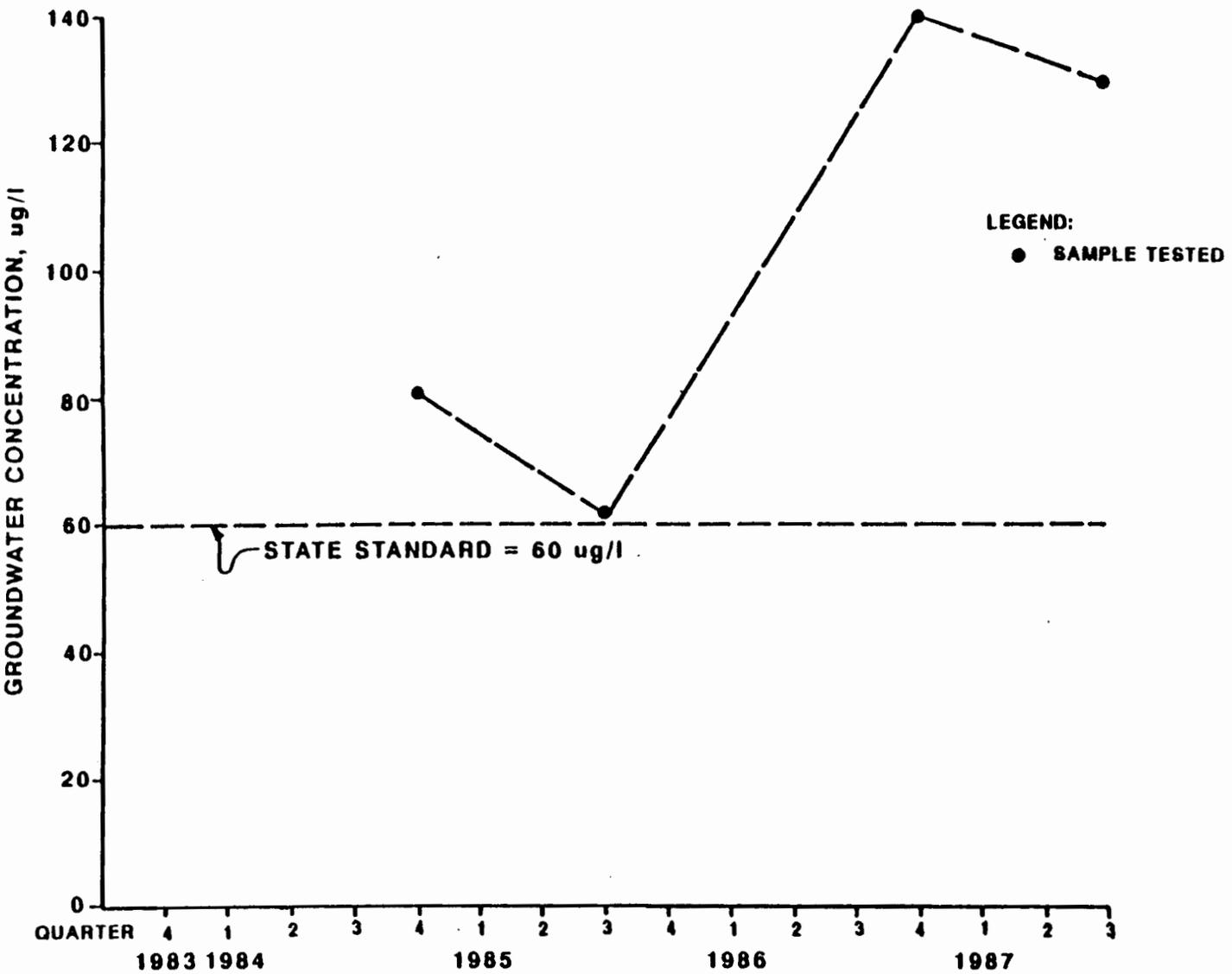
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06310.036.12

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DATE

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DATE



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Engineers, Geologists
& Geophysicists

TCA QUARTERLY SAMPLING
1983 TO 1987 : MW-6

PLATE

9

DRAWN
JLT

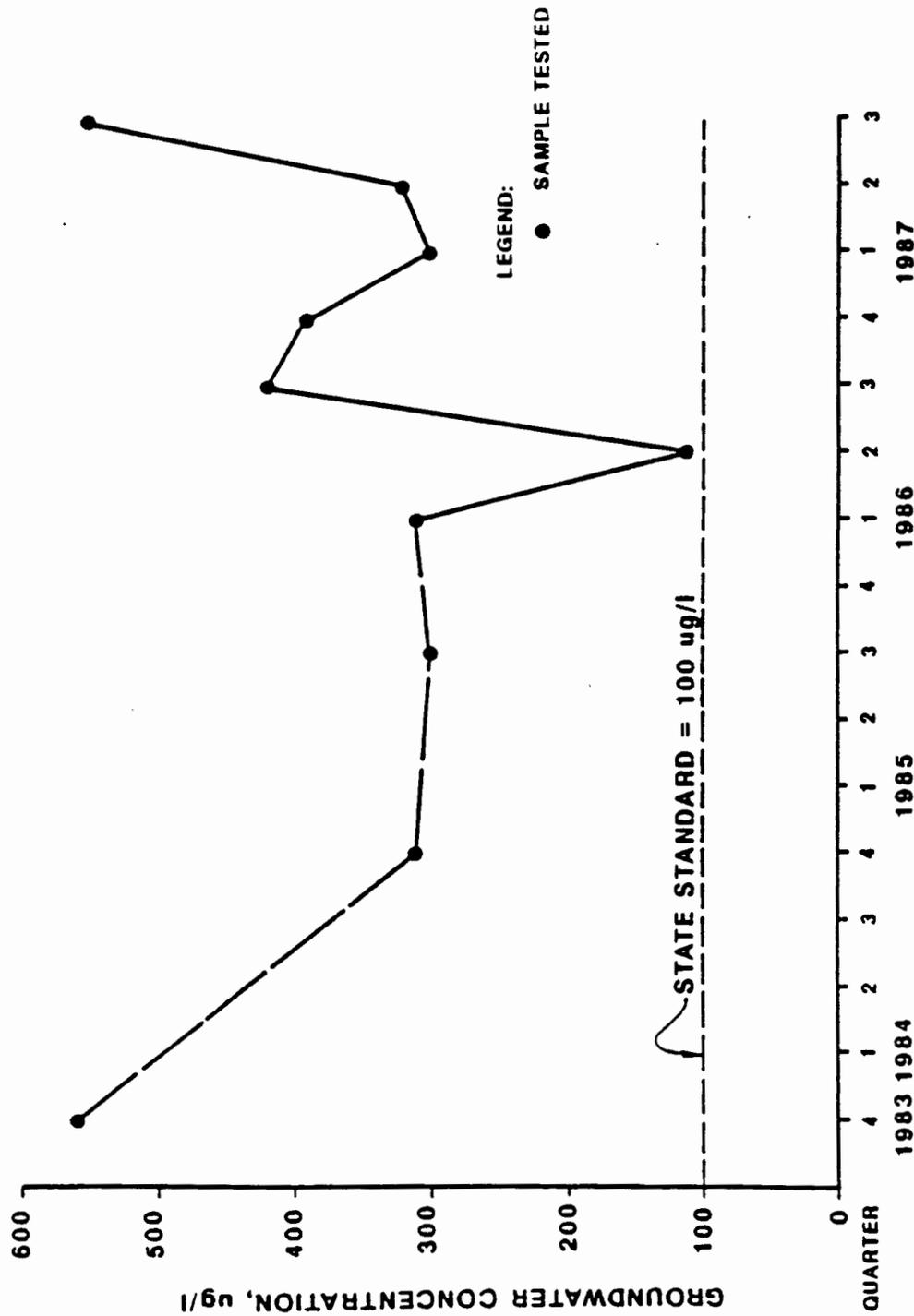
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 & Geophysicists

TCE QUARTERLY SAMPLING
1983 TO 1987 : MW-6

PLATE

10

DRAWN
 JLT

JOB NUMBER
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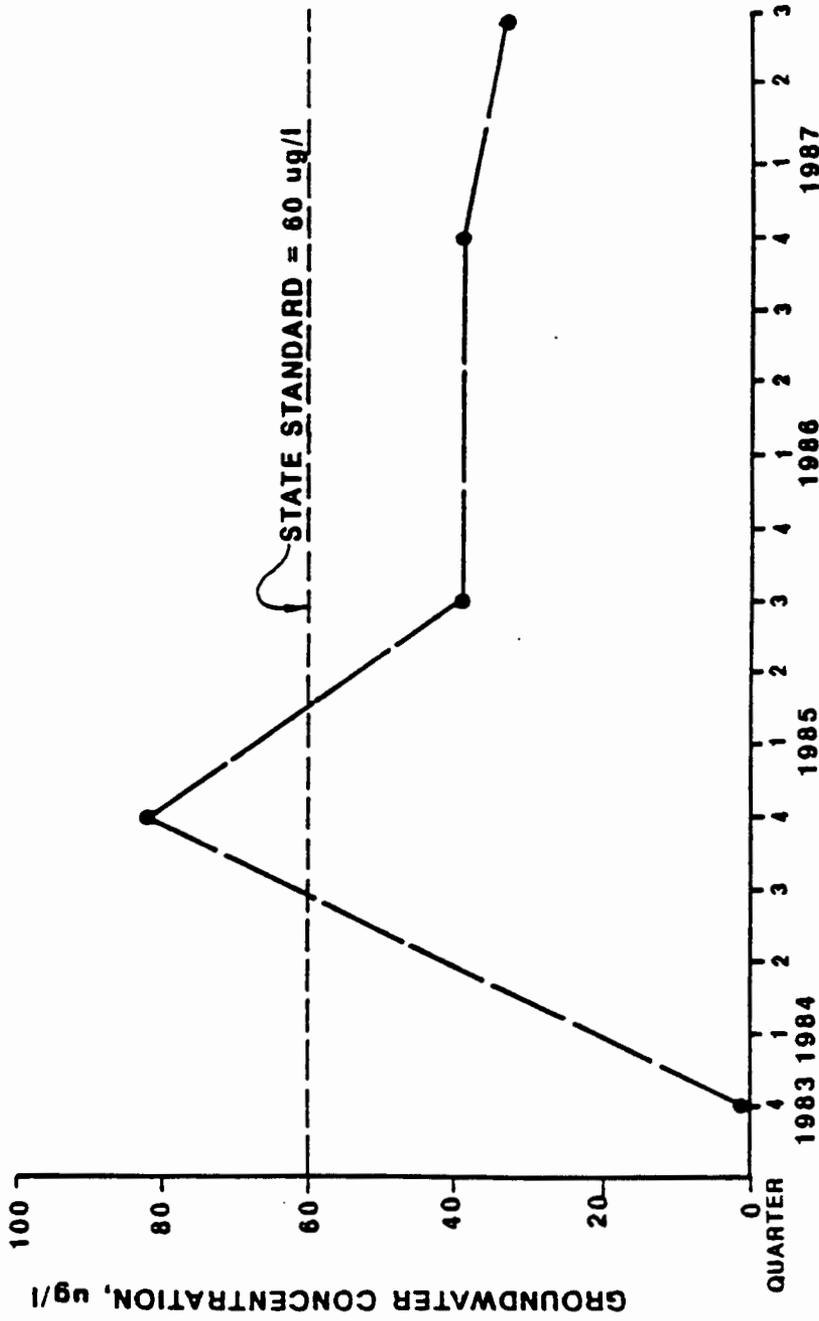
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DATE

LEGEND:
● SAMPLE TESTED



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TCA QUARTERLY SAMPLING
1983 TO 1987 : MW-8

PLATE

11

DRAWN
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JOB NUMBER
06310.038.12

APPROVED

DATE

REVISED

DATE

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JOB NUMBER

APPROVED

DATE

REVISED

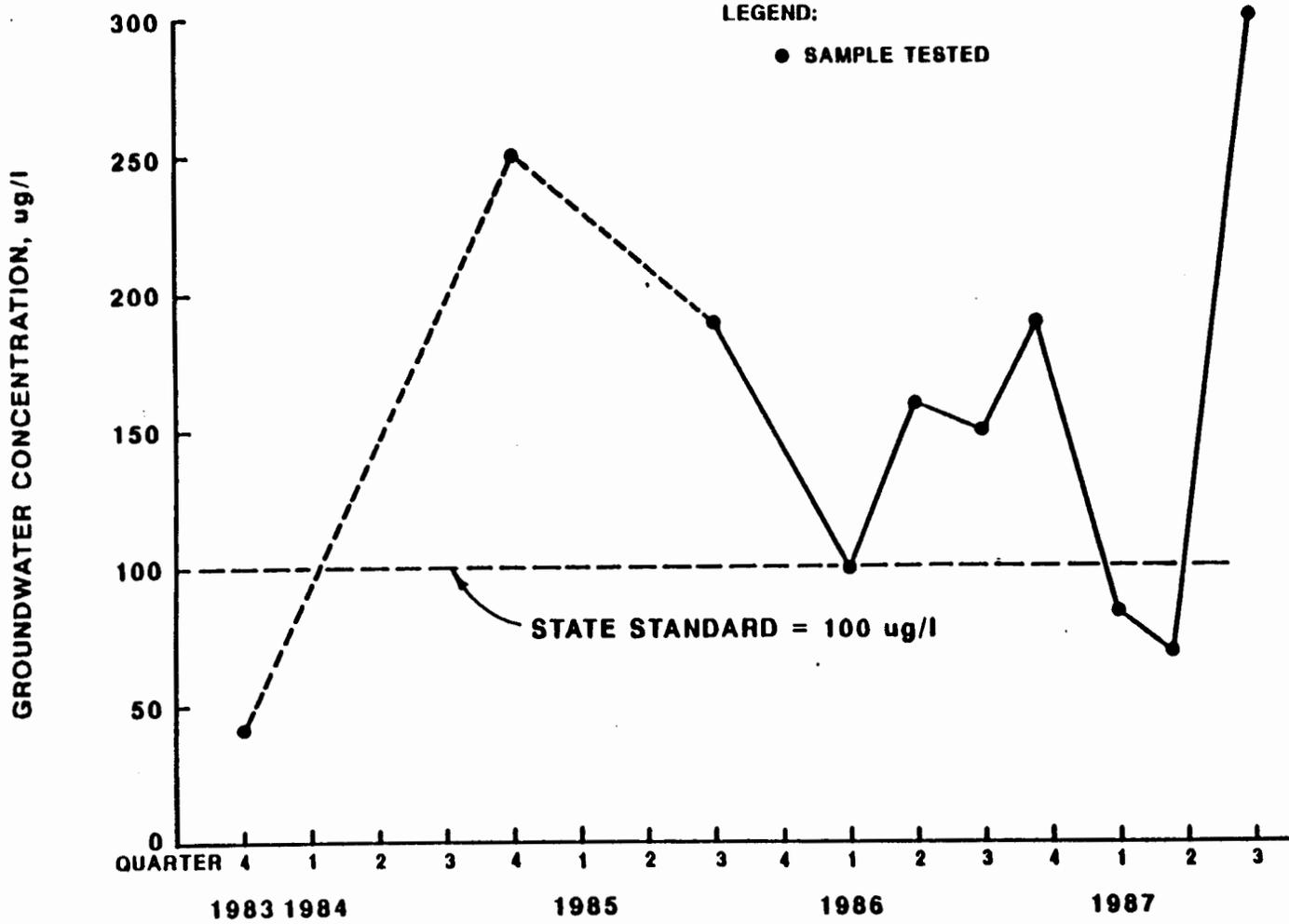
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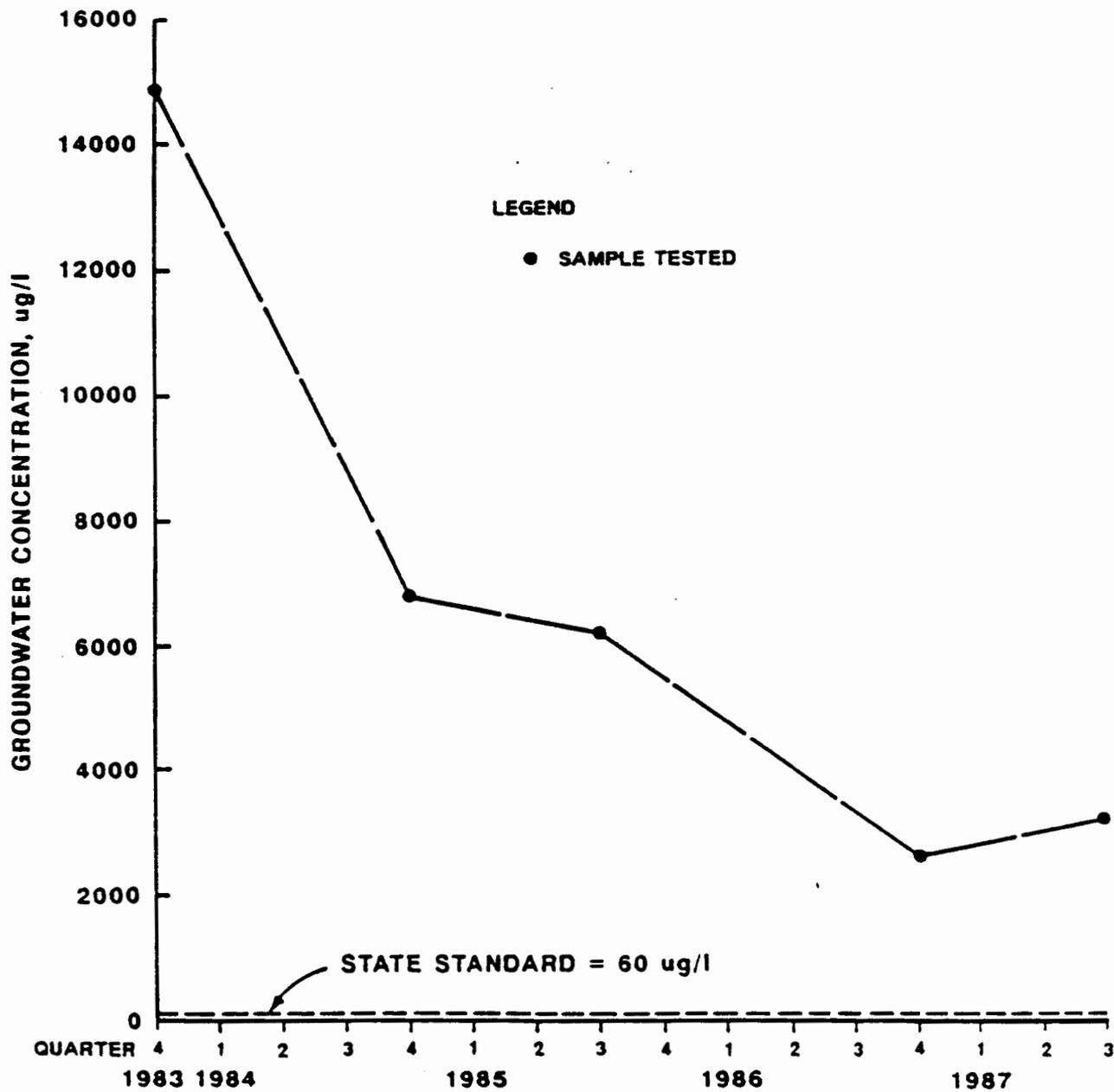


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TCE QUARTERLY SAMPLING
1983 TO 1987 : MW-8

PLATE
12





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& Geophysicists

**TCA QUARTERLY SAMPLING
1983 TO 1987 : MW-9**

PLATE

13

DRAWN
JLT

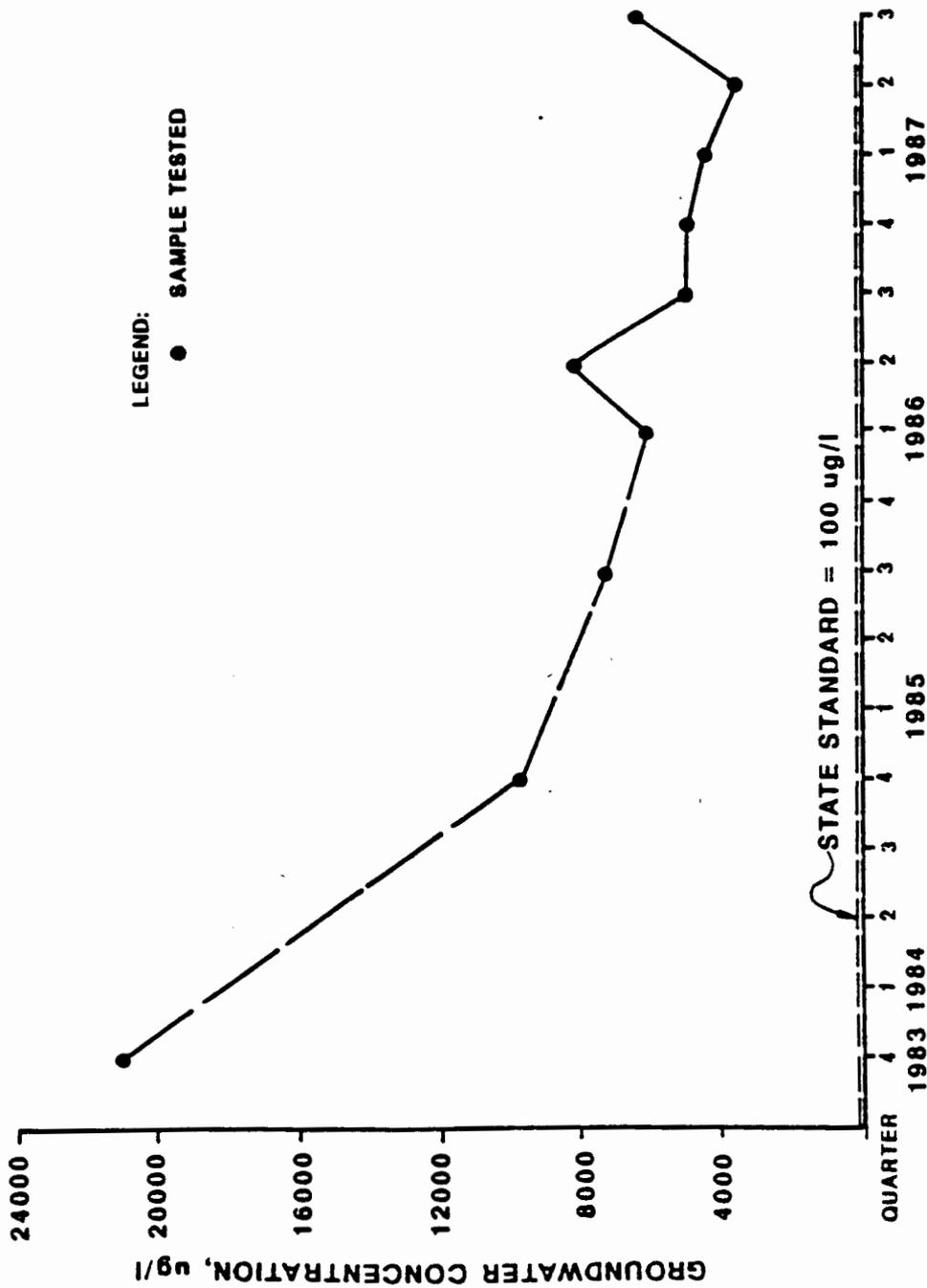
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APPROVED

DATE

REVISED

DATE



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**TCE QUARTERLY SAMPLING
 1983 TO 1987 : MW-9**

PLATE

14

DRAWN
JLT

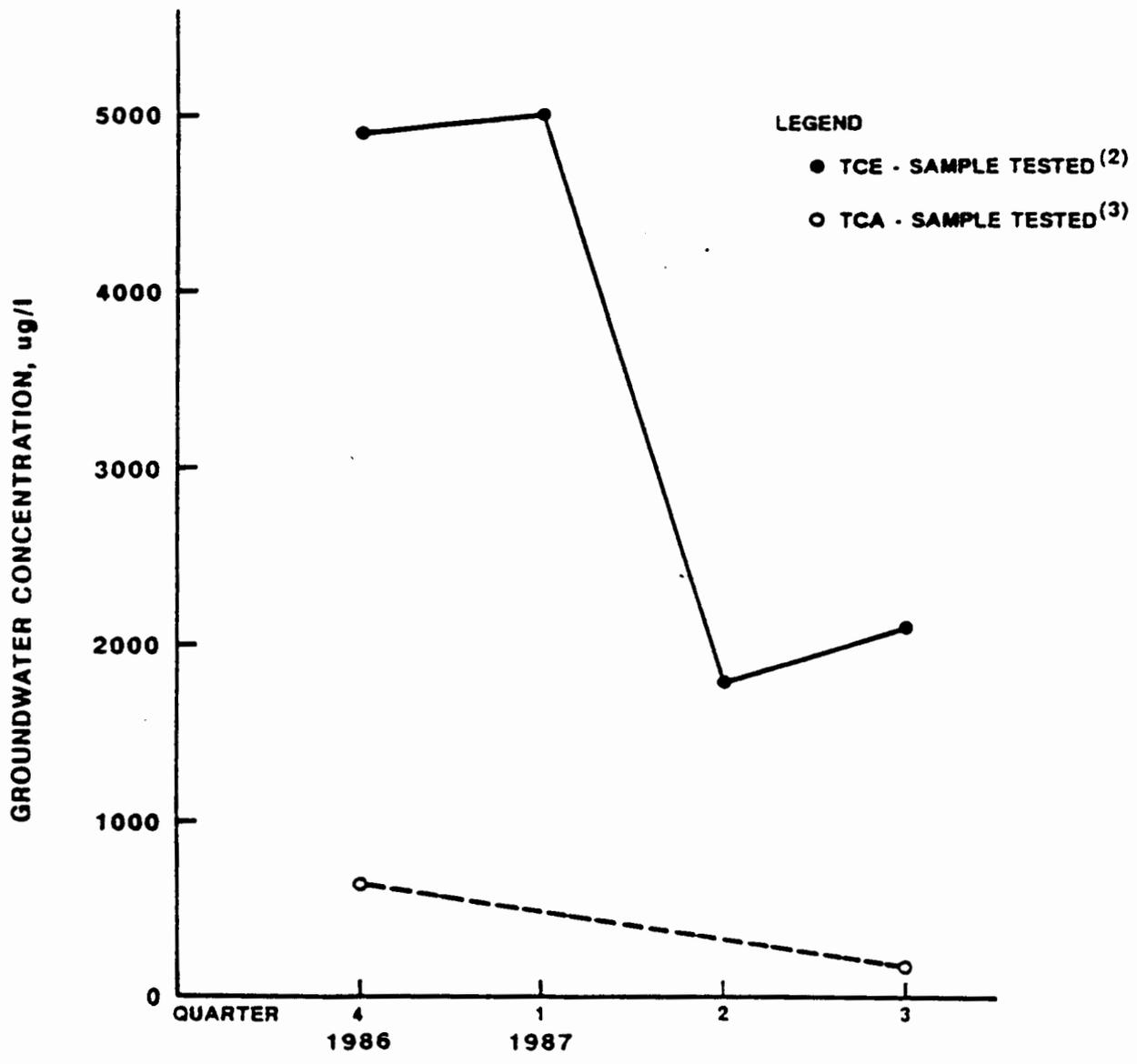
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06310.036.12

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DATE

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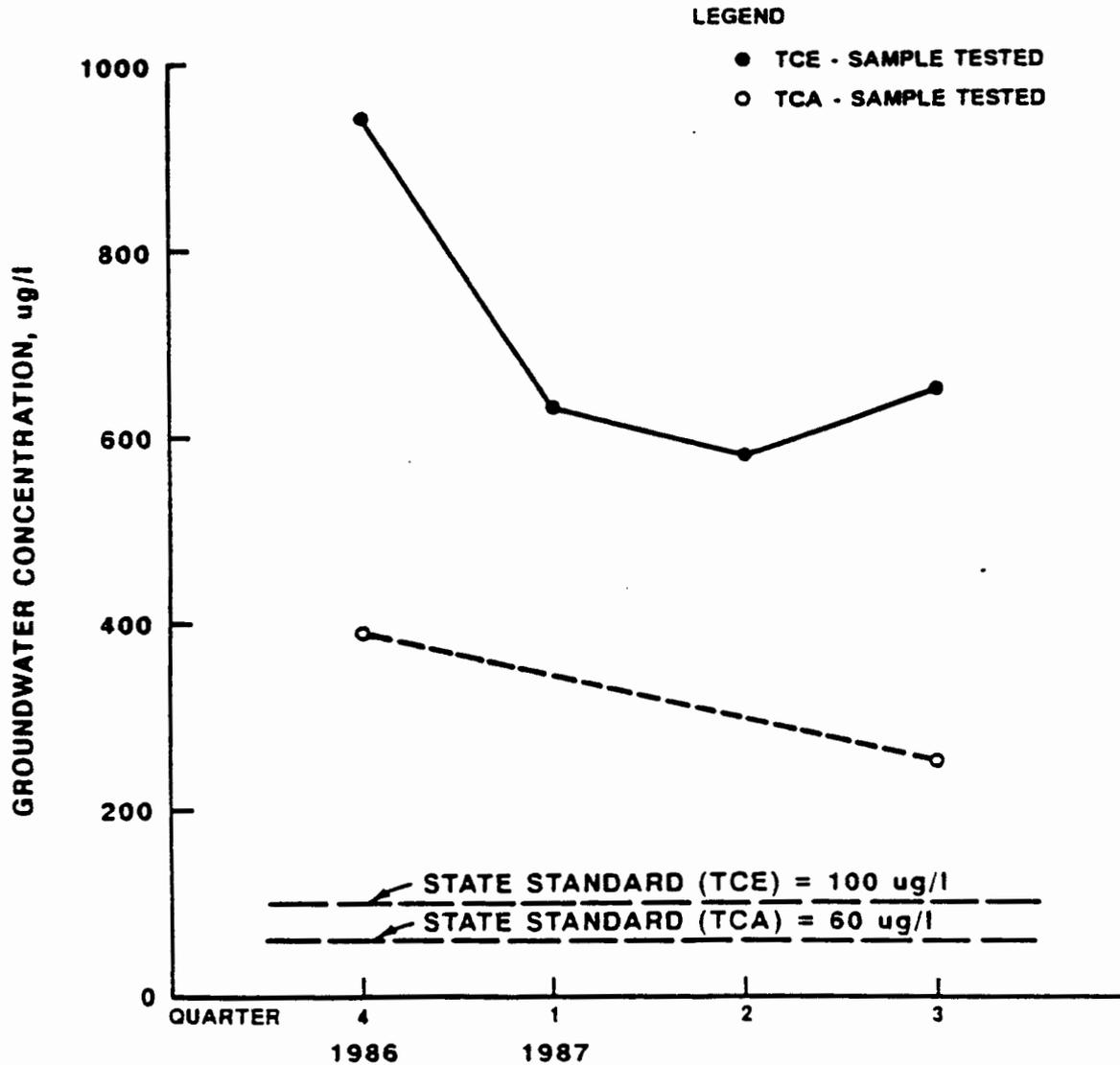
DATE



NOTES: 1. PACKER PLACED TO ISOLATE UPPER FLOW ZONE IN 1985.
 2. STATE STANDARD (TCE) = 100 ug/l.
 3. STATE STANDARD (TCA) = 60 ug/l.



**TCA AND TCE QUARTERLY SAMPLING⁽¹⁾
 1986 TO 1987 : MW-14**



NOTE: 1. PACKER PLACED TO ISOLATE UPPER FLOW ZONE IN 1985.



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TCA AND TCE QUARTERLY SAMPLING⁽¹⁾
1986 TO 1987 : MW-15

PLATE

16

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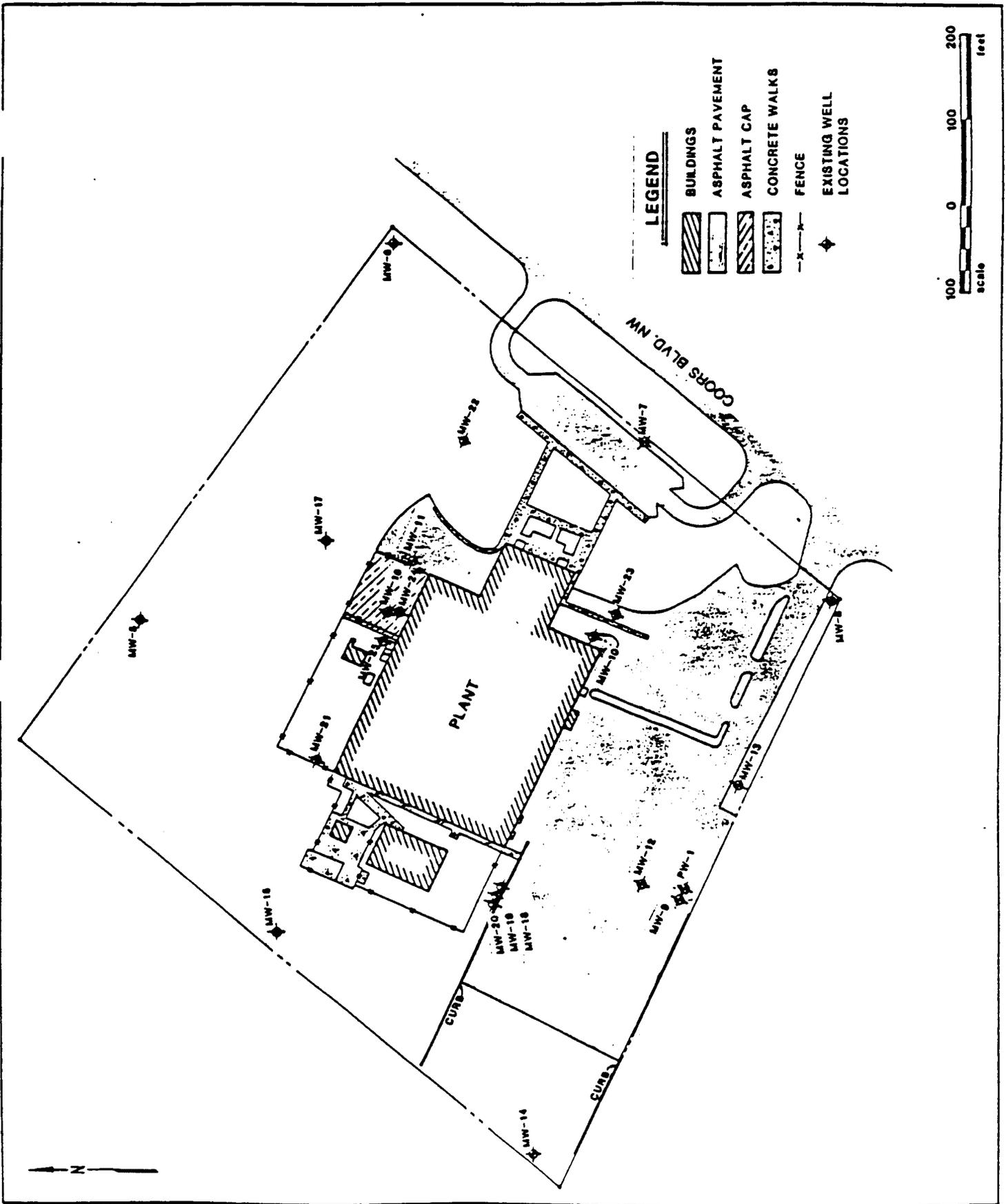
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06310.036.12

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REVISED

DATE



Harding Lawson Associates
 Engineers, Geologists
 & Geophysicists

EXISTING WELLS
 Sparton Technology, Inc.
 Albuquerque, New Mexico

PLATE

17

$$(1) \quad V = \frac{cKi}{n}$$

where: V = velocity, in feet/year
 K = 0.92 feet/day
 i = 0.007
 n = 0.40
 c = 365 days/year

$$V = \frac{(365 \text{ days/year}) (0.92 \text{ feet/day}) (0.007)}{0.40}$$

$$= 5.88 \text{ feet/year}$$

$$(2) \quad V = \frac{(365 \text{ days/year}) (13.0 \text{ feet/day}) (0.007)}{0.40}$$

$$= 83.04 \text{ feet/year}$$



Figure (A) ADVECTION (with continuous source)

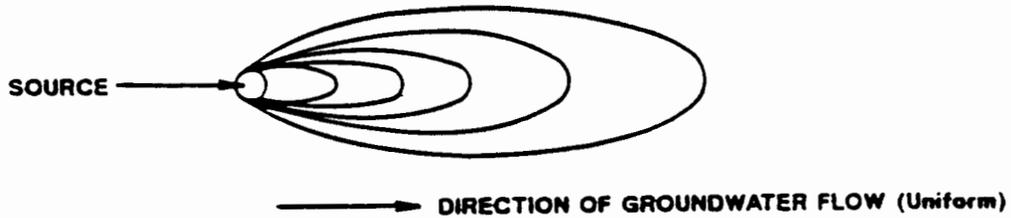


Figure (B) ADVECTION (with terminated source)



Figure (C) DISPERSION (with no advective influence)

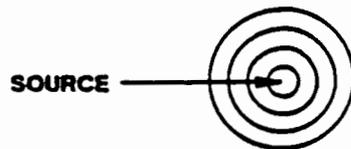


Figure (D) ADVECTION (with minor dispersion influence)

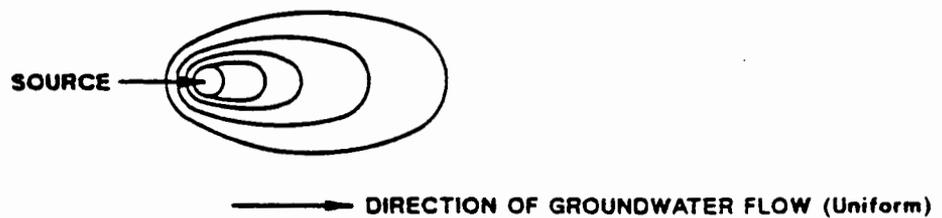
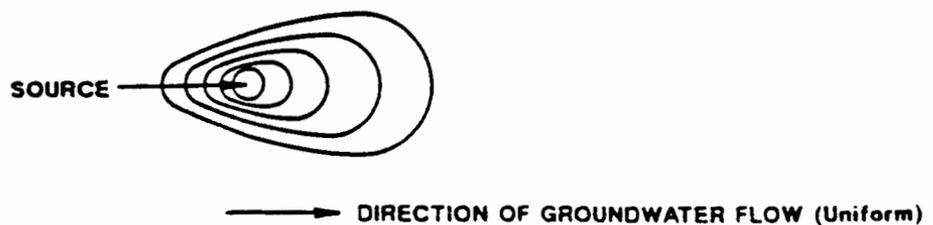
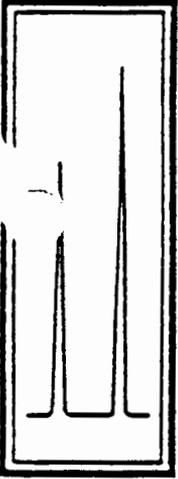


Figure (E) DISPERSION (with minor advection influence; i.e.: low groundwater velocity)



APPENDIX A
TRC Report, 1987



Tracer Research Corporation

3855 North Business Center Drive Tucson, Arizona 85705 (602) 888-9400

SHALLOW SOIL GAS INVESTIGATION
AT THE
SPARTON FACILITY
ALBUQUERQUE, NEW MEXICO

AUGUST, 1987

PREPARED FOR:

HARDING LAWSON ASSOCIATES
6220 Westpark, Suite 100
Houston, Texas 77057

SUBMITTED BY:

Tracer Research Corporation



TABLE OF CONTENTS

INTRODUCTION..... 1

BACKGROUND ON THE METHODOLOGY..... 2

SAMPLING AND ANALYTIC PROCEDURES..... 3

QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES 5

APPENDIX A

 CONDENSED DATA..... 7

FIGURES (MAPS)..... ATTACHED

INTRODUCTION

A shallow soil gas investigation was conducted by Tracer Research Corporation in the vicinity of the Sparton facility in Albuquerque, New Mexico. The investigation was conducted July 20-24, 1987. Additionally a depth profile consisting of 6 samples was taken on August 7, 1987. The main purpose was to delineate the subsubsurface distribution of the following compounds:

- 1,1,1-Trichloroethane (TCA)
- Trichloroethene (TCE)
- Tetrachloroethene (PCE)

Analytical results are condensed in Appendix A. Maps of sampling locations and isoconcentration contours for TCA and TCE are attached.



BACKGROUND ON THE METHODOLOGY

The presence of volatile organic chemicals (VOCs) in shallow soil gas indicates the observed compounds may either be in the vadose zone near the probe or in groundwater below the probe. The soil gas technology is most effective in mapping low molecular weight halogenated solvent chemicals and petroleum hydrocarbons possessing high vapor pressures and low aqueous solubilities. These compounds readily partition out of the groundwater and into the soil gas as a result of their high gas/liquid partitioning coefficients. Once in the soil gas, VOCs diffuse vertically and horizontally through the soil to the ground surface where they dissipate into the atmosphere. The contamination acts as a source and the above ground atmosphere acts as a sink, and typically a concentration gradient develops between the two. The concentration gradient in soil gas between the source and ground surface may be locally distorted by hydrologic and geologic anomalies (e.g. clays, perched water); however, soil gas mapping generally remains effective because distribution of the contamination is usually broader in areal extent than the local geologic barriers and is defined using a large data base. The presence of geologic obstructions on a small scale tends to create anomalies in the soil gas-groundwater correlation, but generally does not obscure the broader areal picture of the contaminant distribution.



SAMPLING AND ANALYTIC PROCEDURES

Tracer Research Corporation utilized an analytical field van which was equipped with two gas chromatographs and two Spectra Physics SP4270 computing integrators. In addition, the van has two built-in gasoline powered generators which provide the electrical power (110 volts AC) to operate all of the gas chromatographic instruments and field equipment. A specialized hydraulic mechanism consisting of two cylinders and a set of jaws was used to drive and withdraw the sampling probes. Probes consist of 7-foot lengths of 3/4 inch diameter steel pipe which are fitted with detachable drive points. A hydraulic hammer was used to assist in driving probes past cobbles and through unusually hard soil.

Soil gas samples were collected by driving a hollow steel probe to a depth less than 14 feet into the ground. The above-ground end of the sampling probes was fitted with a steel reducer and a length of polyethylene tubing leading to a vacuum pump. Five to 10 liters of gas was evacuated with a vacuum pump. During the soil gas evacuation, samples were collected by inserting a syringe needle through a silicone rubber segment in the evacuation line and down into the steel probe. Ten milliliters of gas were collected for immediate analysis in the TRC analytical field van. Soil gas was subsampled (duplicate injections) in volumes ranging from 1 μ l to 2 ml, depending on the VOC concentration at any particular location.

A gas chromatograph equipped with an electron capture detector was used for analyses of TCA, TCE and PCE. Nitrogen was used as the carrier gas.



Detection limits are a function of the injection volume as well as the detector sensitivity for individual compounds. Thus, the detection limit varies with the sample size. Generally, the larger the injection size the greater the sensitivity. However, peaks for compounds of interest must be kept within the linear range of the detector. If any compound has a high concentration, it is necessary to use small injections, and in some cases to dilute the sample to keep it within linear range. This may cause decreased detection limits for other compounds in the analyses. The detection limits range down to 0.00005 ug/l for compounds such as TCA and PCE depending on the conditions of the measurement, in particular, the sample size. If any component being analyzed is not detected, the detection limit for that compound in that analysis is given as a "less than" value (e.g. <0.0001 ug/l). This number is calculated from the current response factor, the sample size, and the estimated minimum peak size (area) that would have been visible under the conditions of the measurement.



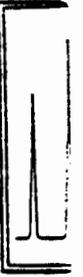
QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Tracer Research Corporation's normal quality assurance procedures were followed in order to prevent any cross-contamination of soil gas samples.

- . Steel probes are used only once during the day and then washed with high pressure soap and hot water spray or steam-cleaned to eliminate the possibility of cross-contamination. Enough probes are carried on each van to avoid the need to reuse any during the day.
- . Probe adaptors (steel reducer and tubing) are used once during the course of the day and cleaned at the end of each working day by baking in the GC oven. The tubing is replaced periodically as needed during the job to insure cleanliness and good fit.
- . Silicone tubing (connecting the adaptor to the vacuum pump) is replaced as needed to insure proper sealing around the syringe needle. This tubing does not directly contact soil gas samples.
- . Glass syringes are usually used for only one sample per day and are washed and baked out at night. If they must be used twice, they are purged with carrier gas (nitrogen) and baked out between probe samplings.
- . Septa through which soil gas samples are injected into the chromatograph are replaced on a daily basis to prevent possible gas leaks from the chromatographic column.
- . Analytical instruments are calibrated each day by the use of chemical standards prepared in water by serial dilution from commercially available pure chemicals. Calibration checks are also run after approximately every five soil gas sampling locations.
- . 2 cc subsampling syringes are checked for contamination prior to sampling each day by injecting nitrogen carrier gas into the gas chromatograph.
- . Prior to sampling each day, system blanks are run to check the sampling apparatus (probe, adaptor, 10 cc syringe) for contamination by drawing ambient air from above ground through the system and comparing the analysis to a concurrently sampled air analysis.



- . All sampling and 2 cc subsampling syringes are decontaminated each day and no such equipment is reused before being decontaminated. Microliter size subsampling syringes are reused only after a nitrogen carrier gas blank is run to insure it is not contaminated by the previous sample.
- . Soil gas pumping is monitored by a vacuum gauge to insure that an adequate gas flow from the vadose zone is maintained. A negative pressure (vacuum) of 2 in. Hg less than the maximum capacity of the pump (evacuation rate >0.02 cfm) usually indicates that a reliable gas sample cannot be obtained because the soil has a very low air permeability.



APPENDIX A: CONDENSED DATA

HAROLD G. LAWSON/SPARTON/ALBUQUERQUE, NEW MEXICO

Sample	Depth	Date	TCB (ug/l)	ICE (ug/l)	PCE (ug/l)
56H-01	5.5'	07/20	0.01	1	0.007
56H-02	5'	07/20	2	2	0.01
56H-03	6'	07/20	12	10	0.1
56H-04	6'	07/20	20	15	0.2
56H-05	6'	07/20	23	24	0.4
56H-06	6'	07/20	32	40	0.4
56H-07	6'	07/20	6	10	0.2
56H-08	5.5'	07/20	0.9	9	0.07
56H-09	5.5'	07/20	0.7	9	0.09
56H-10	5.5'	07/20	3	11	0.4
56H-11	5.5'	07/20	2	5	0.2
56H-12	5.5'	07/20	5	13	0.5
56H-13	6'	07/20	8	20	0.7
56H-14	6'	07/20	7	13	0.6
56H-15	5.5'	07/20	7	0.01	0.4
56H-16	6'	07/20	0.0006	0.0002	0.0006
56H-17	5'	07/21	0.6	0.6	0.006
56H-18	6'	07/24	0.4	1	0.05
56H-19	5'	07/24	0.2	0.01	0.002
56H-20	4.5'	07/24	0.1	0.002	0.0007
56H-21	5'	07/24	0.001	0.0008	0.0006
56B-01	6'	07/21	0.2	0.0004	0.01
56B-02	5'	07/21	0.4	0.02	0.006
56B-03	6'	07/21	0.6	0.02	0.001
56B-04	6'	07/21	0.2	0.006	0.0004
56B-05	5'	07/21	0.04	0.0002	0.0006
56B-06	6'	07/21	0.1	<0.0002	0.0002
56B-07	5'	07/21	0.02	0.001	0.0001
56B-08	6'	07/21	0.004	0.001	0.0002
56B-09	6'	07/21	0.1	0.4	0.007
56B-10	6'	07/21	0.9	0.0	0.01
56B-11	6'	07/21	0.02	0.01	0.0003
56B-12	6'	07/21	0.004	0.001	0.0001

Notations:
 I interference with adjacent peaks
 NI not analyzed

Analyzed by S. Cherba
 Checked by M. Favero
 Proofed by L. Laplander

HAK 6 LAWSON ASSOCIATES/SPARTAN/ALBUQUERQUE, NEW MEXICO

Sample	Depth	Date	TCN Cug/L	TCE Cug/L	PCE Cug/L
S60-13	6'	07/24	0.0006	<0.0001	0.0001
S60-01	6'	07/20	0.0005	0.0002	0.0001
S60-02	6'	07/21	0.009	0.003	0.0001
S60-03	5'	07/21	0.02	0.02	0.0002
S60-04	6'	07/21	0.02	0.03	0.0002
S60-05	6'	07/21	0.002	0.001	0.00009
S60-06	5'	07/21	0.0009	0.001	0.00009
S60-07	6'	07/21	0.0009	0.001	0.00009
S60-08	6'	07/21	0.001	0.0009	0.0006
S60-09	6'	07/21	0.03	0.01	0.00009
S60-10	6'	07/21	0.02	0.004	0.00009
S60-11	6'	07/22	0.009	0.002	0.0002
S60-12	6'	07/22	0.002	<0.0002	0.00000
S60-13	6'	07/22	0.01	0.0002	0.00008
S60-14	6'	07/22	0.04	0.004	0.00008
S60-15	6'	07/22	0.02	0.0009	0.00009
S60-16	5'	07/22	0.006	0.0002	0.00005
S60-01	6'	07/20	0.0004	0.007	0.0003
S60-02	6'	07/21	0.0006	0.001	0.0001
S60-03	6'	07/22	0.009	0.003	0.0002
S60-04	6'	07/22	0.002	0.003	0.0002
S60-05	6'	07/22	0.001	<0.0002	0.0002
S60-06	6'	07/22	0.0008	0.0002	0.0002
S60-07	5'	07/22	0.0004	<0.0002	0.00006
S60-08	5.5	07/22	0.0004	0.001	0.00008
S60-09	6'	07/22	0.0003	<0.0002	0.00006
S60-10	6'	07/22	0.0003	<0.0002	0.00008
S60-10a	6'	07/22	0.0003	0.0002	0.00008
S60-11	6'	07/22	0.0002	<0.0002	0.00006
S60-12	6'	07/22	0.0001	<0.0002	0.00006
S6E-01	6'	07/23	6	7	0.2
S6E-02	6'	07/23	16	13	0.4
S6E-03	6'	07/23	14	12	0.2

Notations:

I interference with adjacent peaks
 III not analyzed

Analyzed by S. Cherba
 Checked by M. Favero
 Proofed by L. Lanlander

HARDY'S LAWSON ASSOCIATES/SPARTON/ALBUQUERQUE, NEW MEXICO

Sample	Depth	Date	TCM (ug/L)	TCR (ug/L)	PCE (ug/L)
S6E-04	6'	07/23	31	27	0.5
S6E-05	6'	07/23	21	14	0.3
S6E-06	6'	07/23	11	9	0.1
S6E-07	6'	07/23	0.8	0.7	0.009
S6E-08	6'	07/23	0.1	0.04	0.0009
S6E-09	6'	07/23	0.3	0.1	0.001
S6E-10	6'	07/24	0.6	2	0.09
S6E-11	6'	07/24	0.03	0.04	0.003
S6E-12	6'	07/24	0.001	0.0008	0.00007
S6E-13	6'	07/24	0.0004	0.0001	0.00007
S6E-01	5'	07/24	0.01	0.004	0.0002
S6E-02	6'	07/24	0.07	0.02	0.00008
S6E-03	6'	07/24	0.01	0.01	0.0004
S6E-04	5'	07/24	0.0003	<0.0001	0.00009
S6E-05	6'	07/24	0.0005	0.0001	0.0002
S6E-06	6'	07/24	0.0003	<0.0001	0.0002
S6E-07	6'	07/24	0.0002	0.002	0.0008
S6E-08	6'	07/23	0.0008	0.0007	0.0002
S6B2-02	5'	07/23	0.0004	0.0004	0.0001
S6B2-03	5'	07/23	0.01	0.002	0.00005
S6B2-04	4.5'	07/23	0.06	0.001	0.0002
S6B2-05	6'	07/23	0.09	0.003	0.0001
S6B2-06	6'	07/23	0.1	0.006	0.0003
S6B2-07	6'	07/23	2	0.05	0.005
S6B2-08	6'	07/23	0.3	0.02	0.0002
S6B2-09	5'	07/23	0.2	0.1	0.0004
S6B2-10	6'	07/23	0.5	0.2	0.0007
S6B2-11	6'	07/23	0.03	0.01	0.0002

Notations:
 I interference with adjacent peaks
 NA not analyzed

Analyzed by S. Cherba
 Checked by M. Favero
 Proofed by L. Laplander

HARDING LAISON/SPIRITON/ALBUQUERQUE, NEW MEXICO

Sample	Depth (feet)	TCR (ug/l)	TCE (ug/l)	PLE (ug/l)
560-12	0'	0.2	0.007	0.0006
560-13	0'	0.09	0.009	0.0002
560-14	0'	0.03	<0.0001	0.0001
560-2-01	0'	0.0003	<0.0002	0.00007
560-2-02	5'	0.0004	<0.0002	0.00008
560-2-03	1.5'	0.0004	0.0003	0.0002
560-2-04	5'	0.0006	<0.0002	0.00009
560-2-05	0'	0.0002	<0.0002	0.00007
560-2-06	0'	0.0003	<0.0002	0.00007
560-2-07	0'	0.0002	<0.0002	0.00005
560-2-08	0'	0.0006	<0.0002	0.00005
560-2-09	0'	0.0008	<0.0002	0.00005
560-2-10	0'	0.0004	<0.0002	0.00005
560-2-11	0'	0.005	0.0002	0.00009

Analysed by S. Cherba
Checked by M. Favero
Prepared by L. Lanlander

Notes:
1. and references with adjacent peaks
HA not analysed

HARDING LAWSON/SPARTON/ALBUQUERQUE, NEW MEXICO

Sample	Date	TCA (ug/l)	TCE (ug/l)	PCE (ug/l)
DP-5.0	• 08/07	2	0.03	0.007
DP-10.3	• 08/07	3	0.2	<0.001
DP-15.7	• 08/07	8	0.8	4
DP-21.0	• 08/07	11	1	<0.02
DP-26.3	• 08/07	14	1	<0.02
DP-31.7	• 08/07	11	1	<0.02

Notations:

I interference with adjacent peaks
NA not analyzed

Analyzed by T. Bode
Checked by T. Bode
Proofed by D. Evans

APPENDIX B
TRC Report, 1984

CONFIDENTIAL

CONSULTING REPORT

Harding Lawson Associates
6300 Westpark, Suite 100
Houston, Texas 77057

Soil gas investigation of volatile organic
compounds at the Sparton Technology, Inc.
site, 9621 Coors Road NW, Albuquerque,
New Mexico 87114

By

Glenn M. Thompson Ph.D.
Tracer Research Corporation
1687 West Grant Road
Tucson, Arizona 85745

602-623-0200

May 25, 1984

-CONFIDENTIAL-

OBJECTIVES:

A soil gas survey was performed to determine to the extent of volatile contaminant migration off-site in the down-gradient direction from the Spartan property and to determine if there was a source of contamination up-gradient from the property that was contributing to ground water contamination in the area.

METHOD:

The soil gas survey is performed by collecting and analysing samples of shallow soil gas in transects across the property and in accessible down-gradient areas for the principal volatile constituents of the contamination. The soil gas is collected by driving a 3/4" steel pipe into the ground to a depth of five (5) feet. The pipe is closed at the tip with perforations for air entry several inches up from the tip. Soil gas is pumped from the ground through the probe at the rate of two (2) or three (3) liters per minute for a period of about three (3) minutes, the time required to obtain a representative sample. The sample is collected in a glass syringe and immediately injected into a gas chromatograph for analysis. The analysis is performed in the field in the TRC mobil laboratory. The analysis typically requires three (3) to four (4) minutes and is completed in about the same amount of time that is required to pull the sampling probe from the ground.

The results of the measurement are immediately available to be used in deciding where to place the next probe.

Blanks are periodically run to determine if the sampling system is contaminated. The blank is obtained by drawing air above ground through the probe, pump and syringe sampling system. Thus, an uncontaminated system should produce a gas sample that looks exactly like air above ground injected with a clean syringe.

SELECTION OF CONTAMINANTS FOR PLUME MAPPING:

Previous work at the site by HLA indicated that TCE, 1,1,1 TCA, 1,1 DCE, methylenechloride and PCE were present in the ground water. Of these contaminants, TCE and TCA were present in concentration^S of at least a factor of ten (10) higher than all the rest. Accordingly, TCE and TCA were the two components of the contamination selected for use in the plume mapping effort. In addition to the fact that TCE and TCA were the major volatile contaminants, other factors reinforced the decision to monitor only the TCE and TCA. The detectability of TCE and TCA is at least fifty (50) times greater than the DCE and the methylenechloride at the same concentration. Thus it is impractical in measurements where speed is essential, to measure the minor components of the contaminant mixture in the presence of major components that may yield 500 times more signal.

The TCE and TCA are also believed to be as mobil or more mobil in ground water systems than the other volatile components. Thus the TCE and TCA are likely to represent the "worst case" situation for movement of contaminants off-site. PCE which is as detectable as TCE and TCA was present in much smaller concentrations and was of little significance in this investigation.

TABLE 1 - 5/10/84

SAMPLE	TCA Concentration ug/l	TCE Concentration ug/l
SG420	11	7.6
SG430	59	28
SG440	140	59
SG450	440	720
SG460	150	61
SG470	78	61
SG480	19	32
SG490	53	140
SG500	28	48
MW5	170	400
SG510	32	43
SG520	56	102
MW4	5,600	11,000
SG530	45	32
SG540	41	27
SG550	26	25

Table 2 - Repeat sampling within five (5) foot radius of selected points to test reproducibility of sampling procedure.

<u>5/8/84</u>	<u>TCA</u>	<u>TCE</u>	<u>5/9/84</u>	<u>TCA</u>	<u>TCE</u>
SG10	1.8	4.0	SG10B	1.9	4.1
SG100	2.9	.85	SG100B	3.2	.99
SG110	2.9	3.6	SG110B	2.7	3.3
SG50	315	675	SG50B	200	360
SG45	220	240	SG45B	172	200

Table 3 - TCA and TCE soil gas concentration compared to ground water concentrations in the shallow aquifer.

Monitoring Well	Soil Gas Sampling Point	TCA ug/l water/ug/l SG	TCE ug/l water/ug/l SG
MW8	SG10B	107/1.9 = 56	447/4.1 = 109
MW7	SG100B	85/3.2 = 27	380/.99 = 380
MW9	SG50B	17,000/198 = 85	22,000/364 = 60
MW6	SG110B	151/2.7 = 55	585/3.3 = 177
MW5	SG370	165/40 = 4.1	395/80 = 5
MW4	SG120	5,600/334 = 17	11,000/560 = 19

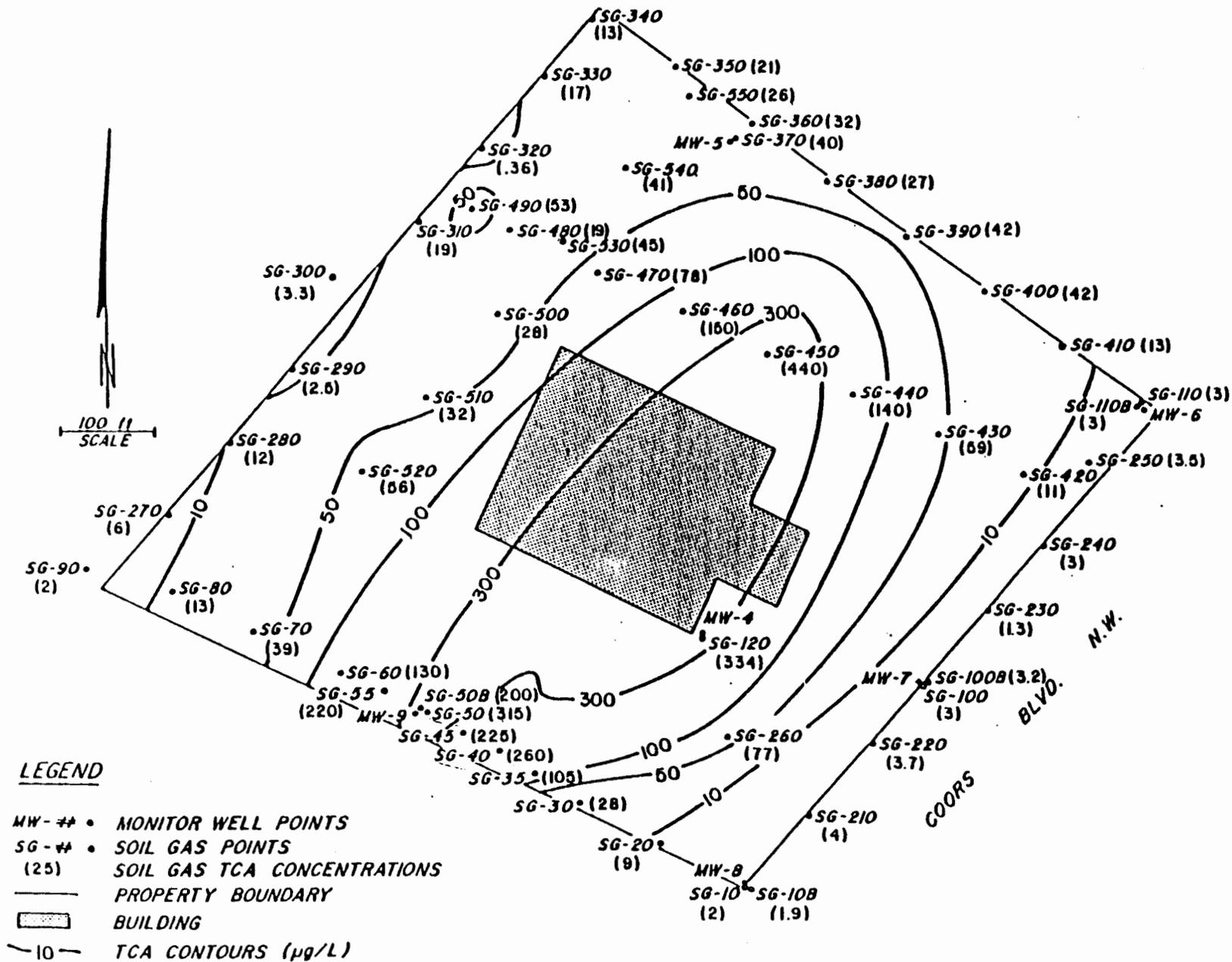


Figure 2. TCA in Soil-Gas Contour Map.

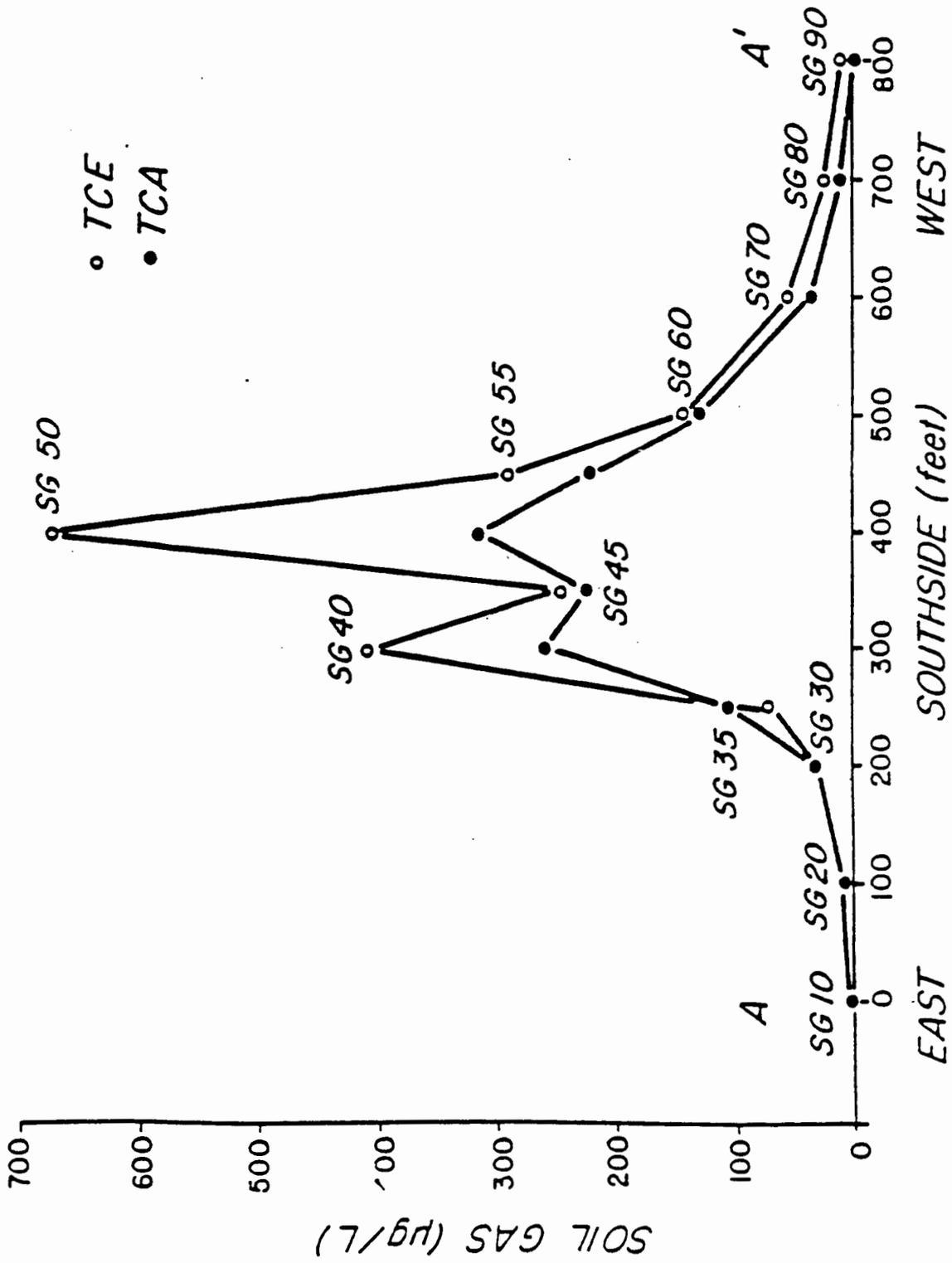


Figure 3 - Soil gas transect A-A' along southwestern property boundary.

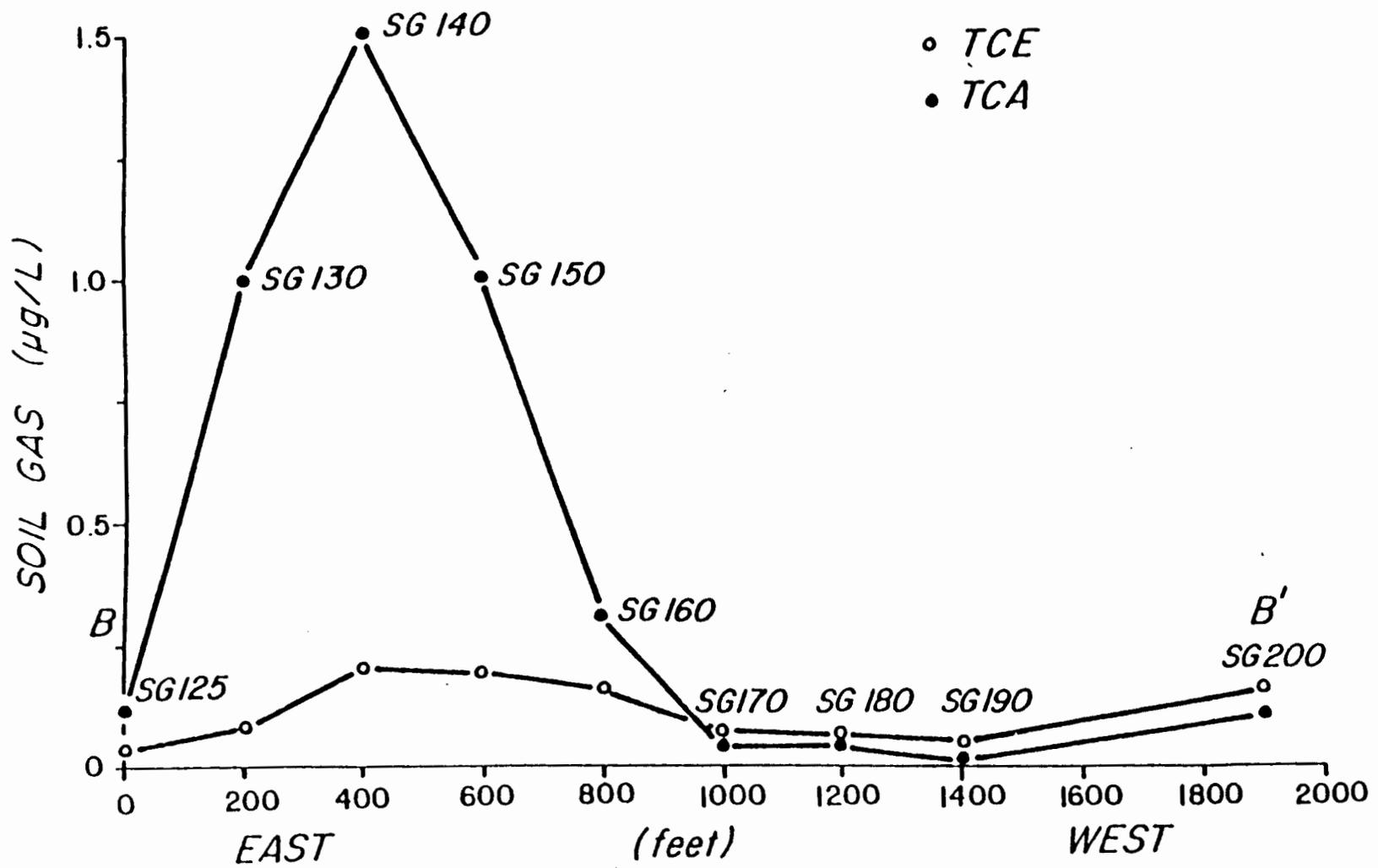


Figure 4 - Soil gas transect B-B' 800 feet southwest of the property down-gradient from transect A-A'.

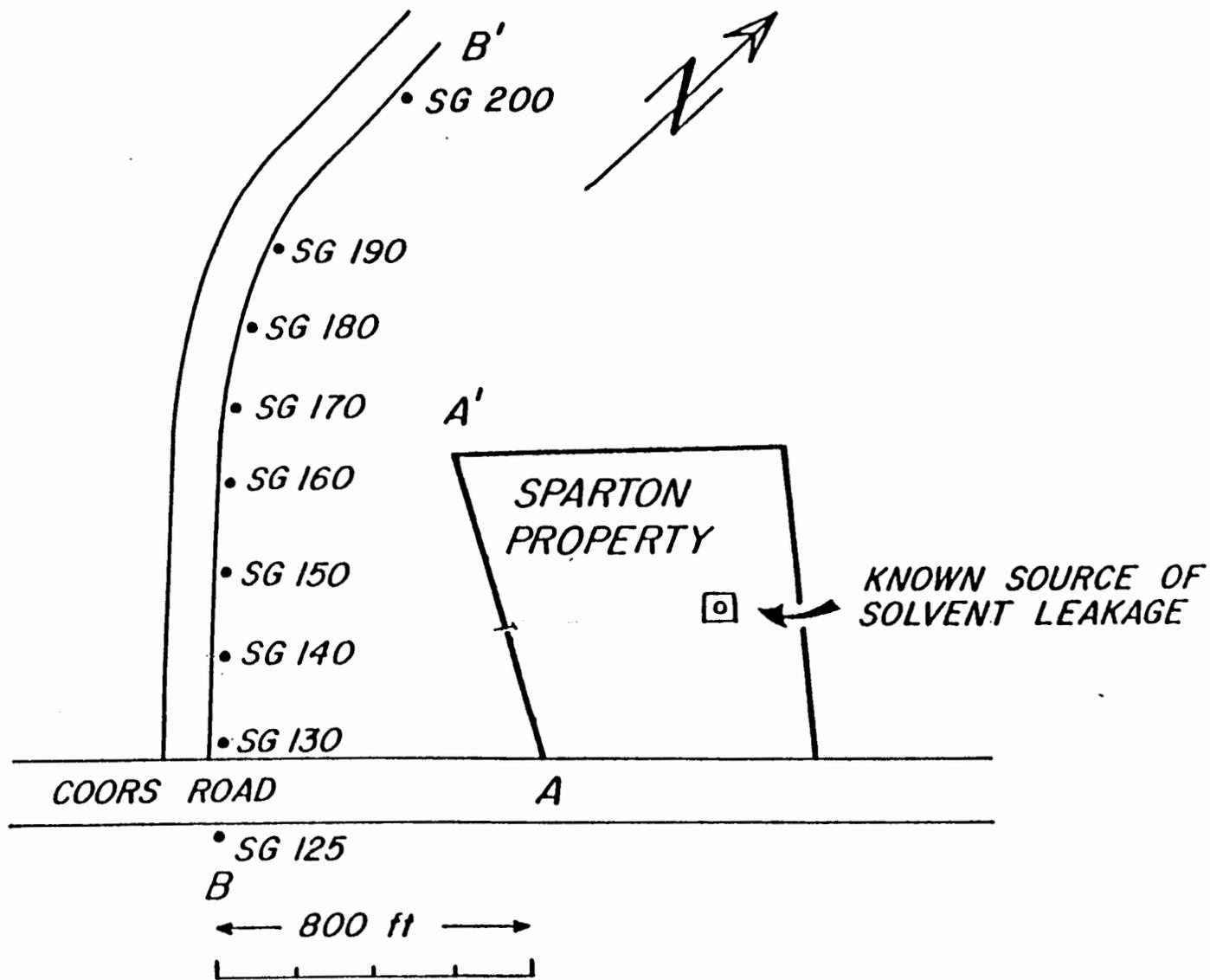


Figure 5 - Map showing location of transects A-A' and B-B' relative to to the property.

DISCUSSION OF RESULTS:

The soil gas sampling shows TCA and TCE decreasing in concentration radially in all directions from the known contamination source area on the northeast side of the building (Figs. 1 & 2). The contours are skewed to the southwest in the direction of ground water movement and indicate that contamination is moving off-site in the ground water. The contamination was observed again 800 feet further down-gradient in the second transect.

The off-site plume cross section showed TCA and TCE concentrations in the shallow soil gas of 1.5 ug/l and 0.19 ug/l respectively. The system blank analysed during this part of the work showed that the background for TCA in the system was 0.003 ug/l and 0.014 ug/l for TCE. Thus the TCA anomaly observed off-site was approximately 300 times greater than background and the TCE was 13 times greater than background. The TCE background represents a small amount of equipment contamination from the on-site work earlier that day. However, the TCA background represents primarily the ambient atmospheric levels of TCA.

The ability to predict the concentration of TCA in the ground water off-site is limited by the fact that the coupled ground water/soil gas measurements needed for prediction are made on-site in rather close proximity to the source. The on-site correlation measurements are less valuable for prediction of off-site ground water contamination because they are influenced by lateral diffusion of contaminants from the source in addition to upward diffusion of contaminants from the water table.

The highest ground water/soil gas ratios are probably the best to use for prediction of ground water contamination off-site because they are the least effected by lateral diffusion from the source (Table 3). The highest ratios observed were 85 and 380 for TCA and TCE respectively. Using these ground water to soil gas ratios to determine the level of off-site contamination in the ground water one calculates concentrations of 120 ug/l and 80 ug/l for TCA and TCE respectively at the high point indicated by the transect. No meaningful confidence interval can be attached to these estimates due to the lack of sufficient data for correlation off-site.

The estimates could be off by a considerable factor in either direction, but they appear plausible considering the high concentrations measured 800 feet up-gradient in the ground water at MW9 (17,000 ug/l TCA and 22,000 ug/l TCE).

The ratio of contaminant concentration in the ground water to soil gas can be effected by a variety of variables and an attempt to evaluate and adjust for each of the variables would be a hopeless task. An empirical average obtained from several paired ground water - soil gas measurements is usually the best approach for predicting the amount of contaminant in the ground water and will probably give "order of magnitude" prediction accuracy. However, in this case, the problems related to the proximity of the source are thought to be significant enough to justify the slightly different approach used here.

Two soil gas transects were made across the north and west sides of the property in an attempt to determine if an up-gradient source of contamination existed. The only source evident in the soil gas survey however is on-site. With a minor exception on the northwest part of the property, soil gas TCE and TCA concentrations decrease away from the center of the Sparton property (Figs. 1 & 2). However, the magnitude of the on-site source would easily obscure a minor contribution to the soil gas made by an off-site source. A transect made 800 or 1,000 feet up-gradient would have been needed to clearly identify an up-gradient source.

APPENDIX C
Data Analysis

WELL NO.	[----- TCE -----]			[----- TCA -----]		
	GROUNDWATER CONC. ,ug/l	SOIL GAS CONC. ,ug/l	GW/SG RATIO	GROUNDWATER CONC. ,ug/l	SOIL GAS CONC. ,ug/l	GW/SG RATIO
5	39	13	3.0	15	16	0.9
6	540	0.7	771.4	130	0.8	162.5
8	300	1	300.0	33	0.01	3300.0
9	6400	24	266.7	3300	23	143.5
13	1300	12.5	104.0	520	16	32.5
14	2100	3	700.0	170	0.7	242.9
15	650	20	32.5	250	8	31.3
AVERAGE			311			559
STANDARD DEVIATION			311			1212



PROJECT _____

SUBJECT _____

1) TCE

Using a t -statistic at the 95% confidence level, with 6 degrees of freedom;

$$t_{.95,6} = 2.45$$

The upper limit (worst case) of the 95% confidence interval is given by

$$\bar{x} + 2.45(s)$$

where \bar{x} = average

s = standard deviation

$$\begin{aligned} \text{so } \bar{x} + 2.45(s) &= 311 + 2.45(311) \\ &= 1073 \end{aligned}$$

$$\text{OR, } \frac{GW}{SG} = 1073$$

where GW = groundwater conc.

SG = soil gas conc.



PROJECT _____
SUBJECT _____

AND, SOLVING FOR SG

$$SG = \frac{GW}{1073}$$

IF WE ARE LOOKING FOR GROUNDWATER
CONCENTRATIONS EQUAL TO THE STATE
STANDARD (100 ug/l), THE ESTIMATED
SOIL GAS CONCENTRATION WOULD THEN
BE

$$SG = \frac{100}{1073}$$
$$= \underline{\underline{0.09 \text{ ug/l}}}$$



PROJECT _____
SUBJECT _____

2) TCA

USING A SIMILAR ANALYSIS FOR THE TCA
RATIOS,

THE UPPER LIMIT OF THE 95% CONFIDENCE
INTERVAL = 3528

AND THE SOIL GAS CONCENTRATION
CORRESPONDING TO THE STATE LIMIT
OF 60 ug/l IS = 0.02 ug/l

ATTACHMENT 9

June 1991 Sampling and Analysis



PREPARED FOR:

**Metric Corporation
8429 Washington Place NE
Suite A
Albuquerque, New Mexico 87113
(505)828-2801**

SHALLOW SOIL GAS INVESTIGATION

**SPARTAN TECHNOLOGY BUILDING
9621 NORTH COORS ROAD
ALBUQUERQUE, NEW MEXICO**

**JUNE 1991
REVISED 12/91**

SUBMITTED BY:

Tracer Research Corporation

**191263S.REP
1-91-263-S**



TABLE OF CONTENTS

INTRODUCTION 1

SHALLOW SOIL GAS INVESTIGATION - METHODOLOGY 2

EQUIPMENT 3

SOIL GAS SAMPLING PROCEDURES 3

ANALYTICAL PROCEDURES 4

QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES 5

TEST RESULTS 7

CONCLUSIONS 8

APPENDIX A: ANALYTICAL DATA 9

APPENDIX B: FIGURES 10



INTRODUCTION

A shallow soil gas investigation was performed by Tracer Research Corporation (*TRACER*) at the Spartan Technology Building site located in Albuquerque, New Mexico. The investigation was conducted on June 17-19, 1991 under contract to Metric Corporation. The purpose of the investigation was to delineate the extent of possible contamination in the subsurface.

During this survey, a total of 63 soil gas samples were collected and analyzed. Samples were analyzed for volatile organic compounds from the following suite:

<u>COMPOUND</u>	<u>DETECTOR</u>
1,1,1-trichloroethane (TCA)	ECD
trichloroethene (TCE)	ECD
tetrachloroethene (PCE)	ECD

The compounds in this suite were chosen as target compounds because of their suspected presence in the subsurface and amenability to soil gas technology. Soil gas samples were screened on a gas chromatograph equipped with an electron capture detector (ECD).



SHALLOW SOIL GAS INVESTIGATION - METHODOLOGY

Shallow soil gas investigation refers to a method developed by *TRACER* for investigating underground contamination from volatile organic chemicals (VOCs) such as industrial solvents, cleaning fluids and petroleum products by looking for their vapors in the shallow soil gas. The method involves pumping a small amount of soil gas out of the ground through a hollow probe driven into the ground and analyzing the gas for the presence of volatile contaminants. The presence of VOCs in shallow soil gas indicates the observed compounds may either be in the vadose zone near the probe or in groundwater below the probe. The soil gas technology is most effective in mapping low molecular weight halogenated solvent chemicals and petroleum hydrocarbons possessing high vapor pressures and low aqueous solubilities. These compounds readily partition out of the groundwater and into the soil gas as a result of their high gas/liquid partitioning coefficients. Once in the soil gas, VOCs diffuse vertically and horizontally through the soil to the ground surface where they dissipate into the atmosphere. The contamination acts as a source and the above ground atmosphere acts as a sink, and typically a concentration gradient develops between the two. The concentration gradient in soil gas between the source and ground surface may be locally distorted by hydrologic and geologic anomalies (e.g. clays, perched water); however, soil gas mapping generally remains effective because distribution of the contamination is usually broader in areal extent than the local geologic barriers and is defined using a large database. The presence of geologic obstructions on a small scale tends to create anomalies in the soil gas-groundwater correlation, but generally does not obscure the broader areal picture of the contaminant distribution.

Soil gas contaminant mapping helps to reduce the time and cost required to delineate underground contamination by volatile contaminants. The soil gas investigation does this by outlining the general areal extent of contamination. Conventional bore holes or observation wells are used to verify both the presence and extent of the subsurface



contamination as indicated in the soil gas survey. In this manner, soil gas contaminant mapping can assist in determining the placement of monitoring wells. Thus the likelihood of drilling unnecessary monitoring wells is reduced. The soil gas survey is not intended to be substitute for conventional methodology, but rather to enable conventional methods to be used efficiently.

EQUIPMENT

Tracer Research Corporation utilized a one ton Ford analytical van that was equipped with one gas chromatograph and two Spectra Physics computing integrators. In addition, the van had two built-in gasoline powered generators that provide the electrical power (110 volts AC) to operate all of the gas chromatographic instruments and field equipment. A specialized hydraulic mechanism consisting of two cylinders and a set of jaws was used to drive and withdraw the sampling probes. A hydraulic hammer was used to assist in driving probes past cobbles and through unusually hard soil.

SOIL GAS SAMPLING PROCEDURES

Sampling probes consisted of 7 foot lengths of 3/4 inch diameter hollow steel pipe that were fitted with detachable drive tips. Soil gas probes were advanced 4-6 feet below grade. Once inserted into the ground, the above-ground end of the sampling probes were fitted with a steel reducer and a length of polyethylene tubing leading to a vacuum pump. Gas flow was monitored by a vacuum gauge to insure that an adequate flow was obtained.

To adequately purge the volume of air within the probe, 2 to 5 liters of gas was evacuated with a vacuum pump. During the soil gas evacuation, samples were collected in a glass syringe by inserting a syringe needle through a silicone rubber segment in the evacuation line and down into the steel probe. Ten milliliters of gas were collected for immediate analysis in the *TRACER* analytical field van. Soil gas was subsampled (duplicate



injections) in volumes ranging from 1 μ L to 2 mL, depending on the VOC concentration at any particular location.

Sample probe vacuums ranged from 1-5 inches Hg. The maximum pump vacuum was measured at 17 inches Hg (If the probe had become plugged or totally obstructed the vacuum would have read the maximum of 17 inches Hg).

ANALYTICAL PROCEDURES

A Varian 3300 gas chromatograph was used for the soil gas analyses. It was equipped with an electron capture detector (ECD). Compounds were separated on a 6' by 1/8" OD packed column with OV-101 as the stationary phase in a temperature controlled oven. Nitrogen was used as the carrier gas.

Halocarbon compounds detected in the samples were identified by chromatographic retention time. Quantification of compounds was achieved by comparison of the detector response of the sample with the response measured for calibration standards (external standardization). Instrument calibration checks were run periodically throughout the day and system blanks were run at the beginning of the day to check for contamination in the soil gas sampling equipment. Air samples were also routinely analyzed to check for background levels in the atmosphere.

Detection limits for the compounds of interest were a function of the injection volume as well as the detector sensitivity for individual compounds. Thus the detection limit varied with the sample size. Generally, the larger the injection size the greater the sensitivity. However, peaks for compounds of interest were kept within the linear range of the analytical equipment. If any compound had a high concentration, it was necessary to use small injections, and in some cases to dilute the sample to keep it within linear range. This may have caused decreased detection limits for other compounds in the analyses.

The detection limits for the halocarbon compounds were approximately 0.0002 μ g/L.



Detection limits were dependant upon the conditions of the measurement, in particular, the sample size. If any component being analyzed was not detected, the detection limit for that compound in that analysis is given as a "less than" value (e. g. < 0.1 ug/L). Detection limits obtained from GC analyses were calculated from the current response factor, the sample size, and the estimated minimum peak size (area) that would have been visible under the conditions of the measurement.

QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Tracer Research Corporation's normal quality assurance procedures were followed in order to prevent any cross-contamination of soil gas samples. These procedures are described below:

- . Steel probes are used only once during the day and then washed with high pressure soap and hot water spray or steam-cleaned to eliminate the possibility of cross-contamination. Enough probes are carried on each van to avoid the need to reuse any during the day.
- . Probe adaptors (*TRACER's* patented design) are used to connect the sample probe to the vacuum pump. The adaptor is designed to eliminate the possibility of exposing the sample stream to any part of the adaptor. Associated tubing connecting the adaptor to the vacuum pump is replaced periodically as needed during the job to insure cleanliness and good fit. At the end of each day the adaptor is cleaned with soap and water and baked in the GC oven.
- . Silicone tubing (which acts as a septum for the syringe needle) is replaced as needed to insure proper sealing around the syringe needle. This tubing does not directly contact soil gas samples.



- . Glass syringes are usually used for only one sample per day and are washed and baked out at night. If they must be used twice, they are purged with carrier gas (nitrogen) and baked out between probe samplings.
- . Injector port septa through which soil gas samples are injected into the chromatograph are replaced on a daily basis to prevent possible gas leaks from the chromatographic column.
- . Analytical instruments are calibrated each day by analytical standards from Chem Service, Inc. Calibration checks are also run after approximately every five soil gas sampling locations.
- . Subsampling syringes are checked for contamination prior to sampling each day by injecting nitrogen carrier gas into the gas chromatograph.
- . Prior to sampling each day, system blanks are run to check the sampling apparatus (probe, adaptor, 10 cc syringe) for contamination by drawing ambient air from above ground through the system and comparing the analysis to concurrently sampled ambient air analysis.
- . All sampling and subsampling syringes are decontaminated each day and no such equipment is reused before being decontaminated. Microliter size subsampling syringes are reused only after a nitrogen carrier gas blank is run to insure it is not contaminated by the previous sample.
- . Soil gas pumping is monitored by a vacuum gauge to insure that an adequate gas flow from the vadose zone is maintained. A reliable gas sample can be obtained if the sample vacuum gauge reading is at least 2 inches Hg less than the maximum pump vacuum.



TEST RESULTS

A total of 63 soil gas and 8 ambient air samples were collected and analyzed on site. Analytical data are condensed in Appendix A and reported in micrograms per liter. Appendix B contains maps showing the distribution of the target VOCs.

Ambient air samples were collected during the course of the investigation to help evaluate the Level of Significance for the selected compounds. The Level of Significance is simply the level above which is considered to be significant in terms of groundwater or soil contamination. TCA, TCE and PCE were not detected in any of the ambient air samples analyzed in the field. The Level of Significance for each target compound is based on several factors; concentrations in ambient air, background levels, and *TRACER*'s past experience. Based on the evaluation of these factors, the Level of Significance for the selected target compounds was determined to be 0.001 ug/L. In other words, soil gas concentrations of TCA, TCE and PCE greater than the determined Level of Significance may indicate possible VOC contamination in the vicinity.

Prior to the start of the soil gas survey, sample locations were placed by the client. The investigation started at sampling point SG-91-1 and continued from that point as data became available. Sample locations SG-91-1 through SG-91-10 were collected along North Coors Road, investigation proceeded to the north-northwest of the Spartan Building and proceeded to cover the area surrounding the building.

TCA concentrations over the entire site ranged from non-detect (<0.0004 ug/L) to 12 ug/L. The highest concentration was detected at sampling location SG-61. The elevated levels of TCA are concentrated around the Spartan Building and decrease as you move further away from the building decreasing to non-detect (<0.0004 ug/L) levels to the northwest.

The TCE detected followed much the same path as the TCA mentioned earlier although not a broad spread. TCE ranged in concentration from non-detect (<0.001 ug/L)



to 24 ug/L detected at sampling location SG-91-61. Concentrations of TCE above 1 ug/L were detected at those sampling locations immediately surrounding the Spartan Building with concentrations decreasing away from the building. The TCE seemed to be concentrated in a more southwesterly direction than the TCA as shown in figure 3.

PCE was also detected during the investigation. The PCE was detected in a much smaller area than either the TCA or the TCE and at lower concentrations. The PCE ranged in concentration from non-detect (<0.0006 ug/L) to 0.2 ug/L being detected at sampling locations SG-91-42, SG-91-49, SG-91-50, and SG-91-61, these samples being located immediately to the north-northwest of the Spartan Building. One isolated area around sampling location SG-91-38 also showed contourable levels of PCE.

CONCLUSIONS

The highest concentrations of TCA, TCE and PCE were detected at those sampling locations in the immediate vicinity of the Spartan Building. Concentrations decreased to levels of non-detect to the northwest. No conclusions can be drawn regarding the area to the southeast of this site because no samples were collected to the southeast of the Spartan Building, further investigation would need to be conducted to assess the area in this direction and soil gas technology would be ideal for this function.



APPENDIX A: ANALYTICAL DATA

METRIC CORPORATION/SPARTAN FACILITY/ALBUQUERQUE, NEW MEXICO JOB #1-91-263-S

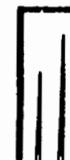
6/17/91

CONDENSED DATA

SAMPLE	TCA ug/l	TCE ug/l	PCB ug/l
SG-91-23-5'	<0.0004	<0.001	<0.0006
SG-91-24-6'	<0.0004	<0.001	<0.0006
SG-91-25-6'	<0.0004	<0.001	<0.0006
SG-91-26-4'	<0.0004	<0.001	<0.0006
SG-91-27-6'	0.003	<0.001	<0.0006
SG-91-28-6'	0.02	<0.001	<0.0006
SG-91-29-6'	0.09	0.02	<0.0006
SG-91-30-5'	0.04	<0.001	<0.0006
SG-91-31-6'	<0.0004	<0.001	<0.0006
SG-91-32-6'	<0.0004	<0.001	<0.0006
AIR	<0.0002	<0.0007	<0.0003

Analyzed by: D. Ho

Proofed by:



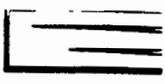
METRIC CORPORATION/SPARTAN FACILITY/ALBUQUERQUE, NEW MEXICO JOB #1-91-263-S

6/19/91

CONDENSED DATA

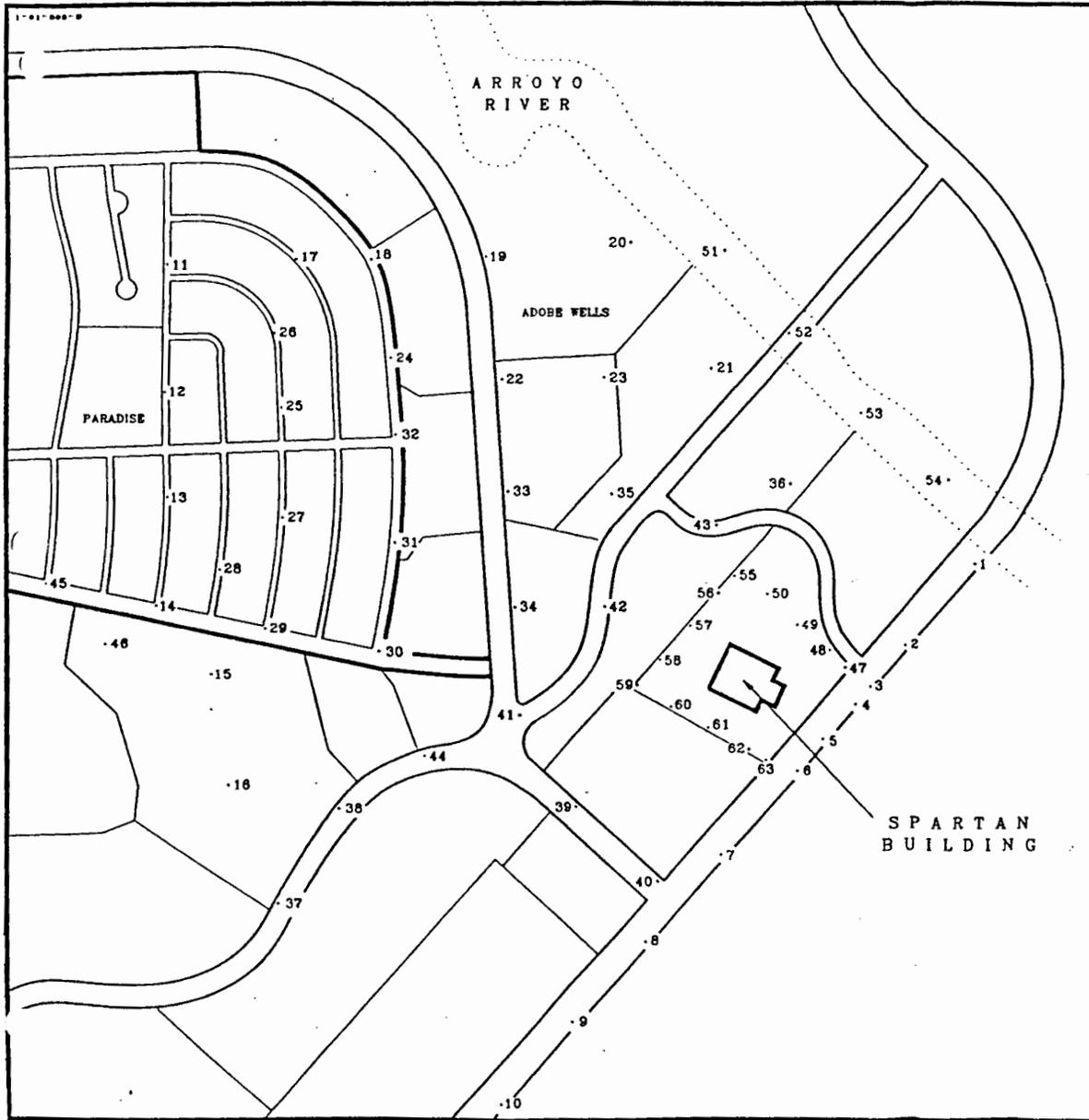
SAMPLE	TCA ug/l	TCE ug/l	PCB ug/l
AIR	<0.0003	<0.001	0.0009
SO-91-61-6'	12	24	0.2
SO-91-62-6'	6	7	<0.1
SO-91-63-6'	1	2	<0.05
AIR	<0.0003	<0.001	<0.0005

Analyzed by: D. Ho
 Proofed by: KL



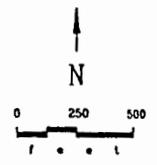


APPENDIX B: FIGURES



EXPLANATION

·61 Sampling Probe Location

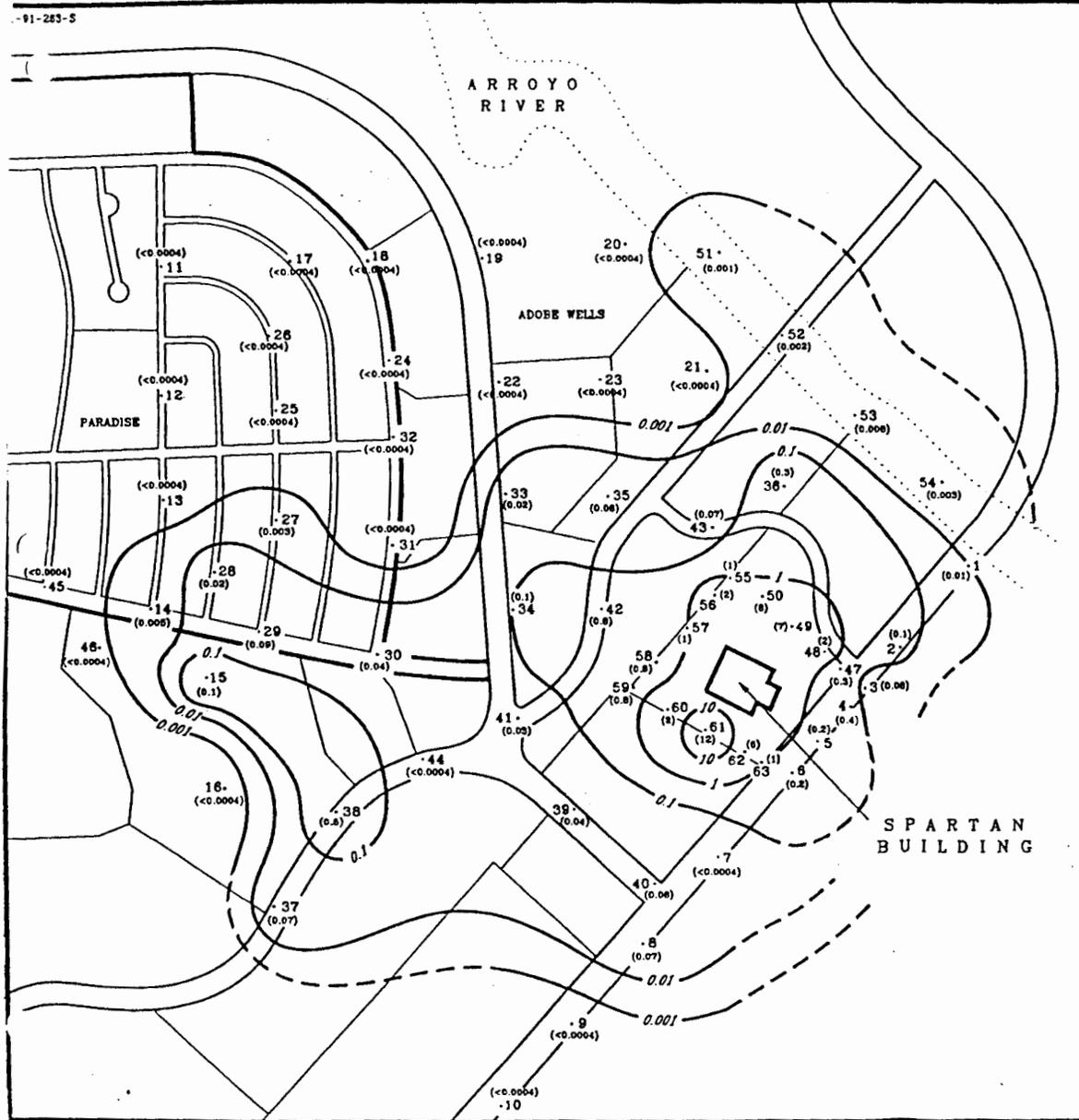


SPARTAN TECHNOLOG

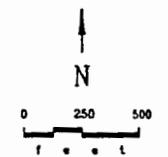
9021 NORTH COORS
ALBUQUERQUE, NEW MEXICO

SAMPLING LOCATIONS

Figure 1

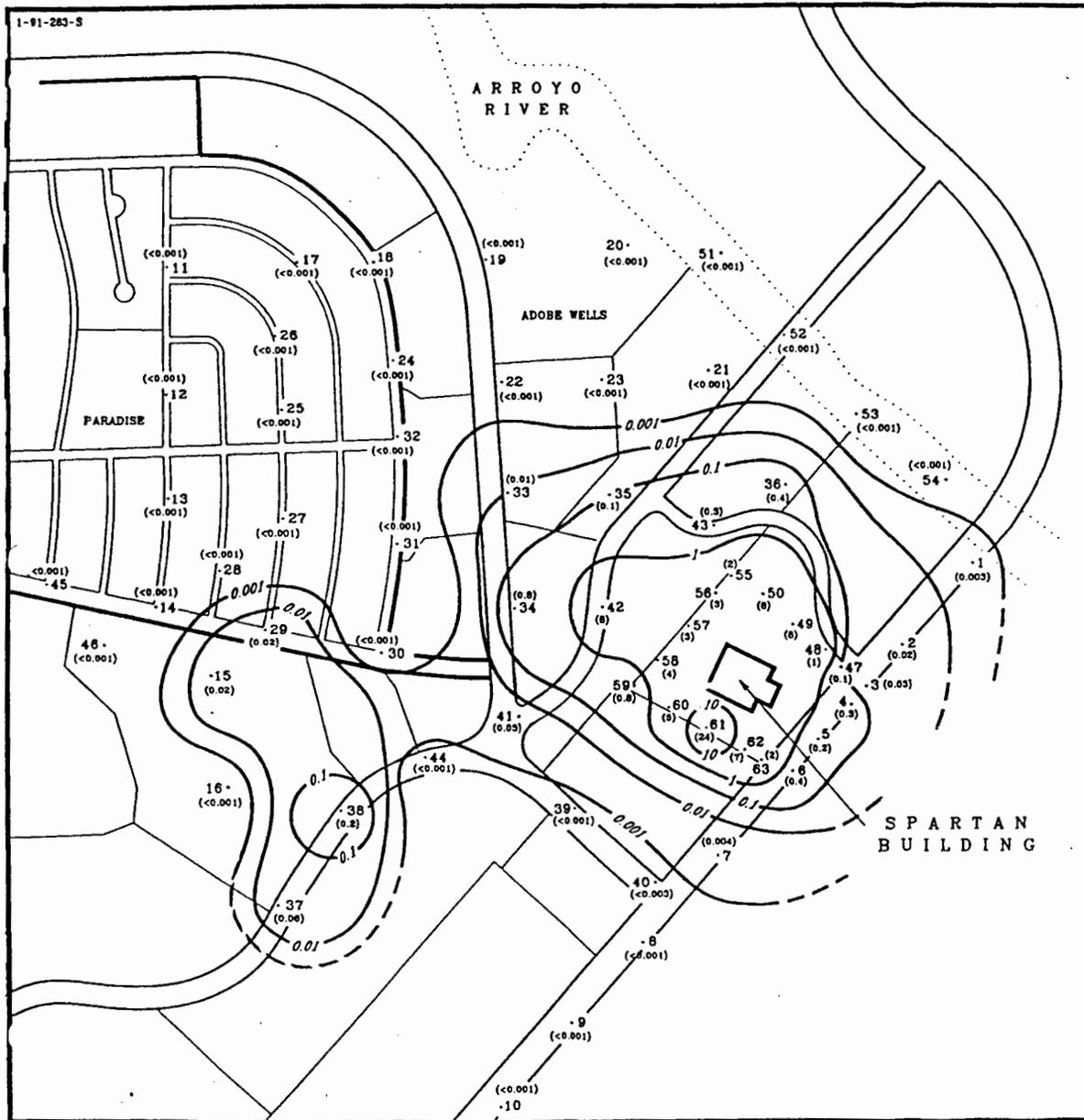


- EXPLANATION**
- 61 Sampling Probe Location
 - (12) Soil Gas Sample Value (µg/l)
 - 10 - Isoconcentration Line (µg/l)



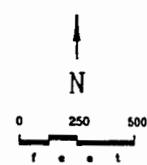
SPARTAN TECHNOLOGY
 8821 NORTH COORS
 ALBUQUERQUE, NEW MEXICO
 TRICHLOROETHANE (TCA)

Figure 2



EXPLANATION

- 61 Sampling Probe Location
- (24) Soil Gas Sample Value (µg/l)
- 10 — Isoconcentration Line (µg/l)

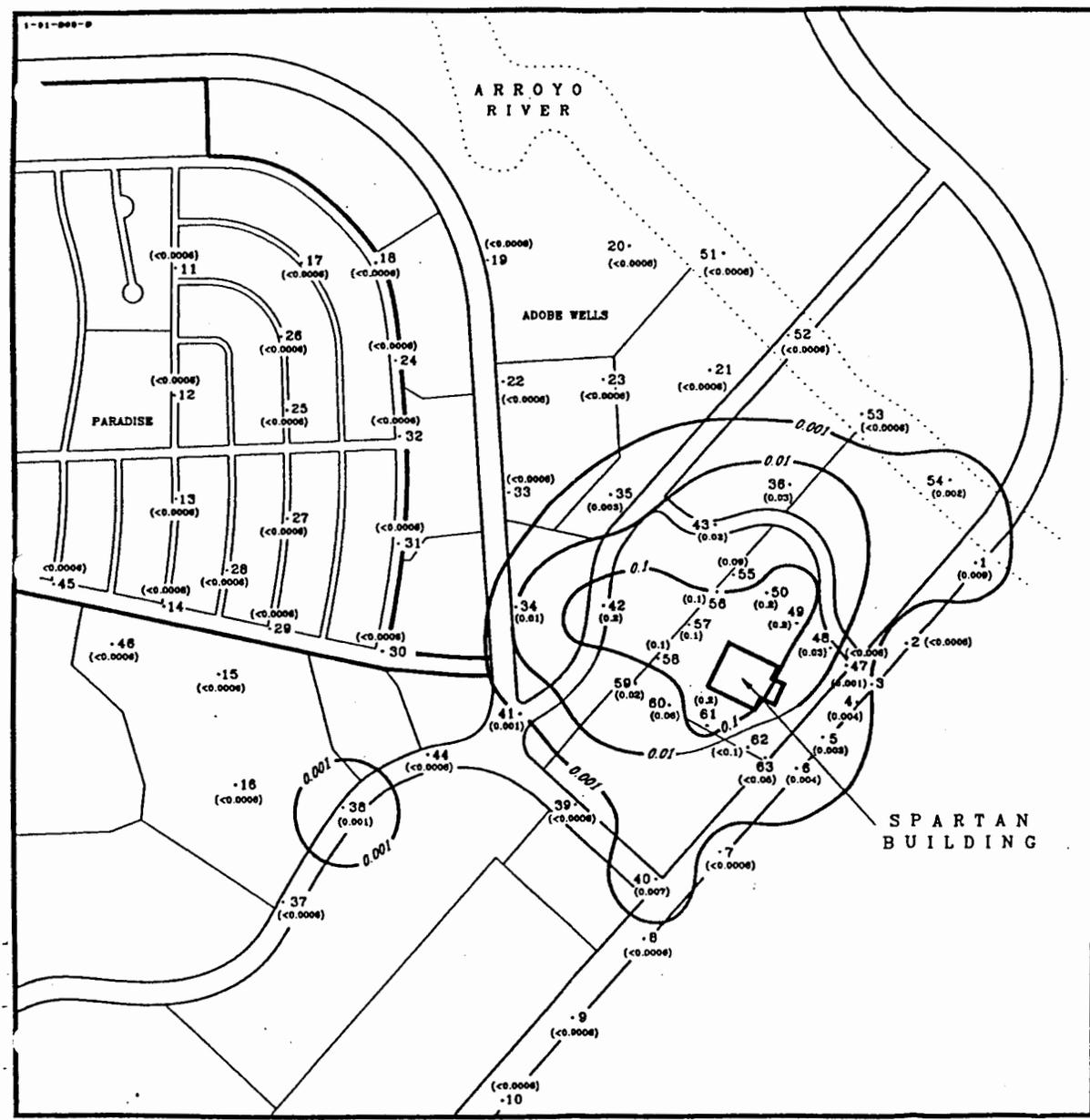


SPARTAN TECHNOLOGY
 9921 NORTH COORS
 ALBUQUERQUE, NEW MEXICO
 TRICHLOROETHENE (TCE)

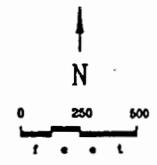
Figure 3

1-21-900-9

Tracer Research Corporation



- EXPLANATION**
- 61 Sampling Probe Location
 - (0.2) Soil Gas Sample Value ($\mu\text{g}/\text{l}$)
 - 0.1 Isoconcentration Line ($\mu\text{g}/\text{l}$)



SPARTAN TECHNOLOGY
 6621 NORTH COORS
 ALBUQUERQUE, NEW MEXICO
 TETRACHLOROETHENE (PCE)

Figure 4

Mike

Here is the
draft Soil Gas
Information Summary

All of the referenced
material is attached.

Pierce

Soil Gas Information Summary
Sparton Technology, Inc.
Coors Road Plant
Albuquerque, New Mexico

1. The Sparton Plant began operation in 1961 to manufacture electronic components. The manufacturing process generated an aqueous metal plating waste and a solvent waste. These wastes were accumulated in on-site surface impoundments located in what is now referred to as the pond/sump area on the northeast side of the building.
2. In 1983, several groundwater monitoring wells were installed around the pond/sump area. Analytical results from groundwater samples obtained from these wells indicated concentrations of TCE and TCA above state standards.
3. In Spring of 1984, Tracer Research Corporation conducted a limited soil gas survey to a) assist in delineating the extent of off-site groundwater impacts and b) determine if there was a source upgradient from the Sparton property. Over 50 sampling points were utilized on-site and 9 sampling points were utilized along Irving Boulevard south of the property. Highest constituent concentrations were observed in the sampling transect nearest the pond/sump area (near current monitoring well MW-17). Soil gas TCE concentrations ranged from 720 ug/l (161 ppm_V) to less than 0.25 ug/l. TCA concentrations ranged from 440 ug/l (97 ppm_V) to less than 0.25 ug/l.

The Tracer study concluded a) that soil gas concentrations decreased radially in all directions from the pond/sump area and b) that concentration isopleths are skewed to the southwest in the direction of groundwater movement (RFI, Attachment 7, Appendix B). Results were also included in Appendix 2 of the CMS Report.

4. The use of soil gas as a "tracer" for groundwater contamination was an evolving technology. The 1984 Sparton soil gas/groundwater investigation was summarized in a paper by Eric Lappalla in 1984 and was included in the 1989 EPA Seminar Publication "Corrective Action: Technologies and Applications" (EPA/625/4-89/020).

5. In September 1985, a vadose zone investigation was conducted on site-- primarily in the pond/sump area. At EPA's request, a report containing the results and discussion of this investigation was not included in the RFI; however, boring logs and analytical results were included in Attachment 6 of the RFI. A total of 13 borings (including groundwater monitoring well MW-18) were used. Soil samples were obtained at approximately 5-foot intervals. These samples were screened using a PID to select samples for laboratory testing. A total of 126 soil samples were subsequently analyzed for TOX. The 21 samples with positive TOX detection were further tested for target VOC previously identified in groundwater samples. Voc was detected in only 6 of these samples (RFI, p. 82-83).

The results of the field screening and analytical testing showed that highest concentrations occurred in the immediate pond/sump area and were associated with silt/clay and/or the water table. At the time of the investigation (9/85), it appeared that the bulk of any contaminant release had completed its migration to the water table leaving behind only scattered residual VOC sorbed onto fine-grained silts and clays. Consistent with the 1984 soil gas survey, concentration isopleths were centered on the pond/sump area.

6. In July 1987, an extensive soil gas survey of over 100 sampling points was made. The purpose of the soil gas survey was to determine the extent and magnitude of groundwater impacts--particularly off-site (At this point in time, 25 groundwater monitoring wells had been installed on-site). The soil gas investigation indicated that on-site concentrations had dropped well over an order of magnitude since the 1984 survey. The 1987 results were also consistent in pattern with the 1984 soil gas study and the 1985 vadose zone investigation--the isopleths were still centered on the pond/sump area. The 1987 study is included in Attachment 7 of the RFI and Appendix 2 of the CMS.
7. A third soil gas survey using 63 sampling points was conducted in June 1991. The 1991 investigation covered approximately the same area as the 1987 survey, so valid comparisons could be made. A report was included in Attachment 9 to the RFI Report and the results were included in Appendix 2 of the CMS Report.

In this third survey, both TCE and TCA were found over the same area as in the 1987 survey, but concentrations had dropped approximately an order of magnitude (RFI, p. 97 and CMS p. III-28 and III-29). The concentration pattern was consistent with previous work. At a single location on the southwest side of the building TCE concentration was a maximum 24 ug/l (5 ppm_v) and TCA was a maximum 12 ug/l (3 ppm_v). Moving away from the plant, concentrations dropped over 4 orders of magnitude.

8. The RFI Report was approved by EPA on July 1, 1992.
9. In April 1996, soil gas data was obtained from 13 monitoring wells screened across the water table. Soil gas samples were obtained from the monitoring wells and analyzed for VOC. The soil gas results were consistent with previous investigations. Highest soil gas concentration occurred on-site near the pond/sump area. Soil gas concentration decreased rapidly moving away from the source area and concentrations were negligible off-site. The obtained soil gas results were compared to predicted equilibrium soil gas concentrations calculated using Henry's Law and the groundwater concentration at each well location. The comparisons indicated that, with the possible exception of TCA at monitoring well MW-17, soil gas is not a source of constituents to the groundwater and, in fact, groundwater is probably the source of VOC detections in soil gas at locations distant from the pond/sump area (CMS, p. III-29 - p. III-30, Appendix 2).
10. In June 1996, a vapor probe cluster was installed in the immediate vicinity of the solvent sump area. This was the first intrusive investigation in the source area since the pond/sump area had been closed and capped with pavement in 1986. The vapor probe cluster consisted of six individual probes screened at approximately 10-foot intervals down to just above the water table. Subsurface materials ranged from clay and very fine sand to scattered cobble gravel. As expected because of the location beneath the sump area, soil gas constituent concentrations were very high, ranging from 24,000 to 27,000 ug/l TCE (5376 to 6048 ppm_v) in fine sand to cobble gravel zone at 60 feet (Soil Gas Report, p. 14 & Appendix 2). These results were consistent with previous data.

11. In February 1997, 5 vapor recovery wells were installed in and around the pond/sump area. Recovery well VR-1 was installed through the center of the original solvent sump and the remaining wells were installed at varying radial distances up to 100 feet. All wells were screened from 10 feet bgs to just above the water table (approximately 55-foot screen). During installation, headspace soil gas readings were obtained from soil samples at 5-foot intervals. Well VR-1 had the highest headspace readings of 280 ppm with the higher readings corresponding to silt/clay zones. In the remaining wells, headspace readings were in the single digit to fractional ppm range. Subsequent sampling and analysis gave consistent information with the established pattern. VOC concentrations were highest at VR-1 and dropped off an order of magnitude at a radial distance of 100 feet from the sump location (Soil Gas Report, pp. 1-7, Appendix 1).
12. A soil vapor extraction (SVE) pilot test was conducted on site in February 1997. The pilot test was conducted in VR-1 and demonstrated a useable radius of influence of 175 to 200 feet at a flow of 65 cfm and an extraction well vacuum of five inches of water. The effects of the clay zones could be easily seen in the vapor probe cluster vacuum readings some six feet away from the recovery well (Soil Gas Report, pp. 16-21, Appendix 3).
13. In lieu of any soil gas data, the areal extent of soil gas outside the source area could be inferred from the areal extent of the groundwater plume. Assuming that soil gas constituent concentrations are in equilibrium with aqueous-phase concentrations at the groundwater surface, Henry's Law could be used to calculate soil gas concentrations. As given in Appendix 2 of the CMS:
TCE gas concentration in $\text{ppm}_v = 0.072$ water concentration in ug/l
TCA gas concentration in $\text{ppm}_v = 0.030$ water concentration in ug/l
At equilibrium, the 10 ppm_v soil gas limit would correspond to groundwater concentrations of 139 ug/l for TCE and 333 ug/l for TCA.
However, as the April 1996 deep soil gas investigation showed, actual soil gas concentrations (with the single exception of TCA at MW-17) are significantly below predicted equilibrium concentrations--particularly with distance from the pond/sump area.

14. From 1984 through the present date, soil gas information has been obtained through a variety of investigations; however, the information provides a consistent description.
- a) The area of elevated soil gas concentration (>10 ppm_v) is finite and within the boundaries of the Sparton Property.
 - b) Primary constituents are TCE and TCA.
 - c) Soil gas concentrations are highest in the immediate vicinity of the original solvent sump.
 - d) Concentrations decrease rapidly with increasing horizontal distance from the original solvent sump area.
 - e) Soil gas impact occurs through the entire unsaturated vadose zone with highest constituent concentrations corresponding to silt/clay layers with sorbed residual VOC.
 - f) Soil gas does not appear to be a source of contamination to groundwater.
 - g) All data (and regression analyses) indicate that elevated (>10 ppm_v) soil gas concentrations may extend out approximately 200 feet from the sump area--at least on the north side of the building.
 - h) Because of the capping effect of the building and the pavement around the building, elevated concentrations may extend slightly beyond the south side of the building.

A Report Prepared for:

Sparton Technology, Inc.
4901 Rockaway Boulevard, SE
Rio Rancho, New Mexico

DRAFT FINAL
CORRECTIVE MEASURE STUDY
Sparton Technology, Inc.
Coors Road Facility
Albuquerque, New Mexico

Prepared by HDR Engineering, Inc.
12700 Hillcrest Avenue, Suite 125
Dallas, Texas 75230-2096

Revised by Black & Veatch
5728 LBJ Freeway, Suite 300
Dallas, Texas 75240

May 6, 1996



Pierce L. Chandler, Jr.
Senior Project Manager
Black & Veatch

TABLE OF CONTENTS

	LIST OF FIGURES	vi
I	INTRODUCTION	I-1
II	BACKGROUND	II-1
III	DESCRIPTION OF CURRENT SITUATION	III-1
	A. Physiography, geology, hydrology, climatology	III-1
	1. Regional Setting	III-1
	a. Physiography	III-1
	b. Geology	III-1
	c. Hydrogeology	III-5
	d. Groundwater Flow Directions	III-5
	e. Groundwater Recharge	III-6
	2. Site-Specific Conditions	III-6
	a. Geology/Hydrogeology	III-6
	b. Site Stratigraphy	III-10
	c. Project Hydrogeology	III-11
	d. Summary of Recent Groundwater Levels and Flow Direction	III-22
	3. Surface Waters	III-23
	4. Climate	III-24
	B. Contamination Characterization	III-25
	1. Soil Contamination	III-26
	a. Vadose Zone Investigation	III-26
	b. Surface Soil Gas Investigations	III-28
	c. Deep Soil Gas Investigation	III-29
	2. Surface Water and Sediment Contamination	III-30
	3. Air Contamination	III-30
	4. Groundwater Contamination	III-31
	a. Definition of Plume	III-31
	b. Horizontal Extent of Contamination	III-36
	(1) Upper Flow Zone	III-37
	(2) Upper Lower Flow Zone	III-41
	(3) Lower Lower Flow Zone	III-44
	(4) Third Flow Zone	III-48
	c. Vertical Extent of Contamination	III-48

TABLE OF CONTENTS (cont).

4.	Groundwater Contamination (cont.)	
d.	Plume Movement	III-51
(1)	Horizontal Movement	III-51
(2)	Vertical Movement	III-57
e.	Presence of Appendix IX Constituents	III-57
C.	Previous and Continuing Corrective Action	III-60
1.	Closure of Solid Waste Management Units	III-60
2.	Final Closure of Solid Waste Management Units	III-61
3.	Interim Measure	III-61
D.	Potential Receptors/Exposure Pathways	III-62
1.	General	III-62
2.	Groundwater	III-63
3.	Surface Water	III-71
4.	Residential	III-72
5.	Commercial/Industrial	III-75
E.	Groundwater Protection Standards	III-76
1.	Maximum Concentration Limits	III-76
2.	Maximum Contaminant Levels (MCL's)	III-76
3.	New Mexico Groundwater Standards	III-76
4.	Other Standards	III-76
F.	Purpose for Response	III-83
IV	ESTABLISHMENT OF CORRECTIVE ACTION OBJECTIVES	IV-1
V	SCREENING OF CORRECTIVE MEASURES TECHNOLOGIES	V-1
VI	IDENTIFICATION OF THE CORRECTIVE MEASURE ALTERNATIVE OR ALTERNATIVES	VI-1
A.	General	VI-1
B.	Retained Alternatives	VI-2
C.	Non-Retained Alternatives	VI-3
1.	Slurry Wall	VI-3
2.	Subsurface Drains	VI-4
3.	Discharge to POTW	VI-4
4.	Activated Sludge	VI-4
5.	Anaerobic Digestion	VI-5
6.	White Rot Fungus	VI-5
7.	Chemical Oxidation/Reduction	VI-5

TABLE OF CONTENTS (cont.)

C.	Non-Retained Alternatives (cont.)	
8.	Steam Stripping	VI-6
9.	Catalytic Oxidation	VI-7
10.	Wet Air Oxidation	VI-7
11.	Thermal Destruction	VI-8
VII	EVALUATION OF THE CORRECTIVE MEASURE ALTERNATIVE OR ALTERNATIVES	VII-1
A.	General	VII-1
1.	Technical Evaluation Criteria	VII-2
2.	Environmental Evaluation Criteria	VII-3
3.	Human Health Criteria	VII-4
4.	Institutional Criteria	VII-4
B.	Containment of the Dissolved Groundwater Phase (Saturated Zone)	VII-4
1.	No Further Action	VII-4
2.	Infiltration Gallery/Injection Wells	VII-7
3.	Extraction Wells for Containment	VII-10
C.	Restoration of the Dissolved Groundwater Phase (Saturated Zone)	VII-11
1.	No Further Action	VII-13
2.	Continuation of Interim Measure Corrective Action	VII-15
3.	Expansion of Interim Measure	VII-17
4.	Large-Scale Groundwater Extraction and Treatment System	VII-17
a.	Disposal Alternatives for Produced Water	VII-24
(1)	Discharge to the Rio Grande	VII-24
(2)	Injection Wells	VII-25
(3)	Infiltration Galleries	VII-31
(4)	Infiltration Beds	VII-31
(5)	Beneficial Reuse	VII-33
(6)	Calabacillas Arroyo Recharge	VII-35
(7)	Summary	VII-35
b.	Air Stripping	VII-36
c.	Granular Activated Carbon (GAC) Treatment	VII-40
d.	Advanced Oxidation	VII-41
e.	Aerobic Bioreactors	VII-43
f.	Ion Exchange	VII-46
g.	Chemical Precipitation	VII-48
5.	Vapor Extraction System	VII-52
6.	In Situ Air Stripping (Air Sparging)	VII-59
7.	In Situ Bioremediation	VII-60

TABLE OF CONTENTS (cont.)

D.	Removal of the Soil Sorbed Phase (Unsaturated Zone)	VII-67
1.	No Further Action	VII-67
2.	Soil Flushing	VII-68
3.	In Situ Bioremediation	VII-73
4.	Vapor Extraction System	VII-76
E.	Removal of Soil Gas Vapor Phase (Unsaturated Zone)	VII-78
1.	No Further Action	VII-78
2.	Vapor Extraction System	VII-79
VIII	JUSTIFICATION AND RECOMMENDATION FOR THE CORRECTIVE MEASURE OR MEASURES	VIII-1
A.	General	VIII-1
B.	Description of Recommended Alternative	VIII-2
C.	Justification of Recommended Alternative	VIII-9
1.	Human Health/Environmental	VIII-9
2.	Performance	VIII-10
3.	Reliability	VIII-11
4.	Implementability	VIII-11
5.	Summary	VIII-12
	BIBLIOGRAPHY	Biblio-1
	DISTRIBUTION	Dist-1

TABLE OF CONTENTS (cont.)

LIST OF APPENDICES

APPENDIX 1	GROUNDWATER MONITORING
	a) Post-RFI Water Level Data
	b) Analytical Summaries
	c) TCE Concentration Time-History Plots for Well Clusters and Other Selected Wells
APPENDIX 2	SOIL-GAS MONITORING
	a) Results of 1984, 1987, and 1991 Surface Soil-Gas Screening from RFI Report
	b) April 1996 Deep Soil Gas Investigation Results
APPENDIX 3	MODELED IMPACT TO NEW MEXICO UTILITIES WELL (PARADISE HILLS)
APPENDIX 4	REMEDATION TECHNOLOGIES SCREENING MATRIX AND REFERENCE GUIDE

The average annual windspeed is 9 miles per hour. Spring is the windy season. Winds blow most frequently from the north in winter, and from the south along the river valley in summer.

B. Contamination Characterization

By their approval of the RFI Report on July 1, 1992, U.S. EPA approved both the hydrogeologic characterization and contamination characterization contained in the RFI Report. In accordance with §1.3. of the Consent Order, approval of the RFI Report incorporated the document into the Consent Order. However, almost five years have elapsed since the final sampling and analysis (June 1991) used to complete the approved RFI Report. In accordance with Task VII of Exhibit I to the Consent Order, sampling and analysis conducted in the post-RFI period is being used to update the characterization information in the RFI Report. Information on post-RFI changes to contamination characterization is based on multiple results from 43 groundwater monitoring wells, recent results from two additional wells not sampled since the RFI, and recent deep soil-gas results from 13 UFZ monitoring wells screened across the top of the saturated zone.

In the great majority (75%) of groundwater sampling locations with detection histories, contamination is decreasing; however, the leading edge of the contaminant plume has moved past several down-gradient wells showing non-detection in the RFI Report. With the exception of eight wells near the leading edge of the plume, the remaining 37 wells

show either decreasing time histories (24 wells) or continuing non-detect (13 wells). At the current time, four hydraulically down-gradient wells continue to show non-detect.

All on-site monitoring wells show either a decrease in contamination or continue to show non-detect. Further, recent deep soil-gas investigation indicated elevated VOC concentration occurring only under the interior of the Spanton Facility.

All information developed to date indicates that, with the exception of the leading edge of the plume, the contamination characterization contained in the RFI Report is still valid. Even with the movement of the plume leading edge noted since the RFI Report, the plume is adequately characterized for CMS purposes.

1. Soil Contamination

a. Vadose Zone Investigation

The results of PID field screening during the RFI drilling program, analytical testing of borehole soil samples, multiple surface soil gas screenings, and recently conducted deep soil gas analyses indicate that contaminants migrated downward from the ponds and sump. The vertical migration was influenced by the relative location of fine grained silt and/or clay lenses and the presence of more porous coarse-grained sand and gravel layers. Interpretation of the results indicates both sorption and some lateral spreading occurred due to silt/clay layers. Based on available results, most of the contaminant release has completed its migration to the water table, leaving behind only scattered residual levels primarily in the vadose zone underneath the pond and sump area.

Soil gas screening (RFI borehole screening) indicated a general increase in soil gas concentrations of volatile organic constituents (VOC) with depth with the highest concentrations observed under the sump/pond area. Isolated occurrences of higher soil gas concentrations were also observed at depths corresponding to clay/silt lenses. These localized soil gas concentrations are believed to be related to residual VOC sorbed onto the finer-grained soil materials. Recent deep soil gas analyses conducted in April 1996 indicate that, with the exception of the immediate source area, VOC were in the low single-digit ppm (volume or ppmv) range to no detect. In the immediate source area (UFZ monitor well MW-17), VOC were elevated with 184 ppmv TCE and 122 ppmv TCA.

With the exception of TCA concentration in MW-17, deep soil gas results included in Appendix 2 are below equilibrium concentrations with respect to groundwater concentrations predicted by published Henry's Law constants. Based on the deep soil gas results, Henry's Law calculations and considering vapor densities for TCE and TCA are approximately 4-1/2 times air density, the soil gas concentrations indicate that any remaining source material in the unsaturated zone is not migrating to any degree to the ground water. In fact, the observed soil gas concentrations may, in fact, be the result of dissolution from ground water.

Total metals analyses were conducted to assess concentrations of cadmium, chromium, lead, and nickel. Analytical results on several samples indicated that chromium exceeded nominal background levels (2-3 milligrams per kilogram (mg/kg)). Maximum chromium concentration exceeded 3000 mg/kg underneath the sump/pond area. Evaluation

of the data indicates sorption onto silts and clays is probably the dominant process affecting chromium concentration.

b. Surface Soil Gas Investigations

Three surface soil gas investigations have been conducted at the Sparton facility. The first soil gas investigation was conducted in 1984, and involved primarily on-site locations. The second investigation was conducted in 1987, and involved both on-site and off-site locations for soil gas measurements. The third investigation was conducted in June 1991, and covered both on-site and off-site locations (See Figure 3 for Report Identification).

The purpose of these investigations was to obtain an estimate of the areal extent of the contaminant plume and to examine the impact of the Interim Measure (IM) on soil gas VOC concentration. All soil gas samples were taken in the shallow subsurface, approximately five to six feet below ground surface. Contour plots of soil gas concentrations from all three investigations are given in Appendix 2.

Based on these surface soil gas surveys, it appeared that the contaminant plume had moved a short distance beyond the facility boundaries. The shape of the surface soil gas plumes also seem to suggest dispersion and diffusion as the predominant plume transport mechanisms with a lesser advection influence.

Based on the results of the 1987 and 1991 surface soil gas surveys, TCA and TCE were detected in the surface soil gas over approximately the same area. However,

within the facility boundary, the 1991 TCE concentration dropped approximately an order of magnitude with only a single sampling point south of the building above 10 micrograms per liter ($\mu\text{g/l}$). The 1991 TCA concentration also decreased approximately thirty to fifty percent within the property boundary to a single peak level above 10 $\mu\text{g/l}$. Comparison of 1991 data to 1984 on-site data indicate over a thirtyfold decrease in TCA and a fiftyfold decrease in TCE. The surface soil gas results indicate a significant change in soil gas concentration due to both source removal and initiation of the upper flow zone IM in 1988.

c. Deep Soil Gas Investigation

In April 1996, soil gas samples were obtained from a number of upper flow zone wells screened across the top of the saturated zone. Soil gas was purged from the wells until stable, replicate soil gas concentrations were indicated on a photoionization detector field screening instrument calibrated to TCE. Negative pressure and purge rate were also recorded. After purging was completed, soil gas samples were collected using Tedlar[®] bags installed in a vacuum box. The soil gas samples were analyzed on the following day at a local laboratory using EPA Method 8010/8020 procedures. Results are given in Appendix 2.

The deep soil gas results are consistent with the earlier surface soil gas results:

- Highest soil gas concentration occurs in the source area.
- Soil gas concentration is negligible off-site.

The deep soil gas results also indicate that, with the possible exception of TCA in the pond sump area, soil gas is not a source of constituents to the ground water and, in fact, ground water may be the source for deep soil gas VOC detections.

2. Surface Water and Sediment Contamination

There are three surface water bodies in the vicinity of the Sparton facility. The Rio Grande is located approximately 3,000 feet east of the Sparton facility, the Las Calabacillas Arroyo is located approximately 1,200 feet north of the facility and the Corrales Main Canal, an irrigation channel, is located approximately 300 feet east of the facility.

Based on regional and site-specific groundwater gradients, each of these surface water bodies is either upgradient or cross-gradient from the source area at the Sparton facility. In addition, the elevations of the water bodies are well above groundwater elevations beneath the Sparton facility and hence would not be affected by the contaminant plume.

3. Air Contamination

Soil gas concentrations measured in 1991, approximately five to six feet below ground surface, indicated average TCE and TCA soil gas concentrations of less than 10 µg/l (2.2 ppmv) on-site at the Sparton facility, tapering off to 0.001 µg/l (0.00022ppmv) approximately 1/2 mile away. The mass flux rate of these constituents into the

atmosphere, while not measured, is believed to be minimal due to the low concentrations of soil gas measured during the 1991 survey.

4. Groundwater Contamination

a. Definition of Plume

A total of fifty-six groundwater monitoring wells have been installed to assess groundwater elevations and to collect representative groundwater samples for chemical analyses in an effort to evaluate the horizontal and vertical limits of the contaminant plume. Figure 10 (RFI Figure 53) presents pertinent well screen data for the wells. TCE and TCA concentration values have been used to define the plume configuration because they represent the major constituents of the groundwater contamination. Based on concentration data and plume contouring given in the RFI Report, an average TCE concentration of 844 µg/l was calculated for the UFZ and an average concentration of 606 µg/l considering all three flow zones. Using results of the 1996 sampling information (included in Appendix 1) and 1996 plume contouring included in this report, the average UFZ TCE concentration is 372 µg/l and the three-flow-zone TCE average concentration is 366 µg/l. TCA has been observed to occur at concentrations of approximately one third of TCE concentration. Analytical results through January 1996 are summarized in Appendix 1.

APPENDIX 2

SOIL GAS MONITORING

- a) Results of 1984, 1987 and 1991 Surface
Soil-Gas Screening from RFI Report**

A Report Prepared for:

Sparton Technology, Inc.
4901 Rockaway Boulevard, SE
Rio Rancho, New Mexico

RCRA FACILITY INVESTIGATION
Sparton Technology, Inc.
Coors Road Facility
Albuquerque, New Mexico

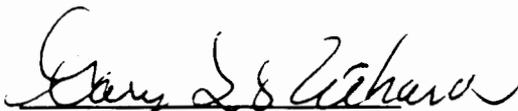
Prepared by Harding Lawson Associates
9800 Richmond Avenue, Suite 150
Houston, Texas 77042

December 14, 1990

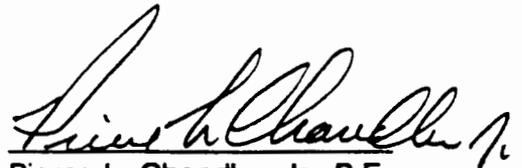
Revised by HDR Engineering, Inc.
12700 Hillcrest Avenue, Suite 125
Dallas, Texas 75230-2096

in conjunction with
Metric Corporation
8429 Washington Place NE, Suite A
Albuquerque, New Mexico 87113

May 1, 1992



Gary L. Richardson, P.E.
Executive Vice President
Metric Corporation



Pierce L. Chandler, Jr., P.E.
Senior Project Manager
HDR Engineering, Inc.

TABLE OF CONTENTS (Continued)

LIST OF ATTACHMENTS

- Volume I**
1. Alternate Groundwater Monitoring Database
 2. Contaminant Properties
 3. Plume Delineation Database
- Volume II**
4. Boring Logs and Well Completion Diagrams
 5. Groundwater Flow
 6. Unsaturated Zone Boring Logs and Analytical Data
 7. Off-Site Investigation
 8. Description of Vicinity Wells
 9. June 1991 Sampling and Analysis
 10. Pumping Test Analysis
 11. November 1991 Sampling and Analysis of MW-32

ATTACHMENT 7

Off-Site Investigation

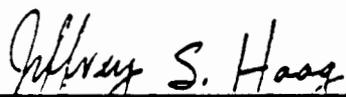
Report Prepared for

Sparton Corporation
2400 East Ganson Street
Jackson, Michigan 49202

OFF-SITE INVESTIGATION
SPARTON TECHNOLOGY, INC.
COORS ROAD PLANT
ALBUQUERQUE, NEW MEXICO

ELA Job No. 6310,036.12

by



Jeffrey S. Haag, C.P.G.
Senior Hydrogeologist



Stephen D. Phillips, C.P.G.
Associate Hydrogeologist

Harding Lawson Associates
6220 Westpark Drive, Suite 100
Houston, Texas 77057
Telephone: (713) 789-8050

October 19, 1987

CONFIDENTIAL
CONSULTING REPORT

Harding Lawson Associates
6300 Westpark, Suite 100
Houston, Texas 77057

Soil gas investigation of volatile organic
compounds at the Sparton Technology, Inc.
site, 9621 Coors Road NW, Albuquerque,
New Mexico 87114

By

Glenn M. Thompson Ph.D.
Tracer Research Corporation
1687 West Grant Road
Tucson, Arizona 85745

602-623-0200

May 25, 1984

-CONFIDENTIAL-

ATTACHMENT 9

June 1991 Sampling and Analysis



PREPARED FOR:

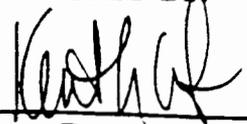
**Metric Corporation
8429 Washington Place NE
Suite A
Albuquerque, New Mexico 87113
(505)828-2801**

SHALLOW SOIL GAS INVESTIGATION

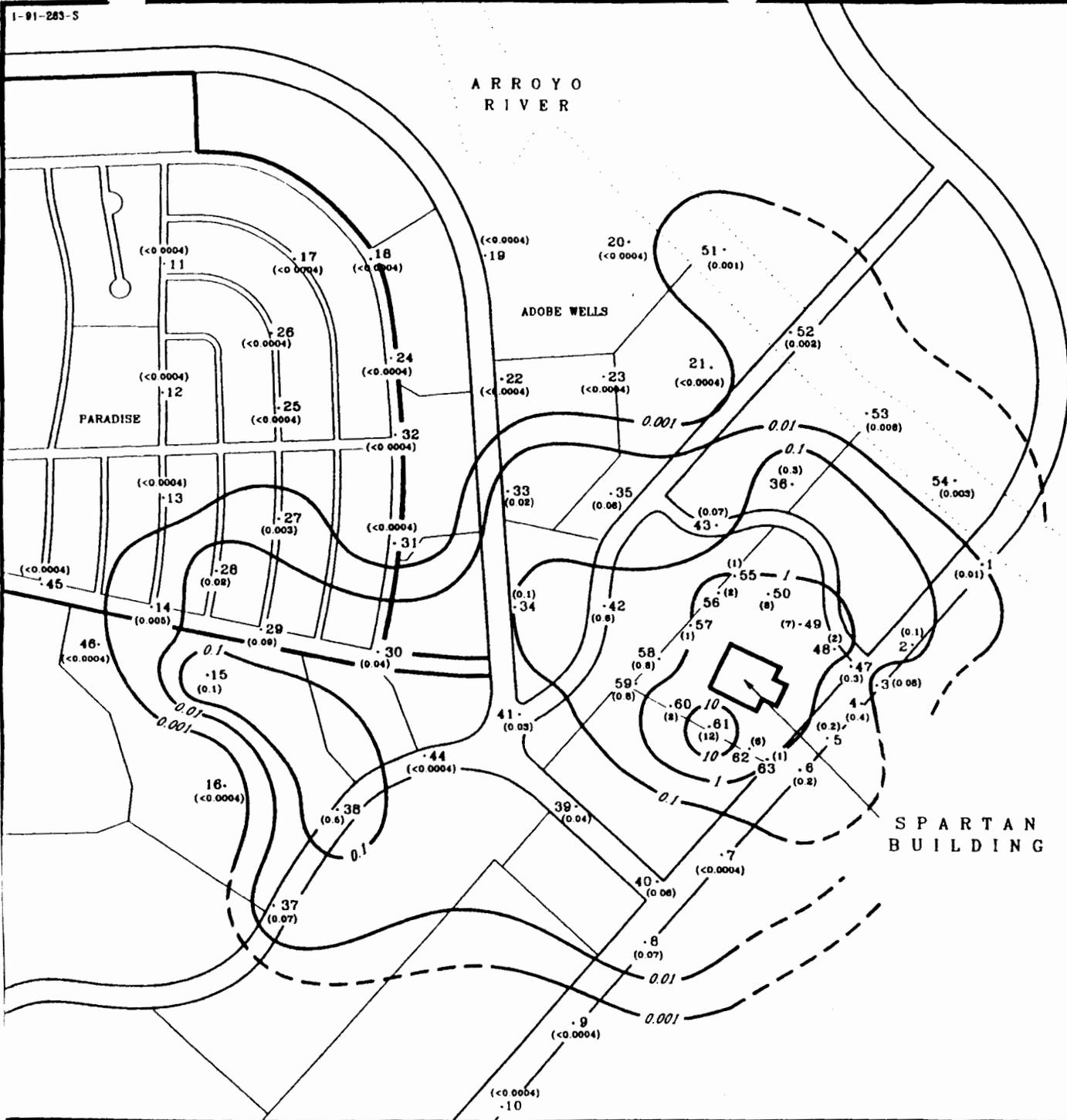
**SPARTAN TECHNOLOGY BUILDING
9621 NORTH COORS ROAD
ALBUQUERQUE, NEW MEXICO**

**JUNE 1991
REVISED 12/91**

SUBMITTED BY:

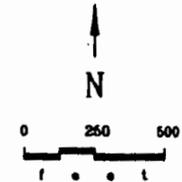

Tracer Research Corporation

**191263S.REP
1-91-263-S**



EXPLANATION

- 61 Sampling Probe Location
- (18) Soil Gas Sample Value (µg/l)
- 10 Trichloroethane Concentration Line (µg/l)



SPARTAN TECHNOLOGY

9621 NORTH COORS
 ALBUQUERQUE, NEW MEXICO
TRICHLOROETHANE (TCA)

Figure 2



ARROYO RIVER

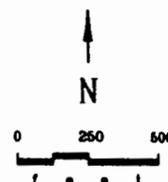
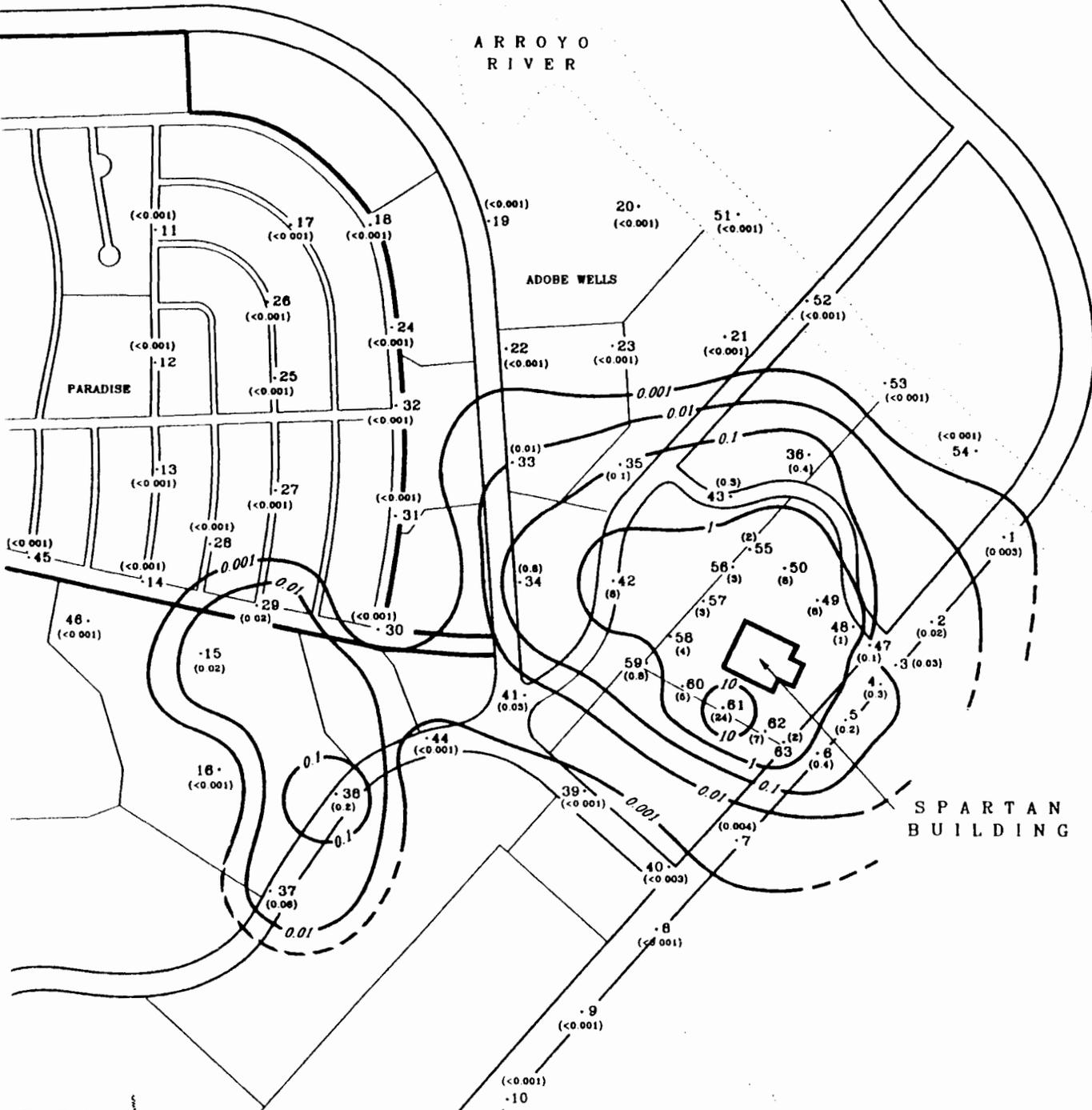
ADOBE WELLS

PARADISE

SPARTAN BUILDING

EXPLANATION

- 61 Sampling Probe Location
- (24) Soil Gas Sample Value (µg/l)
- 10 Isoconcentration Line (µg/l)



SPARTAN TECHNOLOGY
 9621 NORTH COORS
 ALBUQUERQUE, NEW MEXICO
 TRICHLOROETHENE (TCE)

Figure 3

APPENDIX 2

SOIL GAS MONITORING

b) April 1996 Deep Soil-Gas Investigation Results

Sparton Technologies, Inc.

Soil Gas to Groundwater Comparison

Monitor Well (#)	Location	TCE						TCA				
		Jan. 1996 GW Conc. (ug/l)	Predicted Soil Gas Conc. (ppmv)	Actual Soil Gas Conc. (ug/l)	Actual Soil Gas Conc. (ppmv)	Actual to Predicted		Jan. 1996 GW Conc. (ug/l)	Predicted Soil Gas Conc. (ppmv)	Actual Soil Gas Conc. (ug/l)	Actual Soil Gas Conc. (ppmv)	Actual to Predicted
7	OnSite	340.00	24.48	0.25	0.056	0.23%		92.00	2.76	ND <0.1	NA	NA
13	OnSite	380.00	27.36	14.00	3.136	11.46%		54.00	1.62	5.90	1.304	80.49%
14	OnSite	290.00	20.88	15.00	3.360	16.09%		5.80	0.17	0.29	0.064	36.83%
15	OnSite	See Note 6	NA	1.40	0.314	NA		See Note 6	NA	0.43	0.095	NA
17	Source	3,800.00	273.60	820.00	183.680	67.13%		1,100.00	33.00	550.00	121.550	368.33%
18	OnSite	See Note 6	NA	170.00	38.080	NA		See Note 6	NA	33.00	7.293	NA
21	Source	220.00	15.84	6.20	1.389	8.77%		95.00	2.85	3.60	0.796	27.92%
27	OnSite	See Note 6	NA	5.60	1.254	NA		See Note 6	NA	3.40	0.751	NA
33	OnSite	2,000.00	144.00	1.30	0.291	0.20%		160.00	4.80	0.13	0.029	0.60%
37	OffSite	720.00	51.84	4.60	1.030	1.99%		ND <10	NA	ND <0.1	NA	NA
48	OffSite	350.00	25.20	ND <0.03	NA	NA		ND <1	NA	ND <0.1	NA	NA
57	OffSite	ND <0.3	NA	ND <0.03	NA	NA		ND <1	NA	ND <0.1	NA	NA
61	OffSite	1,900.00	136.80	0.59	0.132	0.10%		13.00	0.39	ND <0.1	NA	NA

NOTES:

- 1). Predicted soil gas concentrations obtained using gas constants from Henry's Law (HL).
 $\text{gas concentration (ppmv)} = \text{HL} * \text{water concentration (ug/l)}$
 HL gas constant for TCE 0.072
 HL gas constant for TCA 0.030

- 2). Soil gas concentrations (ppmv) were calculated from laboratory data using the following conversion (Albuquerque conditions, P = 621 mm Hg; T = 20 deg. Centigrade)
 $C \text{ (ppmv)} = 0.224 * C \text{ (ug/l)} \text{ (TCE)}$
 $C \text{ (ppmv)} = 0.221 * C \text{ (ug/l)} \text{ (TCA)}$

- 3). Onsite location indicates Monitor Well is on Sparton Property.
- 4). Offsite location indicates Monitor Well is not on Sparton Property.
- 5). Source location indicates Monitor Well is on Sparton Property in the vicinity of the original source.
- 6). Groundwater data not available.

SPARTON TECHNOLOGY, INC.

Monitor Well Vapor Sampling

Introduction: This test procedure was initiated to collect vadose zone soil gas data immediately above the water table. Several UFZ wells screened across the water table were selected for the test, see attachment 1 for all UFZ wells elevation data. Initially 21 wells were selected for testing with two in reserve pending analytical results, MW-7, 13, 14, 15, 17, 21, 33, 36, 37, 47, 48, 52, 53, 57, 58, 61, also recovery wells MW-18, 24, and 27, and wells in reserve MW-51 and 63. MW-16, in the source area was rejected as the water level elevation was above the top of the well screen. Recovery well MW-24 in the source area was substituted for MW-16. As analytical data became available other wells were rejected. The final count was 13 wells sampled, MW-7, 13, 14, 15, 17, 18, 21, 27, 33, 37, 48, 57 and MW-61 with 2 samples rejected as invalid, MW-24 and MW-25, see text.

Procedure: Calibrate PID at the start of each day. Test and/or calibrate PID between wells. Unlock and open well, take an initial PID reading, determine water level elevation and casing air volume. Pull dedicated sampling equipment and install test plug. Install approximately 3 feet of vinyl tubing to test plug via 1/8 in. brass hose barb and a Parker Quick-Connect fitting. The other end of the vinyl tubing was run through the pressure wall of the Xitech sampler and connected to the vacuum line via a brass hose barb. The rest of the purging apparatus was connected as illustrated on the attached drawing, see photographs also. The end of the air discharge line was taped to the sampling port of the PID and this was inserted and sealed with tape into a 50 gal plastic bag. The plastic bag was inserted into a 32 gal steel drum to approximately measure evacuated air volume. The portable vacuum pump was started and PID (ppm TCE), flowrate (SCFH), and vacuum (in. of Hg) readings were taken see field notes in attachment 2. When at least 3 casing volumes of air were purged and some semblance of stability achieved for PID readings the vinyl sampling tube was pinched near point 3, the sample tube was disconnected from the vacuum line at point 3, see illustration. The sample tube was then connected to a SKC tedlar bag, the crimp in the vinyl tubing was released, the tedlar valve was opened and the sample bag was sealed inside the Xitech Box. Xitech vacuum pump turned on and well vapor sample drawn into the bag. When the bag was full the vacuum pump was turned off, Xitech vent valve opened allowing access to sample bag. The tedlar bag valve was closed, sample tube disconnected, tedlar bag was labeled and placed in a cooler, see photographs. All equipment was disconnected. The test plug and brass hose barb fittings were decontaminated via an Alconox wash and DI water rinse. Vinyl sample tube was disposed after each use.

Results: See enclosed tables and data summaries.

SPARTON TECHNOLOGY, INC.

Equipment Illustration For Monitor Well Vapor Sampling April 10, 1996 Not to Scale

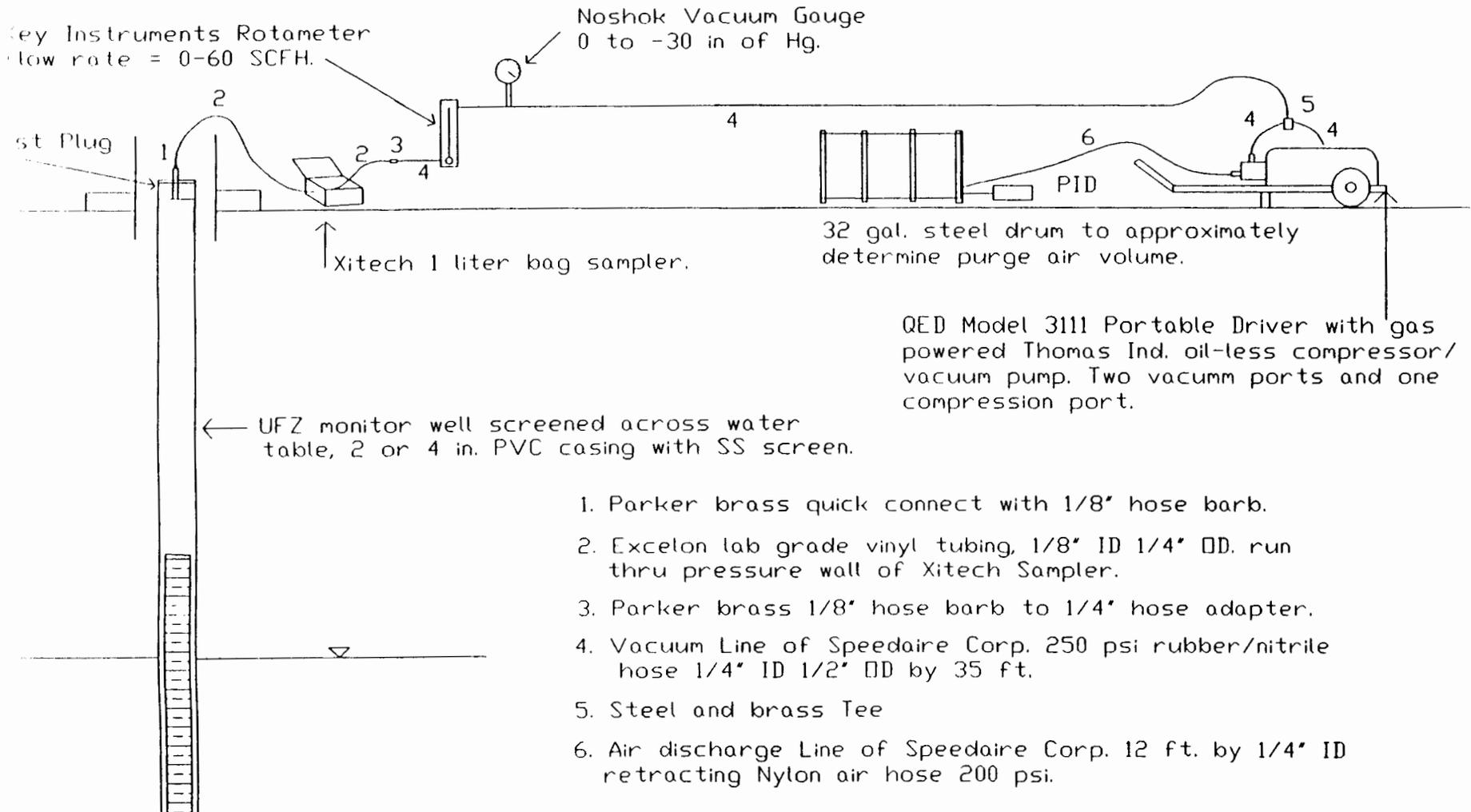


TABLE 1
Summary of Sampling Data and TCE Gas Concentration

Well No.	Date Sampled	Elev top of scrn	WLE	PID* ppm TCE	Vacuum in of Hg	Flowrate SCFH	TCE mg/m3
MW-7	04/10/96	4981.30	4977.82	2.2	14.2	47	0.25
MW-13	04/10/96	4983.25	4975.26	2.3	12.9	58	14
MW-14	04/12/96	4980.41	4972.39	2.5	11.5	45	15
MW-15	04/11/96	4987.49	DRY	1.0	14.0	55	1.4
MW-17	04/10/96	4982.28	4979.20	96.5	12.0	59	820
MW-18	04/10/96	4977.58	4967.81	39.3	13.0	70	170
MW-21	04/12/96	4983.86	4978.84	0.0	9.5	39	6.2
MW-24	04/12/96	4980.30	4973.30	4.3	16.5	10	NS
MW-25	04/12/96	4981.30	4975.36	2.9	9.0	7.5	NS
MW-27	04/11/96	4978.50	4972.59	1.1	7.0	36	5.6
MW-33	04/11/96	4981.29	4973.42	0.0	11.5	68	1.3
MW-37	04/15/96	4976.66	4969.70	0.0	15.5	48	4.6
MW-48	04/15/96	4976.31	4967.65	0.3	12.0	36	<0.03
MW-57	04/15/96	4977.54	4967.12	0.3	15.0	14	<0.03
MW-61	04/12/96	4975.98	4967.47	0.3	11.5	46	0.59

*PID reading at sampling time.

Summary of Data During Monitor Well Gas Sampling

Day 1 04/10/96

MW-7	Readings	PID ppm TCE	Flowrate SCFH	Vacuum Hg In
	Minimum	1	47.6	14.2
	Maximum	2.3	47.6	14.2
	Average	1.9	47.6	14.2
	Final	2.2	47.6	14.2

MW-13	Readings	PID ppm TCE	Flowrate SCFH	Vacuum Hg In
	Minimum	1.5	58	12.9
	Maximum	3	58	12.9
	Average	2.4	58	12.9
	Final	2.3	58	12.9

MW-17	Readings	PID ppm TCE	Flowrate SCFH	Vacuum Hg In
	Minimum	25	59	12
	Maximum	99.5	63	13.2
	Average	96.3	59	12
	Final	99.5	59	12

MW-18	Readings	PID ppm TCE	Flowrate SCFH	Vacuum Hg In
	Minimum	0.9	62	11
	Maximum	42.7	70	13.5
	Average	33.1	66.7	12.3
	Final	39.3	70	13

Day 2 04/11/96

MW-33	Readings	PID	Flowrate	Vacuum
		ppm TCE	SCFH	Hg In
	Minimum	0	68	11
	Maximum	0.5	73	12.5
	Average	0.3	69.7	11.7
	Final	0	68	11.5

MW-15	Readings	PID	Flowrate	Vacuum
		ppm TCE	SCFH	Hg In
	Minimum	0.1	55	14.5
	Maximum	1.2	58	15
	Average	0.8	55.8	14.6
	Final	1	55	14.5

MW-27	Readings	PID	Honda Driver		Briggs & Stratton Driver	
			Flowrate	Vacuum	Flowrate	Vacuum
		ppm TCE	SCFH	Hg In	SCFH	Hg In
	Minimum	1.5	52	12.2	36	7
	Maximum	7.7	62	15	40	9
	Average	4.0	60	14	37	8
	Final	6.5	62	15	36	7

Comment QED portable driver failed on this well switched from Honda powered to a Briggs and Stratton powered driver with same model pump for rest of sampling.

Day 3 04/12/96

MW-21	Readings	PID ppm TCE	Flowrate SCFH	Vacuum Hg In
	Minimum	0.0	39	9.5
	Maximum	0.0	39	9.5
	Average	0.0	39	9.5
	Final	0.0	39	9.5

MW-14	Readings	PID ppm TCE	Flowrate SCFH	Vacuum Hg In
	Minimum	0.1	38	9.5
	Maximum	3.2	45	11.5
	Average	1.9	41.6	10.6
	Final	2.5	45	11.5

MW-24	Readings	PID ppm TCE	Flowrate SCFH	Vacuum Hg In
	Minimum	1.5	10	12
	Maximum	9.9	30	16
	Average	5.0	18.3	14.3
	Final	4.3	10	16

Comment This sample was rejected as the water was drawn above the top of the screen. WLE after sampling = 4980.86 vs. WLE prior to sampling = 4973.30 with Top Scrn = 4980.30.

MW-61	Readings	PID ppm TCE	Flowrate SCFH	Vacuum Hg In
	Minimum	0	43	10.5
	Maximum	2.4	46	11.5
	Average	0.4	45	11
	Final	0.3	46	11.5

MW-25	Readings	PID	Flowrate	Vacuum
		ppm TCE	SCFH	Hg In
	Minimum	1.7	7.5	7
	Maximum	11.9	7.5	7
	Average	5.5	7.5	7
	Final	2.9	7.5	7

Comment This sample was rejected as the water was drawn above the top of the screen. WLE after sampling = 4981.850.86 vs. WLE prior to sampling = 4975.36 with Top Scrn = 4981.30.

Day 4 04/15/96

MW-37	Readings	PID	Flowrate	Vacuum
		ppm TCE	SCFH	Hg In
	Minimum	0.0	48	14
	Maximum	0.1	48	15.5
	Average	0.0	48	14.9
	Final	0.0	48	15.5

MW-48	Readings	PID	Flowrate	Vacuum
		ppm TCE	SCFH	Hg In
	Minimum	0	26	10
	Maximum	1.2	36	15.2
	Average	0.2	35	12
	Final	0.3	36	12

MW-57	Readings	PID	Flowrate	Vacuum
		ppm TCE	SCFH	Hg In
	Minimum	0	10	12
	Maximum	1.3	14	15.1
	Average	0.3	13.0	14.2
	Final	2.3	14	15

Attachment 1

American Environmental Network, Inc.

Soil Vapor Sampling of MW-7,13,17,18
Smp'd. 4-10-96
Rec. 4-17-96

AEN I.D. 604338

April 15, 1996

Sparton Technology Inc.
4901 Rockaway Blvd SE
Rio Rancho, NM 87124-4469

Project Name/Number: SVS-2Q96 41096-AIR

Attention: John Wakefield

On 04/10/96, American Environmental Network (NM), Inc., (ADHS License No. AZ0015) (formerly ATI-NM), received a request to analyze air samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.



Kimberly D. McNeill
Project Manager



H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

American Environmental Network, Inc.

CLIENT : SPARTON TECHNOLOGY INC. DATE RECEIVED : 04/10/96
PROJECT # : 41096-AIR
PROJECT NAME : SVS-2Q96 REPORT DATE : 04/15/96

AEN ID: 604338

AEN #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	MW-7 2.2PPM	AIR	04/10/96
02	MW-13 2.3PPM	AIR	04/10/96
03	MW-17 96.5PPM	AIR	04/10/96
04	MW-18 39.3PPM	AIR	04/10/96

---TOTALS---

<u>MATRIX</u>	<u>#SAMPLES</u>
AIR	4

AEN STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

American Environmental Network, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : PURGEABLE HALOCARBONS/AROMATICS (EPA 8010/8020)
 CLIENT : SPARTON TECHNOLOGY INC. AEN I.D.: 604338
 PROJECT # : 41096-AIR
 PROJECT NAME : SVS-2Q96

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	MW-7 2.2PPM	AIR	04/10/96	NA	04/11/96	1
02	MW-13 2.3PPM	AIR	04/10/96	NA	04/11/96	1
03	MW-17 96.5PPM	AIR	04/10/96	NA	04/10/96	100
PARAMETER			UNITS	01	02	03
BENZENE			MG/M ³	<0.05	<0.05	<5.0
BROMODICHLOROMETHANE			MG/M ³	<0.02	<0.02	<2.0
BROMOFORM			MG/M ³	<0.05	<0.05	<5.0
BROMOMETHANE			MG/M ³	<0.10	<0.10	<10
CARBON TETRACHLORIDE			MG/M ³	<0.02	<0.02	<2.0
CHLORO BENZENE			MG/M ³	<0.05	<0.05	<5.0
CHLOROETHANE			MG/M ³	<0.05	<0.05	<5.0
CHLOROFORM			MG/M ³	<0.05	<0.05	<5.0
CHLOROMETHANE			MG/M ³	<0.10	<0.10	<10
DIBROMOCHLOROMETHANE			MG/M ³	<0.02	<0.02	<2.0
1,2-DIBROMOETHANE (EDB)			MG/M ³	<0.02	<0.02	<2.0
1,2-DICHLOROBENZENE			MG/M ³	<0.05	<0.05	<5.0
1,3-DICHLOROBENZENE			MG/M ³	<0.05	<0.05	<5.0
1,4-DICHLOROBENZENE			MG/M ³	<0.05	<0.05	<5.0
1,1-DICHLOROETHANE			MG/M ³	<0.03	<0.03	<3.0
1,2-DICHLOROETHANE (EDC)			MG/M ³	<0.05	<0.05	<5.0
1,1-DICHLOROETHENE			MG/M ³	0.03	1.9 D(10)	100
CIS-1,2-DICHLOROETHENE			MG/M ³	<0.02	<0.02	<2.0
TRANS-1,2-DICHLOROETHENE			MG/M ³	<0.10	<0.10	<10
1,2-DICHLOROPROPANE			MG/M ³	<0.02	<0.02	<2.0
CIS-1,3-DICHLOROPROPENE			MG/M ³	<0.02	<0.02	<2.0
TRANS-1,3-DICHLOROPROPENE			MG/M ³	<0.02	<0.02	<2.0
ETHYLBENZENE			MG/M ³	<0.05	<0.05	<5.0
METHYL-t-BUTYL ETHER			MG/M ³	<0.25	<0.25	<25
METHYLENE CHLORIDE			MG/M ³	<0.20	<0.20	<20
1,1,2,2-TETRACHLOROETHANE			MG/M ³	<0.02	<0.02	5.3
TETRACHLOROETHENE			MG/M ³	<0.05	0.05	25
TOLUENE			MG/M ³	<0.05	<0.05	<5.0
1,1,1-TRICHLOROETHANE			MG/M ³	<0.10	5.9 D(10)	550 D(500)
1,1,2-TRICHLOROETHANE			MG/M ³	<0.02	<0.02	<2.0
TRICHLOROETHENE			MG/M ³	0.25	14 D(10)	820 D(500)
TRICHLOROFLUOROMETHANE			MG/M ³	<0.02	<0.02	<2.0
VINYL CHLORIDE			MG/M ³	<0.05	<0.05	<5.0
TOTAL XYLENES			MG/M ³	<0.05	<0.05	<5.0
SURROGATES:						
BROMOCHLOROMETHANE (%)				96	87	87
TRIFLUOROTOLUENE (%)				97	85	93

D(10)=DILUTED 10X, ANALYZED 04/10/96
 D(500)=DILUTED 500X, ANALYZED 04/12/96

GAS CHROMATOGRAPHY RESULTS

TEST : PURGEABLE HALOCARBONS/AROMATICS (EPA 8010/8020)
 CLIENT : SPARTON TECHNOLOGY INC. AEN I.D.: 604338
 PROJECT # : 41096-AIR
 PROJECT NAME : SVS-2Q96

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
04	MW-18 39.3PPM	AIR	04/10/96	NA	04/11/96	100
PARAMETER			UNITS	04		
BENZENE			MG/M ³	<5.0		
BROMODICHLOROMETHANE			MG/M ³	<2.0		
BROMOFORM			MG/M ³	<5.0		
BROMOMETHANE			MG/M ³	<10		
CARBON TETRACHLORIDE			MG/M ³	<2.0		
CHLOROBENZENE			MG/M ³	<5.0		
CHLOROETHANE			MG/M ³	<5.0		
CHLOROFORM			MG/M ³	<5.0		
CHLOROMETHANE			MG/M ³	<10		
DIBROMOCHLOROMETHANE			MG/M ³	<2.0		
1,2-DIBROMOETHANE (EDB)			MG/M ³	<2.0		
1,2-DICHLOROBENZENE			MG/M ³	<5.0		
1,3-DICHLOROBENZENE			MG/M ³	<5.0		
1,4-DICHLOROBENZENE			MG/M ³	<5.0		
1,1-DICHLOROETHANE			MG/M ³	<3.0		
1,2-DICHLOROETHANE (EDC)			MG/M ³	<5.0		
1,1-DICHLOROETHENE			MG/M ³	33		
CIS-1,2-DICHLOROETHENE			MG/M ³	<2.0		
TRANS-1,2-DICHLOROETHENE			MG/M ³	<10		
1,2-DICHLOROPROPANE			MG/M ³	<2.0		
CIS-1,3-DICHLOROPROPENE			MG/M ³	<2.0		
TRANS-1,3-DICHLOROPROPENE			MG/M ³	<2.0		
ETHYLBENZENE			MG/M ³	<5.0		
METHYL-t-BUTYL ETHER			MG/M ³	<25		
METHYLENE CHLORIDE			MG/M ³	<20		
1,1,2,2-TETRACHLOROETHANE			MG/M ³	<2.0		
TETRACHLOROETHENE			MG/M ³	<5.0		
TOLUENE			MG/M ³	<5.0		
1,1,1-TRICHLOROETHANE			MG/M ³	33		
1,1,2-TRICHLOROETHANE			MG/M ³	<2.0		
TRICHLOROETHENE			MG/M ³	170		
TRICHLOROFLUOROMETHANE			MG/M ³	<2.0		
VINYL CHLORIDE			MG/M ³	<5.0		
TOTAL XYLENES			MG/M ³	<5.0		
SURROGATES:						
BROMOCHLOROMETHANE (%)				87		
TRIFLUOROTOLUENE (%)				98		

GAS CHROMATOGRAPHY RESULTS - QUALITY CONTROL

TEST	: EPA 8010/8020	AEN I.D.	: 604338
BLANK I.D.	: 041196	MATRIX	: AIR
CLIENT	: SPARTON TECHNOLOGY INC.	DATE EXTRACTED	: NA
PROJECT #	: 41096-AIR	DATE ANALYZED	: 04/11/96
PROJECT NAME	: SVS-2Q96	DIL. FACTOR	: 1

PARAMETER	UNITS	
BENZENE	MG/M ³	<0.05
BROMODICHLOROMETHANE	MG/M ³	<0.02
BROMOFORM	MG/M ³	<0.05
BROMOMETHANE	MG/M ³	<0.10
CARBON TETRACHLORIDE	MG/M ³	<0.02
CHLOROBENZENE	MG/M ³	<0.05
CHLOROETHANE	MG/M ³	<0.05
CHLOROFORM	MG/M ³	<0.05
CHLOROMETHANE	MG/M ³	<0.10
DIBROMOCHLOROMETHANE	MG/M ³	<0.02
1,2-DIBROMOETHANE (EDB)	MG/M ³	<0.02
1,2-DICHLOROBENZENE	MG/M ³	<0.05
1,3-DICHLOROBENZENE	MG/M ³	<0.05
1,4-DICHLOROBENZENE	MG/M ³	<0.05
1,1-DICHLOROETHANE	MG/M ³	<0.03
1,2-DICHLOROETHANE (EDC)	MG/M ³	<0.05
1,1-DICHLOROETHENE	MG/M ³	<0.02
CIS-1,2-DICHLOROETHENE	MG/M ³	<0.02
TRANS-1,2-DICHLOROETHENE	MG/M ³	<0.10
1,2-DICHLOROPROPANE	MG/M ³	<0.02
CIS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
TRANS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
ETHYLBENZENE	MG/M ³	<0.05
METHYL-t-BUTYL ETHER	MG/M ³	<0.25
METHYLENE CHLORIDE	MG/M ³	<0.20
1,1,2,2-TETRACHLOROETHANE	MG/M ³	<0.02
TETRACHLOROETHENE	MG/M ³	<0.05
TOLUENE	MG/M ³	<0.05
1,1,1-TRICHLOROETHANE	MG/M ³	<0.10
1,1,2-TRICHLOROETHANE	MG/M ³	<0.02
TRICHLOROETHENE	MG/M ³	<0.03
TRICHLOROFLUOROMETHANE	MG/M ³	<0.02
VINYL CHLORIDE	MG/M ³	<0.05
TOTAL XYLENES	MG/M ³	<0.05

SURROGATES:

BROMOCHLOROMETHANE (%)	96
TRIFLUOROTOLUENE (%)	98

GAS CHROMATOGRAPHY RESULTS - QUALITY CONTROL

TEST	: EPA 8010/8020	AEN I.D.	: 604338
BLANK I.D.	: 041096	MATRIX	: AIR
CLIENT	: SPARTON TECHNOLOGY INC.	DATE EXTRACTED	: NA
PROJECT #	: 41096-AIR	DATE ANALYZED	: 04/10/96
PROJECT NAME	: SVS-2Q96	DIL. FACTOR	: 1

PARAMETER	UNITS	
BENZENE	MG/M ³	<0.05
BROMODICHLOROMETHANE	MG/M ³	<0.02
BROMOFORM	MG/M ³	<0.05
BROMOMETHANE	MG/M ³	<0.10
CARBON TETRACHLORIDE	MG/M ³	<0.02
CHLOROBENZENE	MG/M ³	<0.05
CHLOROETHANE	MG/M ³	<0.05
CHLOROFORM	MG/M ³	<0.05
CHLOROMETHANE	MG/M ³	<0.10
DIBROMOCHLOROMETHANE	MG/M ³	<0.02
1,2-DIBROMOETHANE (EDB)	MG/M ³	<0.02
1,2-DICHLOROBENZENE	MG/M ³	<0.05
1,3-DICHLOROBENZENE	MG/M ³	<0.05
1,4-DICHLOROBENZENE	MG/M ³	<0.05
1,1-DICHLOROETHANE	MG/M ³	<0.03
1,2-DICHLOROETHANE (EDC)	MG/M ³	<0.05
1,1-DICHLOROETHENE	MG/M ³	<0.02
CIS-1,2-DICHLOROETHENE	MG/M ³	<0.02
TRANS-1,2-DICHLOROETHENE	MG/M ³	<0.10
1,2-DICHLOROPROPANE	MG/M ³	<0.02
CIS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
TRANS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
ETHYLBENZENE	MG/M ³	<0.05
METHYL-t-BUTYL ETHER	MG/M ³	<0.25
METHYLENE CHLORIDE	MG/M ³	<0.20
1,1,2,2-TETRACHLOROETHANE	MG/M ³	<0.02
TETRACHLOROETHENE	MG/M ³	<0.05
TOLUENE	MG/M ³	<0.05
1,1,1-TRICHLOROETHANE	MG/M ³	<0.10
1,1,2-TRICHLOROETHANE	MG/M ³	<0.02
TRICHLOROETHENE	MG/M ³	<0.03
TRICHLOROFLUOROMETHANE	MG/M ³	<0.02
VINYL CHLORIDE	MG/M ³	<0.05
TOTAL XYLENES	MG/M ³	<0.05

SURROGATES:

BROMOCHLOROMETHANE (%)	85
TRIFLUOROTOLUENE (%)	96

GAS CHROMATOGRAPHY RESULTS - QUALITY CONTROL

TEST	: EPA 8010/8020	AEN I.D.	: 604338
BLANK I.D.	: 041296	MATRIX	: AIR
CLIENT	: SPARTON TECHNOLOGY INC.	DATE EXTRACTED	: NA
PROJECT #	: 41096-AIR	DATE ANALYZED	: 04/12/96
PROJECT NAME	: SVS-2Q96	DIL. FACTOR	: 1

PARAMETER	UNITS	
BENZENE	MG/M ³	<0.05
BROMODICHLOROMETHANE	MG/M ³	<0.02
BROMOFORM	MG/M ³	<0.05
BROMOMETHANE	MG/M ³	<0.10
CARBON TETRACHLORIDE	MG/M ³	<0.02
CHLOROBENZENE	MG/M ³	<0.05
CHLOROETHANE	MG/M ³	<0.05
CHLOROFORM	MG/M ³	<0.05
CHLOROMETHANE	MG/M ³	<0.10
DIBROMOCHLOROMETHANE	MG/M ³	<0.02
1,2-DIBROMOETHANE (EDB)	MG/M ³	<0.02
1,2-DICHLOROBENZENE	MG/M ³	<0.05
1,3-DICHLOROBENZENE	MG/M ³	<0.05
1,4-DICHLOROBENZENE	MG/M ³	<0.05
1,1-DICHLOROETHANE	MG/M ³	<0.03
1,2-DICHLOROETHANE (EDC)	MG/M ³	<0.05
1,1-DICHLOROETHENE	MG/M ³	<0.02
CIS-1,2-DICHLOROETHENE	MG/M ³	<0.02
TRANS-1,2-DICHLOROETHENE	MG/M ³	<0.10
1,2-DICHLOROPROPANE	MG/M ³	<0.02
CIS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
TRANS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
ETHYLBENZENE	MG/M ³	<0.05
METHYL-t-BUTYL ETHER	MG/M ³	<0.25
METHYLENE CHLORIDE	MG/M ³	<0.20
1,1,2,2-TETRACHLOROETHANE	MG/M ³	<0.02
TETRACHLOROETHENE	MG/M ³	<0.05
TOLUENE	MG/M ³	<0.05
1,1,1-TRICHLOROETHANE	MG/M ³	<0.10
1,1,2-TRICHLOROETHANE	MG/M ³	<0.02
TRICHLOROETHENE	MG/M ³	<0.03
TRICHLOROFLUOROMETHANE	MG/M ³	<0.02
VINYL CHLORIDE	MG/M ³	<0.05
TOTAL XYLENES	MG/M ³	<0.05
SURROGATES:		
BROMOCHLOROMETHANE (%)		89
TRIFLUOROTOLUENE (%)		94

GAS CHROMATOGRAPHY RESULTS - QUALITY CONTROL

TEST	: EPA 8010/8020	AEN I.D.	: 604338
BLANK I.D.	: 040996	MATRIX	: AIR
CLIENT	: SPARTON TECHNOLOGY INC.	DATE EXTRACTED	: NA
PROJECT #	: 41096-AIR	DATE ANALYZED	: 04/09/96
PROJECT NAME	: SVS-2Q96	DIL. FACTOR	: 1

PARAMETER	UNITS	
BENZENE	MG/M ³	<0.05
BROMODICHLOROMETHANE	MG/M ³	<0.02
BROMOFORM	MG/M ³	<0.05
BROMOMETHANE	MG/M ³	<0.10
CARBON TETRACHLORIDE	MG/M ³	<0.02
CHLORO BENZENE	MG/M ³	<0.05
CHLOROETHANE	MG/M ³	<0.05
CHLOROFORM	MG/M ³	<0.05
CHLOROMETHANE	MG/M ³	<0.10
DIBROMOCHLOROMETHANE	MG/M ³	<0.02
1,2-DIBROMOETHANE (EDB)	MG/M ³	<0.02
1,2-DICHLOROBENZENE	MG/M ³	<0.05
1,3-DICHLOROBENZENE	MG/M ³	<0.05
1,4-DICHLOROBENZENE	MG/M ³	<0.05
1,1-DICHLOROETHANE	MG/M ³	<0.03
1,2-DICHLOROETHANE (EDC)	MG/M ³	<0.05
1,1-DICHLOROETHENE	MG/M ³	<0.02
CIS-1,2-DICHLOROETHENE	MG/M ³	<0.02
TRANS-1,2-DICHLOROETHENE	MG/M ³	<0.10
1,2-DICHLOROPROPANE	MG/M ³	<0.02
CIS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
TRANS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
ETHYLBENZENE	MG/M ³	<0.05
METHYL-t-BUTYL ETHER	MG/M ³	<0.25
METHYLENE CHLORIDE	MG/M ³	<0.20
1,1,2,2-TETRACHLOROETHANE	MG/M ³	<0.02
TETRACHLOROETHENE	MG/M ³	<0.05
TOLUENE	MG/M ³	<0.05
1,1,1-TRICHLOROETHANE	MG/M ³	<0.10
1,1,2-TRICHLOROETHANE	MG/M ³	<0.02
TRICHLOROETHENE	MG/M ³	<0.03
TRICHLOROFLUOROMETHANE	MG/M ³	<0.02
VINYL CHLORIDE	MG/M ³	<0.05
TOTAL XYLENES	MG/M ³	<0.05
SURROGATES:		
BROMOCHLOROMETHANE (%)		94
TRIFLUOROTOLUENE (%)		97

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST : PURGEABLE HALOCARBONS/AROMATICS (EPA 8010/8020)
 MSMSD # : 040996 AEN I.D. : 604338
 CLIENT : SPARTON TECHNOLOGY INC. DATE EXTRACTED : NA
 PROJECT # : 41096-AIR DATE ANALYZED : 04/09/96
 PROJECT NAME : SVS-2Q96 SAMPLE MATRIX : AIR
 REF. I.D. : 040996 UNITS : MG/M³

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.05	1.00	1.05	105	0.94	94	11
CHLOROBENZENE	<0.05	1.00	1.04	104	1.05	105	1
1,1-DICHLOROETHENE	<0.02	1.00	0.75	75	0.77	77	3
TOLUENE	<0.05	1.00	1.04	104	0.96	96	8
T DICHLOROETHENE	<0.03	1.00	1.00	100	1.04	104	4

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

CHAIN OF CUSTODY

DATE: 4-10-96 PAGE 1 OF 1

ATI LAB I.D. 604338

PROJECT MANAGER: John M. Wakefield

COMPANY: Sparta Technology Inc.
 ADDRESS: 9621 Coors Rd. NW
 Albuquerque NM 87114
 PHONE: (505) 892-5300
 FAX: (505) 892-5515

BILL TO: "
 COMPANY: "
 ADDRESS: 4701 Rockaway Blvd SE
 Rio Rancho NM 87124-4407

PID TCE room

ANALYSIS REQUEST																			
Petroleum Hydrocarbons (418.1)	(MOD 8015) Gas/Diesel	Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020)	BTXE/MTBE (8020)	Chlorinated Hydrocarbons (601/8010)	Aromatic Hydrocarbons (602/8020)	SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.	Pesticides/PCB (608/8080)	Herbicides (615/8150)	Base/Neutral/Acid Compounds GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	Polynuclear Aromatics (610/8310)	SDWA Primary Standards - Arizona	SDWA Secondary Standards - Arizona	SDWA Primary Standards - Federal	SDWA Secondary Standards - Federal	The 13 Priority Pollutant Metals	RCRA Metals by Total Digestion	RCRA Metals by TCLP (1311)	NUMBER OF CONTAINERS
				X	X														1
				X	X														1
				X	X														1
				X	X														1

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
MW-7	20.2	4-10-96	0912	Air -01
MW-13	20.3	4-10-96	1114	Air -02
MW-17	96.5	4-10-96	1248	Air -03
MW-18	39.3	4-10-96	1445	Air -04

PROJECT INFORMATION	SAMPLE RECEIPT
PROJ. NO: 41096-Air	NO. CONTAINERS: 4
PROJ. NAME: SVS-2096	CUSTODY SEALS: Y/N/A
P.O. NO:	RECEIVED INTACT: Y
SHIPPED VIA: Delivered	RECEIVED COLD: N/A

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: John M. Wakefield Printed Name: John M. Wakefield Company: STI	Signature: _____ Printed Name: _____ Company: _____	Signature: _____ Printed Name: _____ Company: _____

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) 24hr 48hr 72hr 1 WEEK (NORMAL) 2 WEEK

Comments: Need preliminary data faxed to VMW at 892-5300 Note PID Readings. Also fax to Pierce Chandler 214-770-1549

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY (LAB) 3.
Signature: _____ Printed Name: _____ Company: _____	Signature: _____ Printed Name: _____ Company: _____	Signature: [Signature] Printed Name: [Name] Date: 4-10-96 Company: Analytical Technologies, Inc.

American Environmental Network, Inc.

Soil Vapor Sampling of MW-33,15,27
Smp'd: 4-11-96
Rec: 4-17-96

AEN I.D. 604346

April 15, 1996

Sparton Technology Inc.
4901 Rockaway Blvd SE
Albuquerque, NM 87124-4469

Project Name/Number: SVS-2Q96 041196-SV

Attention: John Wakefield

On 04/11/96, American Environmental Network (NM), Inc., (ADHS License No. AZ0015) (formerly ATI-NM), received a request to analyze air samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.



Kimberly D. McNeill
Project Manager



H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

American Environmental Network, Inc.

CLIENT : SPARTON TECHNOLOGY INC. DATE RECEIVED : 04/11/96
PROJECT # : 041196-SV
PROJECT NAME : SVS-2Q96 REPORT DATE : 04/15/96

AEN ID: 604346

AEN #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	MW-33 0.0	AIR	04/11/96
02	MW-15 1.0	AIR	04/11/96
03	MW-27 1.1	AIR	04/11/96

---TOTALS---

<u>MATRIX</u>	<u>#SAMPLES</u>
AIR	3

AEN STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

American Environmental Network, Inc. GAS CHROMATOGRAPHY RESULTS

TEST : PURGEABLE HALOCARBONS/AROMATICS (EPA 8010/8020)
 CLIENT : SPARTON TECHNOLOGY INC. AEN I.D.: 604346
 PROJECT # : 041196-SV
 PROJECT NAME : SVS-2Q96

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	MW-33 0.0	AIR	04/11/96	NA	04/11/96	1
02	MW-15 1.0	AIR	04/11/96	NA	04/11/96	1
03	MW-27 1.1	AIR	04/11/96	NA	04/11/96	1
PARAMETER	UNITS	01	02	03		
BENZENE	MG/M ³	<0.05	<0.05	<0.05		
BROMODICHLOROMETHANE	MG/M ³	<0.02	<0.02	<0.02		
BROMOFORM	MG/M ³	<0.05	<0.05	<0.05		
BROMOMETHANE	MG/M ³	<0.10	<0.10	<0.10		
CARBON TETRACHLORIDE	MG/M ³	<0.02	<0.02	<0.02		
CHLOROBENZENE	MG/M ³	<0.05	<0.05	<0.05		
CHLOROETHANE	MG/M ³	<0.05	<0.05	<0.05		
CHLOROFORM	MG/M ³	<0.05	<0.05	<0.05		
CHLOROMETHANE	MG/M ³	<0.10	<0.10	<0.10		
DIBROMOCHLOROMETHANE	MG/M ³	<0.02	<0.02	<0.02		
1,2-DIBROMOETHANE (EDB)	MG/M ³	<0.02	<0.02	<0.02		
1,2-DICHLOROETHANE	MG/M ³	<0.05	<0.05	<0.05		
1,3-DICHLOROETHANE	MG/M ³	<0.05	<0.05	<0.05		
1,4-DICHLOROETHANE	MG/M ³	<0.05	<0.05	<0.05		
1,1-DICHLOROETHANE	MG/M ³	<0.03	<0.03	<0.03		
1,2-DICHLOROETHANE (EDC)	MG/M ³	<0.05	<0.05	<0.05		
1,1-DICHLOROETHENE	MG/M ³	0.07	0.08	1.0		
CIS-1,2-DICHLOROETHENE	MG/M ³	<0.02	<0.02	<0.02		
TRANS-1,2-DICHLOROETHENE	MG/M ³	<0.10	<0.10	<0.10		
1,2-DICHLOROPROPANE	MG/M ³	<0.02	<0.02	<0.02		
CIS-1,3-DICHLOROPROPENE	MG/M ³	<0.02	<0.02	<0.02		
TRANS-1,3-DICHLOROPROPENE	MG/M ³	<0.02	<0.02	<0.02		
ETHYLBENZENE	MG/M ³	<0.05	<0.05	<0.05		
METHYL-t-BUTYL ETHER	MG/M ³	<0.25	<0.25	<0.25		
METHYLENE CHLORIDE	MG/M ³	<0.20	<0.20	<0.20		
1,1,2,2-TETRACHLOROETHANE	MG/M ³	<0.02	<0.02	<0.02		
TETRACHLOROETHENE	MG/M ³	<0.05	<0.05	0.06		
TOLUENE	MG/M ³	<0.05	<0.05	<0.05		
1,1,1-TRICHLOROETHANE	MG/M ³	0.13	0.43	3.4 D(10)		
1,1,2-TRICHLOROETHANE	MG/M ³	<0.02	<0.02	<0.02		
TRICHLOROETHENE	MG/M ³	1.3	1.4	5.6 D(10)		
TRICHLOROFLUOROMETHANE	MG/M ³	<0.02	<0.02	<0.02		
VINYL CHLORIDE	MG/M ³	<0.05	<0.05	<0.05		
TOTAL XYLENES	MG/M ³	<0.05	<0.05	<0.05		
SURROGATES:						
BROMOCHLOROMETHANE (%)		88	82	91		
TRIFLUOROTOLUENE (%)		85	95	95		

D(10)=DILUTED 10X, ANALYZED 04/12/96

GAS CHROMATOGRAPHY RESULTS - QUALITY CONTROL

TEST	: EPA 8010/8020	AEN I.D.	: 604346
BLANK I.D.	: 040996	MATRIX	: AIR
CLIENT	: SPARTON TECHNOLOGY INC.	DATE EXTRACTED	: NA
PROJECT #	: 041196-SV	DATE ANALYZED	: 04/09/96
PROJECT NAME	: SVS-2Q96	DIL. FACTOR	: 1

PARAMETER	UNITS	
BENZENE	MG/M ³	<0.05
BROMODICHLOROMETHANE	MG/M ³	<0.02
BROMOFORM	MG/M ³	<0.05
BROMOMETHANE	MG/M ³	<0.10
CARBON TETRACHLORIDE	MG/M ³	<0.02
CHLOROBENZENE	MG/M ³	<0.05
CHLOROETHANE	MG/M ³	<0.05
CHLOROFORM	MG/M ³	<0.05
CHLOROMETHANE	MG/M ³	<0.10
DIBROMOCHLOROMETHANE	MG/M ³	<0.02
1,2-DIBROMOETHANE (EDB)	MG/M ³	<0.02
1,2-DICHLOROBENZENE	MG/M ³	<0.05
1,3-DICHLOROBENZENE	MG/M ³	<0.05
1,4-DICHLOROBENZENE	MG/M ³	<0.05
1,1-DICHLOROETHANE	MG/M ³	<0.03
1,2-DICHLOROETHANE (EDC)	MG/M ³	<0.05
1,1-DICHLOROETHENE	MG/M ³	<0.02
CIS-1,2-DICHLOROETHENE	MG/M ³	<0.02
TRANS-1,2-DICHLOROETHENE	MG/M ³	<0.10
1,2-DICHLOROPROPANE	MG/M ³	<0.02
CIS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
TRANS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
ETHYLBENZENE	MG/M ³	<0.05
METHYL-t-BUTYL ETHER	MG/M ³	<0.25
METHYLENE CHLORIDE	MG/M ³	<0.20
1,1,2,2-TETRACHLOROETHANE	MG/M ³	<0.02
TETRACHLOROETHENE	MG/M ³	<0.05
TOLUENE	MG/M ³	<0.05
1,1,1-TRICHLOROETHANE	MG/M ³	<0.10
1,1,2-TRICHLOROETHANE	MG/M ³	<0.02
TRICHLOROETHENE	MG/M ³	<0.03
TRICHLOROFLUOROMETHANE	MG/M ³	<0.02
VINYL CHLORIDE	MG/M ³	<0.05
TOTAL XYLENES	MG/M ³	<0.05
SURROGATES:		
BROMOCHLOROMETHANE (%)		94
TRIFLUOROTOLUENE (%)		97

GAS CHROMATOGRAPHY RESULTS - QUALITY CONTROL

TEST	: EPA 8010/8020	AEN I.D.	: 604346
BLANK I.D.	: 041196	MATRIX	: AIR
CLIENT	: SPARTON TECHNOLOGY INC.	DATE EXTRACTED	: NA
PROJECT #	: 041196-SV	DATE ANALYZED	: 04/11/96
PROJECT NAME	: SVS-2Q96	DIL. FACTOR	: 1

PARAMETER	UNITS	
BENZENE	MG/M ³	<0.05
BROMODICHLOROMETHANE	MG/M ³	<0.02
BROMOFORM	MG/M ³	<0.05
BROMOMETHANE	MG/M ³	<0.10
CARBON TETRACHLORIDE	MG/M ³	<0.02
CHLOROBENZENE	MG/M ³	<0.05
CHLOROETHANE	MG/M ³	<0.05
CHLOROFORM	MG/M ³	<0.05
CHLOROMETHANE	MG/M ³	<0.10
DIBROMOCHLOROMETHANE	MG/M ³	<0.02
1,2-DIBROMOETHANE (EDB)	MG/M ³	<0.02
1,2-DICHLOROBENZENE	MG/M ³	<0.05
1,3-DICHLOROBENZENE	MG/M ³	<0.05
1,4-DICHLOROBENZENE	MG/M ³	<0.05
1,1-DICHLOROETHANE	MG/M ³	<0.03
1,2-DICHLOROETHANE (EDC)	MG/M ³	<0.05
1,1-DICHLOROETHENE	MG/M ³	<0.02
CIS-1,2-DICHLOROETHENE	MG/M ³	<0.02
TRANS-1,2-DICHLOROETHENE	MG/M ³	<0.10
1,2-DICHLOROPROPANE	MG/M ³	<0.02
CIS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
TRANS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
ETHYLBENZENE	MG/M ³	<0.05
METHYL-t-BUTYL ETHER	MG/M ³	<0.25
METHYLENE CHLORIDE	MG/M ³	<0.20
1,1,2,2-TETRACHLOROETHANE	MG/M ³	<0.02
TETRACHLOROETHENE	MG/M ³	<0.05
TOLUENE	MG/M ³	<0.05
1,1,1-TRICHLOROETHANE	MG/M ³	<0.10
1,1,2-TRICHLOROETHANE	MG/M ³	<0.02
TRICHLOROETHENE	MG/M ³	<0.03
TRICHLOROFLUOROMETHANE	MG/M ³	<0.02
VINYL CHLORIDE	MG/M ³	<0.05
TOTAL XYLENES	MG/M ³	<0.05

SURROGATES:

BROMOCHLOROMETHANE (%)	96
TRIFLUOROTOLUENE (%)	98

GAS CHROMATOGRAPHY RESULTS - QUALITY CONTROL

TEST	: EPA 8010/8020	AEN I.D.	: 604346
BLANK I.D.	: 041296	MATRIX	: AIR
CLIENT	: SPARTON TECHNOLOGY INC.	DATE EXTRACTED	: NA
PROJECT #	: 041196-SV	DATE ANALYZED	: 04/12/96
PROJECT NAME	: SVS-2Q96	DIL. FACTOR	: 1

PARAMETER	UNITS	
BENZENE	MG/M ³	<0.05
BROMODICHLOROMETHANE	MG/M ³	<0.02
BROMOFORM	MG/M ³	<0.05
BROMOMETHANE	MG/M ³	<0.10
CARBON TETRACHLORIDE	MG/M ³	<0.02
CHLOROBENZENE	MG/M ³	<0.05
CHLOROETHANE	MG/M ³	<0.05
CHLOROFORM	MG/M ³	<0.05
CHLOROMETHANE	MG/M ³	<0.10
DIBROMOCHLOROMETHANE	MG/M ³	<0.02
1,2-DIBROMOETHANE (EDB)	MG/M ³	<0.02
1,2-DICHLOROBENZENE	MG/M ³	<0.05
1,3-DICHLOROBENZENE	MG/M ³	<0.05
1,4-DICHLOROBENZENE	MG/M ³	<0.05
1,1-DICHLOROETHANE	MG/M ³	<0.03
1,2-DICHLOROETHANE (EDC)	MG/M ³	<0.05
1,1-DICHLOROETHENE	MG/M ³	<0.02
CIS-1,2-DICHLOROETHENE	MG/M ³	<0.02
TRANS-1,2-DICHLOROETHENE	MG/M ³	<0.10
1,2-DICHLOROPROPANE	MG/M ³	<0.02
CIS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
TRANS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
ETHYLBENZENE	MG/M ³	<0.05
METHYL-t-BUTYL ETHER	MG/M ³	<0.25
METHYLENE CHLORIDE	MG/M ³	<0.20
1,1,2,2-TETRACHLOROETHANE	MG/M ³	<0.02
TETRACHLOROETHENE	MG/M ³	<0.05
TOLUENE	MG/M ³	<0.05
1,1,1-TRICHLOROETHANE	MG/M ³	<0.10
1,1,2-TRICHLOROETHANE	MG/M ³	<0.02
TRICHLOROETHENE	MG/M ³	<0.03
TRICHLOROFLUOROMETHANE	MG/M ³	<0.02
VINYL CHLORIDE	MG/M ³	<0.05
TOTAL XYLENES	MG/M ³	<0.05
SURROGATES:		
BROMOCHLOROMETHANE (%)		89
TRIFLUOROTOLUENE (%)		94

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST : PURGEABLE HALOCARBONS/AROMATICS (EPA 8010/8020)
MSMSD # : 040996 AEN I.D. : 604346
CLIENT : SPARTON TECHNOLOGY INC. DATE EXTRACTED : NA
PROJECT # : 041196-SV DATE ANALYZED : 04/09/96
PROJECT NAME : SVS-2Q96 SAMPLE MATRIX : AIR
REF. I.D. : 040996 UNITS : MG/M³

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.05	1.00	1.05	105	0.94	94	11
CHLOROBENZENE	<0.05	1.00	1.04	104	1.05	105	1
1,1-DICHLOROETHENE	<0.02	1.00	0.75	75	0.77	77	3
TOLUENE	<0.05	1.00	1.04	104	0.96	96	8
TRICHLOROETHENE	<0.03	1.00	1.00	100	1.04	104	4

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

CHAIN OF CUSTODY

DATE: 4-11-96 PAGE 1 OF 1

ATI LAB I.D.

604346

PROJECT MANAGER: John M. Wakefield

COMPANY: Sparlon Technology Inc.
 ADDRESS: 9621 Coors Rd. NW
 Albuquerque NM 87114
 PHONE: 505-892-5300
 FAX: 505-892-5515

BILL TO: "
 COMPANY: "
 ADDRESS: 4901 Rockaway Blvd SE
 Rio Rancho NM 87124-4469
 PFO TCE PM

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	Petroleum Hydrocarbons (418.1)	(MOD 8015) Gas/Diesel	Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020)	BTXE/MTBE (8020)	Chlorinated Hydrocarbons (601/8010)	Aromatic Hydrocarbons (602/8020)	SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.	Pesticides/PCB (608/8080)	Herbicides (615/8150)	Base/Neutral/Acid Compounds GC/MS (623/8270)	Volatile Organics GC/MS (624/8240)	Polynuclear Aromatics (610/8310)	SCWA Primary Standards - Arizer 1	SDWA Secondary Standards - Arizona	SDWA Primary Standards - Federal	SDWA Secondary Standards - Federal	The 13 Priority Pollutant Metals	PCRA Metals by Total Digestion	PCRA Metals by TCLP (1311)	NUMBER OF CONTAINERS
MW-33	0.0	4-11-96	09:20	Air -01					X	X														1
MW-15	1.0	4-11-96	10:35	Air -02					X	X														1
MW-27	1.1	4-11-96	13:01	Air -03					X	X														1

PROJECT INFORMATION	SAMPLE RECEIPT	
PROJ. NO: C-41196-5V	NO. CONTAINERS	3
PROJ. NAME: SVS-2096	CUSTODY SEALS	Y/DINA
P.O. NO.:	RECEIVED INTACT	Y
SHIPPED VIA: Delivered	RECEIVED COLD	-

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: John M. Wakefield Time: 4-11-96 14:27	Signature:	Signature:
Printed Name: John M. Wakefield	Printed Name:	Printed Name:
Company: STI Phone: 892-5300	Company:	Company:

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) 24hr 48hr 72hr 1 WEEK (NORMAL) 2 WEEK

Comments: Need preliminary data faxed to 892-5515 and to P. Chandler at 214 770-1549

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: (LAB) 3.
Signature:	Signature:	Signature: [Signature] Time: 1425
Printed Name:	Printed Name:	Printed Name: [Name] Date: [Date]
Company:	Company:	Company: Analytical Technologies, Inc.



American Environmental Network, Inc.

Soil Vapor Sampling of Monitor Wells.
MW-21, 14, G1 Sampled: 4-12-96 Rec: 4-25-96

AEN I.D. 604356

April 16, 1996

Sparton Technology Inc.
4901 Rockaway Blvd SE
Rio Rancho, NM 87124-4469

Project Name/Number: SVS-2Q96 041296

Attention: John Wakefield

On 04/12/96, American Environmental Network (NM), Inc., (ADHS License No. AZ0015) (formerly ATI-NM), received a request to analyze air samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.



Kimberly D. McNeill
Project Manager



H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

American Environmental Network, Inc.

CLIENT : SPARTON TECHNOLOGY INC. DATE RECEIVED : 04/12/96
PROJECT # : 041296
PROJECT NAME : SVS-2Q96 REPORT DATE : 04/16/96

AEN ID: 604356

AEN #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	MW-21 0.0	AIR	04/12/96
02	MW-14 2.5	AIR	04/12/96
03	MW-61 0.3	AIR	04/12/96

---TOTALS---

<u>MATRIX</u>	<u>#SAMPLES</u>
AIR	3

AEN STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

American Environmental Network, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : PURGEABLE HALOCARBONS/AROMATICS (EPA 8010/8020)
 CLIENT : SPARTON TECHNOLOGY INC. AEN I.D.: 604356
 PROJECT # : 041296
 PROJECT NAME : SVS-2Q96

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	MW-21 0.0	AIR	04/12/96	NA	04/13/96	1
02	MW-14 2.5	AIR	04/12/96	NA	04/12/96	1
03	MW-61 0.3	AIR	04/12/96	NA	04/12/96	1
PARAMETER			UNITS	01	02	03
BENZENE			MG/M ³	<0.05	<0.05	<0.05
BROMODICHLOROMETHANE			MG/M ³	<0.02	<0.02	<0.02
BROMOFORM			MG/M ³	<0.05	<0.05	<0.05
BROMOMETHANE			MG/M ³	<0.10	<0.10	<0.10
CARBON TETRACHLORIDE			MG/M ³	<0.02	<0.02	<0.02
CHLOROBENZENE			MG/M ³	<0.05	<0.05	<0.05
CHLOROETHANE			MG/M ³	<0.05	<0.05	<0.05
CHLOROFORM			MG/M ³	<0.05	<0.05	<0.05
CHLOROMETHANE			MG/M ³	<0.10	<0.10	<0.10
DIBROMOCHLOROMETHANE			MG/M ³	<0.02	<0.02	<0.02
1,2-DIBROMOETHANE (EDB)			MG/M ³	<0.02	<0.02	<0.02
1,2-DICHLOROBENZENE			MG/M ³	<0.05	<0.05	<0.05
1,3-DICHLOROBENZENE			MG/M ³	<0.05	<0.05	<0.05
1,4-DICHLOROBENZENE			MG/M ³	<0.05	<0.05	<0.05
1,1-DICHLOROETHANE			MG/M ³	<0.03	<0.03	<0.03
1,2-DICHLOROETHANE (EDC)			MG/M ³	<0.05	<0.05	<0.05
1,1-DICHLOROETHENE			MG/M ³	0.84	0.93	0.02
CIS-1,2-DICHLOROETHENE			MG/M ³	<0.02	0.02	<0.02
TRANS-1,2-DICHLOROETHENE			MG/M ³	<0.10	<0.10	<0.10
1,2-DICHLOROPROPANE			MG/M ³	<0.02	<0.02	<0.02
CIS-1,3-DICHLOROPROPENE			MG/M ³	<0.02	<0.02	<0.02
TRANS-1,3-DICHLOROPROPENE			MG/M ³	<0.02	<0.02	<0.02
ETHYLBENZENE			MG/M ³	<0.05	<0.05	<0.05
METHYL-t-BUTYL ETHER			MG/M ³	<0.25	<0.25	<0.25
METHYLENE CHLORIDE			MG/M ³	<0.20	<0.20	<0.20
1,1,2,2-TETRACHLOROETHANE			MG/M ³	<0.02	<0.02	<0.02
TETRACHLOROETHENE			MG/M ³	0.13	0.14	<0.05
TOLUENE			MG/M ³	<0.05	<0.05	<0.05
1,1,1-TRICHLOROETHANE			MG/M ³	3.6 D(10)	0.29	<0.10
1,1,2-TRICHLOROETHANE			MG/M ³	<0.02	<0.02	<0.02
TRICHLOROETHENE			MG/M ³	6.2 D(10)	15 D(25)	0.59
TRICHLOROFLUOROMETHANE			MG/M ³	<0.02	<0.02	<0.02
VINYL CHLORIDE			MG/M ³	<0.05	<0.05	<0.05
TOTAL XYLENES			MG/M ³	<0.05	<0.05	<0.05

SURROGATES:

BROMOCHLOROMETHANE (%)	92	100	89
TRIFLUOROTOLUENE (%)	96	81	91

D(10)=DILUTED 10X, ANALYZED 04/13/96

γ(25)=DILUTED 25X, ANALYZED 04/13/96

GAS CHROMATOGRAPHY RESULTS - QUALITY CONTROL

TEST	: EPA 8010/8020	AEN I.D.	: 604356
BLANK I.D.	: 041296	MATRIX	: AIR
CLIENT	: SPARTON TECHNOLOGY INC.	DATE EXTRACTED	: NA
PROJECT #	: 041296	DATE ANALYZED	: 04/12/96
PROJECT NAME	: SVS-2Q96	DIL. FACTOR	: 1

PARAMETER	UNITS	
BENZENE	MG/M ³	<0.05
BROMODICHLOROMETHANE	MG/M ³	<0.02
BROMOFORM	MG/M ³	<0.05
BROMOMETHANE	MG/M ³	<0.10
CARBON TETRACHLORIDE	MG/M ³	<0.02
CHLOROBENZENE	MG/M ³	<0.05
CHLOROETHANE	MG/M ³	<0.05
CHLOROFORM	MG/M ³	<0.05
CHLOROMETHANE	MG/M ³	<0.10
DIBROMOCHLOROMETHANE	MG/M ³	<0.02
1,2-DIBROMOETHANE (EDB)	MG/M ³	<0.02
1,2-DICHLOROBENZENE	MG/M ³	<0.05
1,3-DICHLOROBENZENE	MG/M ³	<0.05
1,4-DICHLOROBENZENE	MG/M ³	<0.05
1,1-DICHLOROETHANE	MG/M ³	<0.03
1,2-DICHLOROETHANE (EDC)	MG/M ³	<0.05
1,1-DICHLOROETHENE	MG/M ³	<0.02
CIS-1,2-DICHLOROETHENE	MG/M ³	<0.02
TRANS-1,2-DICHLOROETHENE	MG/M ³	<0.10
1,2-DICHLOROPROPANE	MG/M ³	<0.02
CIS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
TRANS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
ETHYLBENZENE	MG/M ³	<0.05
METHYL-t-BUTYL ETHER	MG/M ³	<0.25
METHYLENE CHLORIDE	MG/M ³	<0.20
1,1,2,2-TETRACHLOROETHANE	MG/M ³	<0.02
TETRACHLOROETHENE	MG/M ³	<0.05
TOLUENE	MG/M ³	<0.05
1,1,1-TRICHLOROETHANE	MG/M ³	<0.10
1,1,2-TRICHLOROETHANE	MG/M ³	<0.02
TRICHLOROETHENE	MG/M ³	<0.03
TRICHLOROFLUOROMETHANE	MG/M ³	<0.02
VINYL CHLORIDE	MG/M ³	<0.05
TOTAL XYLENES	MG/M ³	<0.05

SURROGATES:

BROMOCHLOROMETHANE (%)	89
TRIFLUOROTOLUENE (%)	94

GAS CHROMATOGRAPHY RESULTS - QUALITY CONTROL

TEST	: EPA 8010/8020	AEN I.D.	: 604356
BLANK I.D.	: 041296B	MATRIX	: AIR
CLIENT	: SPARTON TECHNOLOGY INC.	DATE EXTRACTED	: NA
PROJECT #	: 041296	DATE ANALYZED	: 04/13/96
PROJECT NAME	: SVS-2Q96	DIL. FACTOR	: 1

PARAMETER	UNITS	
BENZENE	MG/M ³	<0.05
BROMODICHLOROMETHANE	MG/M ³	<0.02
BROMOFORM	MG/M ³	<0.05
BROMOMETHANE	MG/M ³	<0.10
CARBON TETRACHLORIDE	MG/M ³	<0.02
CHLORO BENZENE	MG/M ³	<0.05
CHLOROETHANE	MG/M ³	<0.05
CHLOROFORM	MG/M ³	<0.05
CHLOROMETHANE	MG/M ³	<0.10
DIBROMOCHLOROMETHANE	MG/M ³	<0.02
1,2-DIBROMOETHANE (EDB)	MG/M ³	<0.02
1,2-DICHLOROBENZENE	MG/M ³	<0.05
1,3-DICHLOROBENZENE	MG/M ³	<0.05
1,4-DICHLOROBENZENE	MG/M ³	<0.05
1,1-DICHLOROETHANE	MG/M ³	<0.03
1,2-DICHLOROETHANE (EDC)	MG/M ³	<0.05
1,1-DICHLOROETHENE	MG/M ³	<0.02
CIS-1,2-DICHLOROETHENE	MG/M ³	<0.02
TRANS-1,2-DICHLOROETHENE	MG/M ³	<0.10
1,2-DICHLOROPROPANE	MG/M ³	<0.02
CIS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
TRANS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
ETHYLBENZENE	MG/M ³	<0.05
METHYL-t-BUTYL ETHER	MG/M ³	<0.25
METHYLENE CHLORIDE	MG/M ³	<0.20
1,1,2,2-TETRACHLOROETHANE	MG/M ³	<0.02
TETRACHLOROETHENE	MG/M ³	<0.05
TOLUENE	MG/M ³	<0.05
1,1,1-TRICHLOROETHANE	MG/M ³	<0.10
1,1,2-TRICHLOROETHANE	MG/M ³	<0.02
TRICHLOROETHENE	MG/M ³	<0.03
TRICHLOROFLUOROMETHANE	MG/M ³	<0.02
VINYL CHLORIDE	MG/M ³	<0.05
TOTAL XYLENES	MG/M ³	<0.05

SURROGATES:

BROMOCHLOROMETHANE (%)	99
TRIFLUOROTOLUENE (%)	100

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST : PURGEABLE HALOCARBONS/AROMATICS (EPA 8010/8020)
 MSMSD # : 041596 AEN I.D. : 604356
 CLIENT : SPARTON TECHNOLOGY INC. DATE EXTRACTED : NA
 PROJECT # : 041296 DATE ANALYZED : 04/15/96
 PROJECT NAME : SVS-2Q96 SAMPLE MATRIX : AIR
 REF. I.D. : 041596 UNITS : MG/M³

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.05	1.00	1.04	104	0.87	87	18
CHLOROBENZENE	<0.05	1.00	1.05	105	0.95	95	10
1,1-DICHLOROETHENE	<0.02	1.00	0.81	81	0.69	69	16
TOLUENE	<0.05	1.00	1.05	105	0.88	88	18
TRICHLOROETHENE	<0.03	1.00	1.05	105	0.94	94	11

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

PROJECT MANAGER: John M. ...

COMPANY: Spectra Technology Inc
 ADDRESS: 9621 Coors Rd. NW
Albuquerque NM 87114
 PHONE: 505 892-5300
 FAX: 5515

BILL TO: "
 COMPANY: "
 ADDRESS: 4901 Rockaway Blvd
Albuquerque NM 87124

ANALYSIS REQUEST																				
Petroleum Hydrocarbons (418.1)	(MOD 8015) Gas/Diesel	Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020)	BTXE/MTBE (8020)	Chlorinated Hydrocarbons (601/8010)	Aromatic Hydrocarbons (602/8020)	SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.	Pesticides/PCB (608/8080)	Herbicides (615/8150)	Base/Neutral/Acid Compounds GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	Polynuclear Aromatics (610/8310)	SDWA Primary Standards - Arizona	SDWA Secondary Standards - Arizona	SDWA Primary Standards - Federal	SDWA Secondary Standards - Federal	The 13 Priority Pollutant Metals	PCRA Metals by Total Digestion	PCRA Metals by TCLP (1311)	NUMBER OF CONTAINERS	
				X	X															1
				X	X															1
				X	X															1

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
MW-21	4/17/96	0820	AW	-01
MW-11	"	0906	"	-02
MW-61	"	1320	"	-03

PROJECT INFORMATION	SAMPLE RECEIPT
PROJ. NO: <u>505-2096</u>	NO. CONTAINERS: <u>3</u>
PROJ. NAME: <u>SVS-2096</u>	CUSTODY SEALS: <u>(Y/N) NA</u>
P.O. NO.:	RECEIVED INTACT: <u>X</u>
SHIPPED VIA: <u>By Truck</u>	RECEIVED COLD: <u>✓</u>

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: <u>[Signature]</u> Time: <u>10:12</u>	Signature: _____ Time: _____	Signature: _____ Time: _____
Printed Name: <u>John M. ...</u> Date: <u>4-17-96</u>	Printed Name: _____ Date: _____	Printed Name: _____ Date: _____
Company: <u>ATI</u> Phone: <u>505-892-5300</u>	Company: _____	Company: _____

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

RUSH 24hr 48hr 72hr 1 WEEK (NORMAL) 2 WEEK

Comments: See Prelims to 892-5515 +
211-770-1549

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY (LAB) 3.
Signature: _____ Time: _____	Signature: _____ Time: _____	Signature: <u>[Signature]</u> Time: <u>1610</u>
Printed Name: _____ Date: _____	Printed Name: _____ Date: _____	Printed Name: <u>John Caldwell</u> Date: <u>4/17/96</u>
Company: _____	Company: _____	Company: <u>Analytical Technologies, Inc.</u>

American Environmental Network, Inc.

Vapor Sampling of Mon. to Wells.
MW - 37, 48, 57 Sampled 4-15-96
Rec. 4-25-96

AEN I.D. 604358

April 19, 1996

Sparton Technology Inc.
4901 Rockaway Blvd SE
Rio Rancho, NM 87124

Project Name/Number: SVS-2Q96 041596

Attention: John Wakefield

On 04/15/96, American Environmental Network (NM), Inc., (ADHS License No. AZ0015) (formerly ATI-NM), received a request to analyze aqueous samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.



Kimberly D. McNeill
Project Manager



H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

American Environmental Network, Inc.

CLIENT : SPARTON TECHNOLOGY INC. DATE RECEIVED : 04/15/96
PROJECT # : 041596
PROJECT NAME : SVS-2Q96 REPORT DATE : 04/19/96

AEN ID: 604358

AEN #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	MW-37	AQUEOUS	04/15/96
02	MW-48	AQUEOUS	04/15/96
03	MW-57	AQUEOUS	04/15/96

---TOTALS---

<u>MATRIX</u>	<u>#SAMPLES</u>
AQUEOUS	3

AEN STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

American Environmental Network, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : PURGEABLE HALOCARBONS/AROMATICS (EPA 8010/8020)
 CLIENT : SPARTON TECHNOLOGY INC. AEN I.D.: 604358
 PROJECT # : 041596
 PROJECT NAME : SVS-2Q96

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	MW-37	AIR	04/15/96	NA	04/15/96	1
02	MW-48	AIR	04/15/96	NA	04/16/96	1
03	MW-57	AIR	04/15/96	NA	04/15/96	1
PARAMETER			UNITS	01	02	03
BENZENE			MG/M ³	<0.05	<0.05	<0.05
BROMODICHLOROMETHANE			MG/M ³	<0.02	<0.02	<0.02
BROMOFORM			MG/M ³	<0.05	<0.05	<0.05
BROMOMETHANE			MG/M ³	<0.10	<0.10	<0.10
CARBON TETRACHLORIDE			MG/M ³	<0.02	<0.02	<0.02
CHLOROBENZENE			MG/M ³	<0.05	<0.05	<0.05
CHLOROETHANE			MG/M ³	<0.05	<0.05	<0.05
CHLOROFORM			MG/M ³	<0.05	<0.05	<0.05
CHLOROMETHANE			MG/M ³	<0.10	<0.10	<0.10
DIBROMOCHLOROMETHANE			MG/M ³	<0.02	<0.02	<0.02
1,2-DIBROMOETHANE (EDB)			MG/M ³	<0.02	<0.02	<0.02
1,2-DICHLOROBENZENE			MG/M ³	<0.05	<0.05	<0.05
1,3-DICHLOROBENZENE			MG/M ³	<0.05	<0.05	<0.05
1,4-DICHLOROBENZENE			MG/M ³	<0.05	<0.05	<0.05
1,1-DICHLOROETHANE			MG/M ³	<0.03	<0.03	<0.03
1,2-DICHLOROETHANE (EDC)			MG/M ³	<0.05	<0.05	<0.05
1,1-DICHLOROETHENE			MG/M ³	0.066	<0.02	<0.02
CIS-1,2-DICHLOROETHENE			MG/M ³	<0.02	<0.02	<0.02
TRANS-1,2-DICHLOROETHENE			MG/M ³	<0.10	<0.10	<0.10
1,2-DICHLOROPROPANE			MG/M ³	<0.02	<0.02	<0.02
CIS-1,3-DICHLOROPROPENE			MG/M ³	<0.02	<0.02	<0.02
TRANS-1,3-DICHLOROPROPENE			MG/M ³	<0.02	<0.02	<0.02
ETHYLBENZENE			MG/M ³	<0.05	<0.05	<0.05
METHYL-t-BUTYL ETHER			MG/M ³	<0.25	<0.25	<0.25
METHYLENE CHLORIDE			MG/M ³	<0.20	<0.20	<0.20
1,1,2,2-TETRACHLOROETHANE			MG/M ³	<0.02	<0.02 D(1)	<0.02
TETRACHLOROETHENE			MG/M ³	0.13	<0.05	<0.05
TOLUENE			MG/M ³	<0.05	<0.05	<0.05
1,1,1-TRICHLOROETHANE			MG/M ³	<0.10	<0.10	<0.10
1,1,2-TRICHLOROETHANE			MG/M ³	<0.02	<0.02	<0.02
TRICHLOROETHENE			MG/M ³	4.6 D(10)	<0.03	<0.03
TRICHLOROFLUOROMETHANE			MG/M ³	<0.02	<0.02	<0.02
VINYL CHLORIDE			MG/M ³	<0.05	<0.05	<0.05
TOTAL XYLENES			MG/M ³	<0.05	<0.05	<0.05

SURROGATES:

BROMOCHLOROMETHANE (%)	93	97	92
TRIFLUOROTOLUENE (%)	97	98	104

D(1)=DILUTED 1X, ANALYZED 04/15/96

D(10)=DILUTED 10X, ANALYZED 04/16/96

GAS CHROMATOGRAPHY RESULTS - QUALITY CONTROL

TEST	: EPA 8010/8020	AEN I.D.	: 604358
BLANK I.D.	: 041696	MATRIX	: AIR
CLIENT	: SPARTON TECHNOLOGY INC.	DATE EXTRACTED	: NA
PROJECT #	: 041596	DATE ANALYZED	: 04/16/96
PROJECT NAME	: SVS-2Q96	DIL. FACTOR	: 1

PARAMETER	UNITS	
BENZENE	MG/M ³	<0.05
BROMODICHLOROMETHANE	MG/M ³	<0.02
BROMOFORM	MG/M ³	<0.05
BROMOMETHANE	MG/M ³	<0.10
CARBON TETRACHLORIDE	MG/M ³	<0.02
CHLOROBENZENE	MG/M ³	<0.05
CHLOROETHANE	MG/M ³	<0.05
CHLOROFORM	MG/M ³	<0.05
CHLOROMETHANE	MG/M ³	<0.10
DIBROMOCHLOROMETHANE	MG/M ³	<0.02
1,2-DIBROMOETHANE (EDB)	MG/M ³	<0.02
1,2-DICHLOROBENZENE	MG/M ³	<0.05
1,3-DICHLOROBENZENE	MG/M ³	<0.05
1,4-DICHLOROBENZENE	MG/M ³	<0.05
1,1-DICHLOROETHANE	MG/M ³	<0.03
1,2-DICHLOROETHANE (EDC)	MG/M ³	<0.05
1,1-DICHLOROETHENE	MG/M ³	<0.02
CIS-1,2-DICHLOROETHENE	MG/M ³	<0.02
TRANS-1,2-DICHLOROETHENE	MG/M ³	<0.10
1,2-DICHLOROPROPANE	MG/M ³	<0.02
CIS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
TRANS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
ETHYLBENZENE	MG/M ³	<0.05
METHYL-t-BUTYL ETHER	MG/M ³	<0.25
METHYLENE CHLORIDE	MG/M ³	<0.20
1,1,2,2-TETRACHLOROETHANE	MG/M ³	<0.02
TETRACHLOROETHENE	MG/M ³	<0.05
TOLUENE	MG/M ³	<0.05
1,1,1-TRICHLOROETHANE	MG/M ³	<0.10
1,1,2-TRICHLOROETHANE	MG/M ³	<0.02
TRICHLOROETHENE	MG/M ³	<0.03
TRICHLOROFLUOROMETHANE	MG/M ³	<0.02
VINYL CHLORIDE	MG/M ³	<0.05
TOTAL XYLENES	MG/M ³	<0.05
SURROGATES:		
BROMOCHLOROMETHANE (%)		98
TRIFLUOROTOLUENE (%)		101

American Environmental Network, Inc.

GAS CHROMATOGRAPHY RESULTS - QUALITY CONTROL

TEST	: EPA 8010/8020	AEN I.D.	: 604358
BLANK I.D.	: 041596	MATRIX	: AIR
CLIENT	: SPARTON TECHNOLOGY INC.	DATE EXTRACTED	: NA
PROJECT #	: 041596	DATE ANALYZED	: 04/15/96
PROJECT NAME	: SVS-2Q96	DIL. FACTOR	: 1

PARAMETER	UNITS	
BENZENE	MG/M ³	<0.05
BROMODICHLOROMETHANE	MG/M ³	<0.02
BROMOFORM	MG/M ³	<0.05
BROMOMETHANE	MG/M ³	<0.10
CARBON TETRACHLORIDE	MG/M ³	<0.02
CHLORO BENZENE	MG/M ³	<0.05
CHLOROETHANE	MG/M ³	<0.05
CHLOROFORM	MG/M ³	<0.05
CHLOROMETHANE	MG/M ³	<0.10
DIBROMOCHLOROMETHANE	MG/M ³	<0.02
1,2-DIBROMOETHANE (EDB)	MG/M ³	<0.02
1,2-DICHLORO BENZENE	MG/M ³	<0.05
1,3-DICHLORO BENZENE	MG/M ³	<0.05
1,4-DICHLORO BENZENE	MG/M ³	<0.05
1,1-DICHLOROETHANE	MG/M ³	<0.03
1,2-DICHLOROETHANE (EDC)	MG/M ³	<0.05
1,1-DICHLOROETHENE	MG/M ³	<0.02
CIS-1,2-DICHLOROETHENE	MG/M ³	<0.02
TRANS-1,2-DICHLOROETHENE	MG/M ³	<0.10
1,2-DICHLOROPROPANE	MG/M ³	<0.02
CIS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
TRANS-1,3-DICHLOROPROPENE	MG/M ³	<0.02
ETHYLBENZENE	MG/M ³	<0.05
METHYL-t-BUTYL ETHER	MG/M ³	<0.25
METHYLENE CHLORIDE	MG/M ³	<0.20
1,1,2,2-TETRACHLOROETHANE	MG/M ³	<0.02
TETRACHLOROETHENE	MG/M ³	<0.05
TOLUENE	MG/M ³	<0.05
1,1,1-TRICHLOROETHANE	MG/M ³	<0.10
1,1,2-TRICHLOROETHANE	MG/M ³	<0.02
TRICHLOROETHENE	MG/M ³	<0.03
TRICHLOROFLUOROMETHANE	MG/M ³	<0.02
VINYL CHLORIDE	MG/M ³	<0.05
TOTAL XYLENES	MG/M ³	<0.05

SURROGATES:

BROMOCHLOROMETHANE (%)	106
TRIFLUOROTOLUENE (%)	104

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST : PURGEABLE HALOCARBONS/AROMATICS (EPA 8010/8020)
 MSMSD # : 041596 AEN I.D. : 604358
 CLIENT : SPARTON TECHNOLOGY INC. DATE EXTRACTED : NA
 PROJECT # : 041596 DATE ANALYZED : 04/15/96
 PROJECT NAME : SVS-2Q96 SAMPLE MATRIX : AIR
 REF. I.D. : 041596 UNITS : MG/M³

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.05	1.00	1.04	104	0.87	87	18
CHLOROBENZENE	<0.05	1.00	1.05	105	0.95	95	10
1,1-DICHLOROETHENE	<0.02	1.00	0.81	81	0.69	69	16
TOLUENE	<0.05	1.00	1.05	105	0.88	88	18
TRICHLOROETHENE	<0.03	1.00	1.05	105	0.94	94	11

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$



CHAIN OF CUSTODY

DATE: 4-15-96 PAGE: 1 OF 1

ATI LAB I.D. 624358

SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: John W. Wakefield

COMPANY: Spanton Tech Inc.
 ADDRESS: 9621 Coors Rd, NW
 Albuquerque NM 87114
 PHONE: 505 892-5300
 FAX: 5515

BILL TO: "
 COMPANY: "
 ADDRESS: 4901 Rockaway Blvd SE
 Rio Rancho NM 87124

SAMPLE ID	DATE	TIME	MATRIX	LAB I.D.	Petroleum Hydrocarbons (413.1) TRPH (MOD. 8015) Diesel/Direct/Inject	(M8015) Gas/Purge & Trac	Gasoline/BTEX & MTBE (M8015/8020)	BTEX/MTBE (8020)	BTEX & Chlorinated Aromatics (602/8020)	STEX/MTBE/EDC & EDS (8020/8010/Short)	Chlorinated Hydrocarbons (601/8010)	504 EDB □ / DBCP □	Polynuclear Aromatics (610/8310)	Volatile Organics (624/8240) GC/MS	Volatile Organics (8260) GC/MS	Pesticides/PCB (608/8080)	Herbicides (615/8150)	Base/Neutral/Acid Compounds GC/MS (625/8270)	General Chemistry:	Priority Pollutant Metals (13)	Target Analyte List Metals (23)	RCRA Metals (8)	RCRA Metals by TCLP (Method 1311)	Metals:
MW-37	4-15-96	0956	Air	-01					X	X														
MW-48	"	1239	"	-02					X	X														
MW-57	"	1520	"	-03					X	X														

PLEASE FILL THIS FORM IN COMPLETELY.

PROJECT INFORMATION		PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS		RELINQUISHED BY: 1.		RELINQUISHED BY: 2.	
PROJ NO: 041596	PROJ NAME: SUS-2096	P.O. NO:	SHIPPED VIA: Delivered	(RUSH) 1 124hr 1 140hr X 72hr 1 1 WEEK (NORMAL) 1 12 WEEK	CERTIFICATION REQUIRED: [] NM [] OTHER	METHANOL PRESERVATION []	COMMENTS: Fax Peltan to DMW 892-5515
SAMPLE RECEIPT		NO. CONTAINERS: 3		CUSTODY SEALS: PINA		RECEIVED INTACT: Y	
BLUE ICE/ICE							
Signature: [Signature]				Time: 109		Signature: [Signature]	
Printed Name: John Wakefield				Date: 4-15-96		Printed Name: [Signature]	
Company: STL						Company: [Signature]	
RECEIVED BY: 1.				RECEIVED BY: 2.			
Signature: [Signature]				Time: [Signature]		Signature: [Signature]	
Printed Name: [Signature]				Date: [Signature]		Printed Name: [Signature] Date: [Signature]	
Company: [Signature]						Analytical Technologies of New Mexico	

SPARTON TECHNOLOGY, INC.

Date: 4-26-96
 To: File
 From: J. Wakefield

Re: WLE vs. Top Screen Elevation
 Page: 1 of 2
 File: SOILVAPAR.WQ1

ONSITE WELLS

Well No.	Flow Zone	Case Dia	Elev top of scrn	WLE 04/24/95	Scr Ele - WLE 4/95	WLE 02/09/96	Scr Ele - WLE 2/9
MW-7	UFZ	2	4981.30	4978.39	2.91	4977.99	3.31
MW-9	UFZ	2	4981.61	4974.58	7.03	4973.99	7.62
MW-12	UFZ	4	4978.58	4974.25	4.33	4973.75	4.83
MW-13	UFZ	2	4983.25	4975.97	7.28	4975.34	7.91
MW-14	UFZ	2	4980.41	4972.85	7.56	4972.72	7.69
MW-15	UFZ	2	4987.49	4974.45	13.04	DRY	
MW-16	UFZ	2	4979.50	4979.90	-0.40	4979.70	-0.20
MW-17	UFZ	2	4982.28	4980.04	2.24	4979.69	2.59
MW-21	UFZ	2	4983.86	4979.85	4.01	4979.68	4.18
MW-22	UFZ	2	4976.06	4978.87	-2.81	4978.64	-2.58
MW-33	UFZ	2	4981.29	4973.99	7.30	4973.61	7.68

PRODUCTION WELLS

Well No.	Flow Zone	Case Dia	Top of Scr Elev	Pump WL 03/28/96	Scr Ele - WLE 3/96
PW-1	UFZ	10	4984.54	4965.04	19.50
MW-18	UFZ	4	4977.58	4969.32	8.26
MW-23	UFZ	2	4976.51	4976.42	0.09
MW-24	UFZ	2	4980.30	4975.56	4.74
MW-25	UFZ	2	4981.30	4977.23	4.07
MW-26	UFZ	2	4972.71	4966.88	5.83
MW-27	UFZ	2	4978.50	4972.73	5.77
MW-28	UFZ	2	4977.69	4972.20	5.49

OFFSITE WELLS

Well No.	Flow Zone	Case Dia	Top of Scr Elev	WLE 04/24/95	Scr Ele - WLE 4/95	WLE 01/17/96	Scr Ele - WLE 1/9
PZ-1	UFZ	2	4961.52	4960.87	0.65	4959.34	2.18
MW-34	UFZ	2	4977.99	4975.36	2.63	4974.88	3.11
MW-35	UFZ	2	4979.30	4973.08	6.22	4972.66	6.64
MW-36	UFZ	2	4977.05	4971.82	5.23	4971.52	5.53
MW-37	UFZ	2	4976.66	4970.57	6.09	4970.24	6.42
MW-47	UFZ	4	4975.83	4969.30	6.53	4968.83	7.00
MW-48	UFZ	4	4976.31	4968.68	7.63	4968.26	8.05
MW-50	UFZ	4	4976.51	4963.44	13.07	4962.28	14.23
MW-51	UFZ	2	4983.86	4981.26	2.60	4980.96	2.90
MW-52	UFZ	4	4975.01	4966.53	8.48	4965.85	9.16
MW-53	UFZ	4	4974.44	4968.00	6.44	4967.52	6.92
MW-54	UFZ		4980.64	4968.62	12.02	4967.97	12.67
MW-57	UFZ	4	4977.54	4968.26	9.28	4967.67	9.87
MW-58	UFZ	4	4974.89	4968.40	6.49	4967.98	6.91
MW-61	UFZ	4	4975.98	4968.40	7.58	4967.87	8.11
MW-62	UFZ	2	4980.00	4969.96	10.04	4969.91	10.09
MW-63	UFZ	2	4982.74	4979.29	3.45	4977.75	4.99



BLACK & VEATCH

5728 LBJ Freeway, Suite 300, Dallas, Texas 75240, (972) 770-1500, Fax: (972) 770-1549

Sparton Technology
Coors Road Facility

B&V Project 26602.0100
B&V File B
July 10, 1997

Mr. Michael A. Hebert, P.E.
RCRA Enforcement
U.S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Re: Report on Soil Gas Characterization
and Vapor Extraction Pilot Testing,
Sparton Technology, Inc. Coors Road Plant

Dear Mr. Hebert:

On behalf of Sparton Technology, Inc., we are forwarding a copy of the referenced report for your files. This copy is being forwarded at the request of Mr. Rob Pine of the New Mexico Environment Department.

Sincerely,

BLACK & VEATCH

Pierce L. Chandler, Jr.
Project Manager

cjs
Enclosure



BLACK & VEATCH

5728 LBJ Freeway, Suite 300, Dallas, Texas 75240, (972) 770-1500, Fax: (972) 770-1549

Sparton Technology
Coors Road Plant

B&V Project 26602.0100
B&V File B
June 18, 1997

Ms. Ana Marie Ortiz
Assistant General Counsel
State of New Mexico Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502

Re: Report on Soil Gas Characterization and
Vapor Extraction System Pilot Testing
Sparton Technology, Inc., Coors Road Plant

Dear Ms. Ortiz:

On behalf of Sparton Technology, Inc., we are enclosing the referenced report for your review. This report summarizes vapor extraction system pilot testing and related soil gas characterization conducted in general conformance with Sparton's December 6, 1996, proposal.

The pilot test results confirm the design of the vapor extraction system and Sparton is ready to implement this corrective action. By copy of this letter, we have also sent reports to Rob Pine and Dennis McQuillan. We would appreciate receiving any comments at your earliest convenience to allow implementation to proceed expeditiously.

Sincerely,

BLACK & VEATCH

Pierce L. Chandler, Jr.
Project Manager

Enclosures

cc: Mr. Dennis McQuillan, NMED
Mr. Rob Pine, NMED
Mr. R. Jan Appel, Sparton Technology, Inc.
Mr. Richard Mico, Sparton Technology, Inc.
Mr. Jim Harris, Thompson and Knight
Mr. Gary Richardson, Metric Corporation

**REPORT ON SOIL GAS CHARACTERIZATION
AND
VAPOR EXTRACTION SYSTEM
PILOT TESTING**

**SPARTON TECHNOLOGY, INC.
COORS ROAD PLANT
ALBUQUERQUE, NEW MEXICO**

Prepared by

**BLACK & VEATCH
Dallas, Texas**

June 16, 1997

TABLE OF CONTENTS

I.	INTRODUCTION	1
II.	ADDITIONS TO SOIL GAS MONITORING SYSTEM	1
III.	PREVIOUS SOIL GAS CHARACTERIZATION	4
IV.	UP-DATED SOIL GAS CHARACTERIZATION	14
V.	SOIL VAPOR EXTRACTION PILOT TESTING	16

TABLES

TABLE 1	ANALYTICAL RESULTS FOR FEBRUARY 20, 1997 SAMPLING OF VAPOR RECOVERY WELLS 1-5	5
TABLE 2	ANALYTICAL RESULTS FOR MARCH 20, 1997 SAMPLING OF VAPOR RECOVERY WELLS 1-5	6
TABLE 3	ANALYTICAL RESULTS FOR VAPOR PROBE CLUSTER VP-1 -- VP-6	15

FIGURES

FIGURE 1	EXISTING SOIL GAS MONITORING NETWORK	2
FIGURE 2	FEBRUARY 1997 ADDITIONS TO SOIL GAS MONITORING NETWORK	3
FIGURE 3	TCE CONCENTRATION CONTOURS (1987)	9
FIGURE 4	TCA CONCENTRATION CONTOURS (1987)	10
FIGURE 5	TCE CONCENTRATION CONTOURS (1991)	11
FIGURE 6	TCA CONCENTRATION CONTOURS (1991)	12
FIGURE 7	DEEP SOIL GAS CONCENTRATION (1996)	13

TABLE OF CONTENTS (Continued)

FIGURES (Continued)

FIGURE 8	SOIL GAS VAPOR DATA (AVERAGE)	17
FIGURE 9	SOIL GAS VAPOR DATA NMED	18
FIGURE 10	PROPOSED SOIL GAS PIPE PROBE LOCATIONS	19
FIGURE 11	PILOT TEST MONITORING LOCATIONS	20

APPENDICES

APPENDIX 1	VAPOR RECOVERY WELL COMPLETION REPORT
APPENDIX 2	VAPOR PROBE INSTALLATION DETAILS
APPENDIX 3	ACUVAC PILOT TEST REPORT

REPORT ON SOIL GAS CHARACTERIZATION AND VAPOR EXTRACTION SYSTEM PILOT TESTING

I. INTRODUCTION

This report summarizes soil gas characterization and related vapor extraction system (VES) pilot testing conducted at the Sparton Technology, Inc., Coors Road plant. This investigative work was conducted in general conformance with the revised proposal of December 6, 1996, submitted to NMED.

The recent investigations further confirm opinions expressed in the Corrective Measures Study Report. Specifically these include:

1. Soil gas constituents are primarily TCE and TCA
2. Soil gas presence is apparently related to the previous on-site solvent sump.
3. Elevated (>10 ppm,) soil gas concentrations occur onsite in the immediate area of the solvent sump
4. Soil vapor extraction (SVE) is feasible
5. Vapor recovery wells have a useable influence radius in excess of 200 feet.

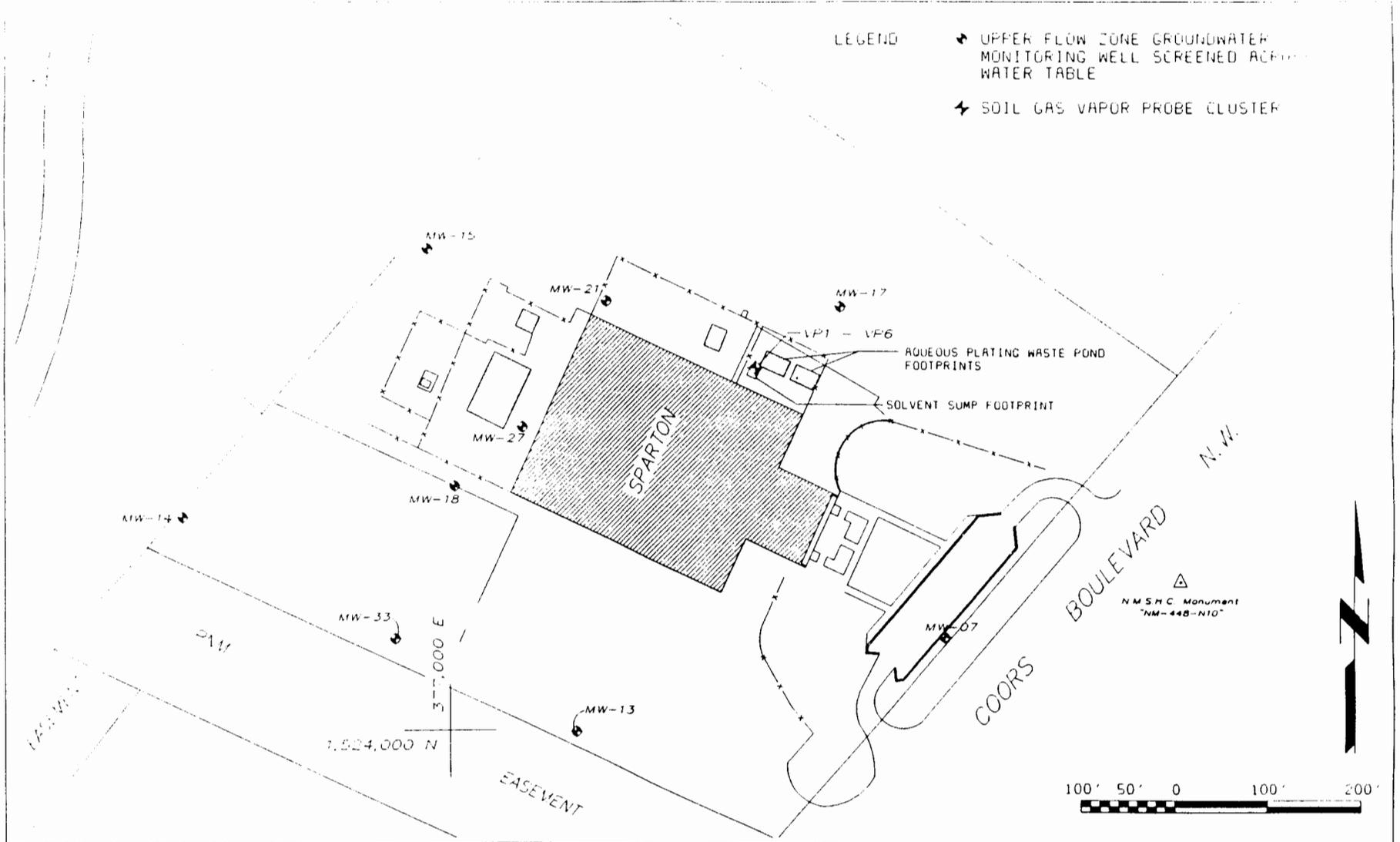
II. ADDITIONS TO SOIL GAS MONITORING SYSTEM

The existing soil gas monitoring system consisted of upper flow zone (UFZ) groundwater monitoring wells screened across the water table and a six-probe cluster in the unsaturated zone immediately adjacent to, and underneath, the original solvent sump as shown on Figure 1. In accordance with the December 6, 1996, proposal, five vapor recovery wells were installed at the plant in early February 1997. These five vapor recovery wells (VR-1 through VR-5) were located as shown on Figure 2. Well VR-1 was located in the center of the original solvent sump and the remaining recovery wells were installed at various radial distances to expand the existing network of soil gas monitoring points.

The vapor recovery wells were installed using hollow stem auger techniques. During drilling of each well, headspace readings were measured using PID field equipment. Headspace readings were obtained from cuttings collected at approximately 5-foot intervals to the completion depths of the wells. Headspace readings, as a function of depth, for each well are included in Appendix 1. As expected, well VR-1 exhibited readings at least several orders of magnitude higher than the other wells. Wells were constructed with a screened interval extending from approximately 10 feet bgs down to several feet above the water table location interpolated from the January 1996

E 22-97 - 21515

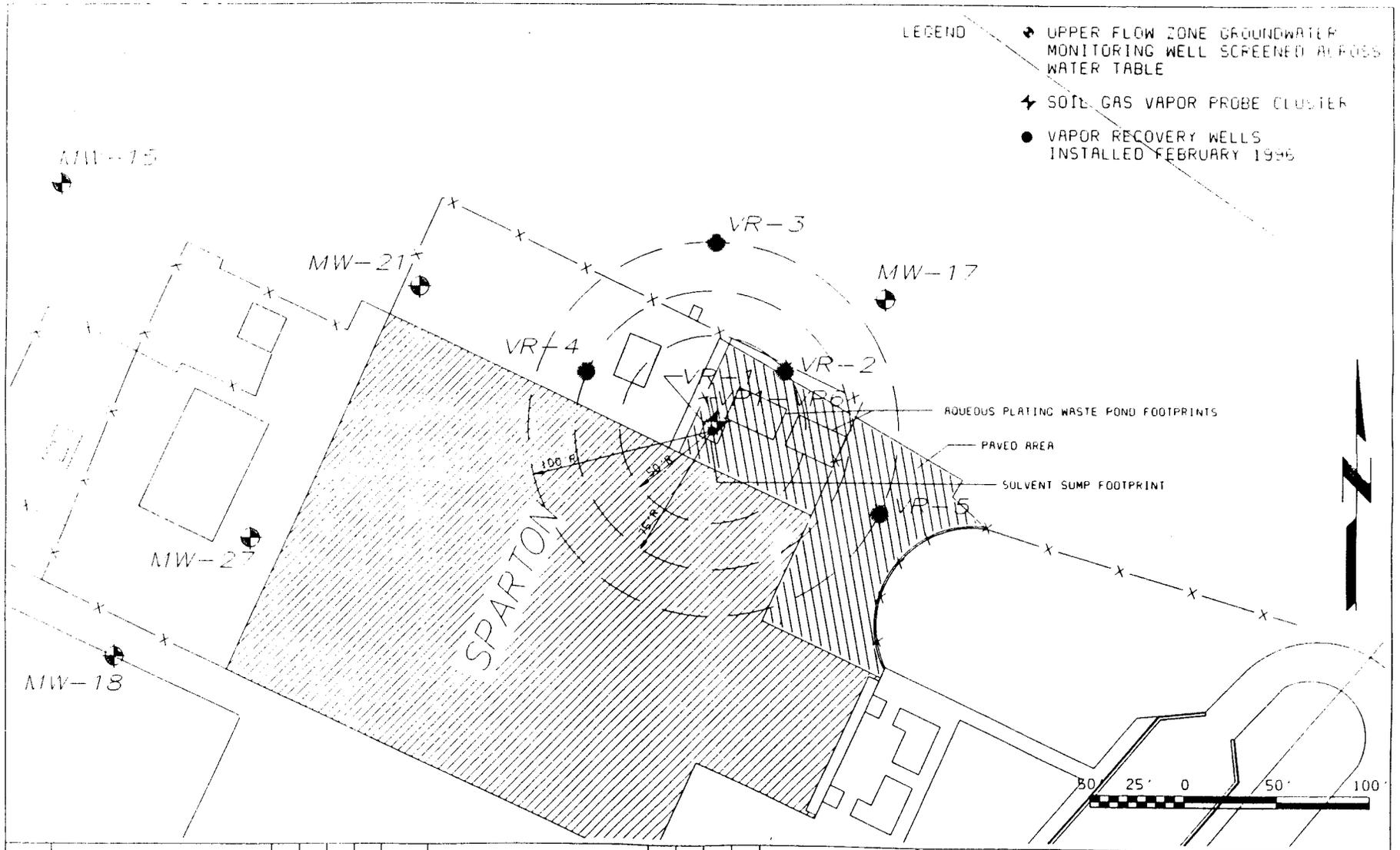
26602.100-FIGURE1
 B000000
 FB00000



- LEGEND
- UPPER FLOW ZONE GROUNDWATER MONITORING WELL SCREENED ABOVE WATER TABLE
 - SOIL GAS VAPOR PROBE CLUSTER

										Black & Veatch 				SPARTON TECHNOLOGY, INC. COORS ROAD PLANT ALBUQUERQUE, NEW MEXICO				FIGURE 1	
										PROJECT 26602				EXISTING SOIL GAS MONITORING NETWORK					
DATE	REVISION OR ISSUE	NO.	BY	CR	APP	DATE	REVISION OR ISSUE	NO.	BY	CR	APP								

5-23-97 - 10:01:40C



26602.100-FIGUREC
B000000
FB000000

DATE		REVISION OR ISSUE		NO.		BY		CK		APP		DATE		REVISION OR ISSUE		NO.		BY		CK		APP		

Black & Veatch

PROJECT
26602

SPARTON TECHNOLOGY, INC.
COORS ROAD PLANT
ALBUQUERQUE, NEW MEXICO

FEBRUARY 1997 ADDITIONS TO
SOIL GAS MONITORING SYSTEM

FIGURE 2

groundwater sampling activity. Installation diagrams for each well are given in the completion report included in Appendix I.

The vapor recovery wells were initially sampled on February 20, 1997. Samples were split with NMED. Sparton analyzed samples using SW-846 methods 8010 and 8020. NMED reportedly used a modification of SW-846 method 8021. Although these analytic methods are comparable in terms of both procedure, analyte identification, and analyte quantification, disparate results were obtained at a given well location; however, no consistent pattern was discerned with the exception that concentration decreased with increasing distance from the sump area. A summary of results is given in Table 1.

The wells were resampled on March 20, 1997. Again the samples were split between Sparton and NMED. Sparton analyzed samples using both methods 8010/8020 and 8260 for comparative purposes. Analytical results varied between different wells with greater differences at the higher concentrations--method 8260 giving higher concentrations. These differences are not unusual. Acceptable tolerances with respect to calibration could result in variations between methods in this range. NMED reportedly used a modified method 8260. In this second sampling, the NMED results were consistently higher than either of the Sparton analytical results as summarized in Table 2. However, subsequently obtained QC data indicated TCE concentration may have been exaggerated.

The variation between the NMED and Sparton analytical results is currently being researched. Previous analytical results from the June 1996 vapor probe soil gas samples split between NMED and Sparton showed excellent agreement (see discussion in Section III). As a consequence, the current variation was unexpected. However, regardless of the laboratory value of soil gas concentration at a given location, the recent results demonstrate a consistent and significant (order of magnitude) decrease in VOC concentration with increasing distance from the sump area.

III. PREVIOUS SOIL GAS CHARACTERIZATION

Sparton has conducted three near-surface (shallow) soil gas investigations (within four to six feet of the ground surface) on- and offsite. The shallow soil gas surveys were originally intended for use as a field screening method to estimate the horizontal extent of soil and/or groundwater VOC contamination. Soil gas surveying is useful because of

Table 1
Analytical Results For February 20, 1997
Sampling of Vapor Recovery Wells 1-5

Well Number	VR-1		VR-2		VR-3		VR-4		VR-5	
	8010/8020	8021M								
Method	STI	NMED								
Sampler/Laboratory	STI	NMED								
Analyte Concentration	mg/m3*	ug/L*								
Trichloroethene	7400 E	25000	3600	6600	870	2000	3800	2600	2300	2500
1,1,1-Trichloroethane	1200	5200	1200	2300	220	850	1600	1100	810	980
1,1-Dichloroethene	250	380	150	320	87 E	110	94	ND <333.3	130 E	200
Tetrachloroethene	300	380	120	ND <333.3	27	ND <200.0	22	ND <333.3	26	ND <333.3
Toluene	7500	8300	ND <5.0	360	ND <1.0	ND <200.0	ND <2.5	ND <333.3	ND <2.5	ND <333.3
Xylene, total	1100	1900	ND <5.0	ND <333.3	ND <1.0	ND <200.0	ND <2.5	ND <333.3	ND <2.5	ND <333.3
Ethylbenzene	350	530	ND <5.0	ND <333.3	ND <1.0	ND <200.0	ND <2.5	ND <333.3	ND <2.5	ND <333.3
Trans 1,3-Dichloropropene	ND <20	ND <500.0	ND <2.0	ND <333.3	ND <0.4	ND <200.0	ND <1.0	ND <333.3	ND <1.0	ND <333.3
Benzene	ND <50	ND <500.0	ND <5.0	ND <333.3	ND <1.0	ND <200.0	ND <2.5	ND <333.3	ND <2.5	ND <333.3
1,1-Dichloroethane	ND <30	ND <500.0	ND <3.0	ND <333.3	ND <0.6	ND <200.0	ND <1.5	ND <333.3	ND <1.5	ND <333.3
1,1,2-Trichloroethane	26	ND <500.0	2.2	ND <333.3	0.5	ND <200.0	ND <1.0	ND <333.3	ND <1.0	ND <333.3
1,2-Dibromoethane	54	ND <500.0	5.5	ND <333.3	1.1	ND <200.0	ND <1.0	ND <333.3	ND <1.0	ND <333.3
Dibromochloromethane	25	ND <500.0	2.9	ND <333.3	0.6	ND <200.0	ND <1.0	ND <333.3	ND <1.0	ND <333.3

E = Estimated Value, overrange for instrumentation

ND = Not detected

STI = Sparton Technology, Inc.

Laboratory-American Environmental Network, Inc.

NMED = New Mexico Environmental Department

Laboratory-State Scientific Laboratory Division

* Note: mg/m3 is equivalent to ug/L (both are weight:volume relationships)

The conversion for a volume:volume relationship is

Concentration (ppmv) = 0.224*Concentration (ug/L) TCE

Concentration (ppmv) = 0.221*Concentration (ug/L) TCA

Table 2
Analytical Results For March 20, 1997
Sampling of Vapor Recovery Wells 1-5

Well Number	VR-1		
Method	8260	8010/8020	8260A
Sampler/Laboratory	STI	STI	NMED
Analyte Concentration	mg/m3*	mg/m3*	mg/m3*
Trichloroethene	19000	13000	24000
1,1,1-Trichloroethane	3900	2600	2900
1,1-Dichloroethene	ND <500	100	310 J
Tetrachloroethene	ND <500	220	330 J
Toluene	6700	6400	7300
Xylene, total	650	970	1155 J
Ethylbenzene	ND <500	300	350 J

Well Number	VR-2		
Method	8260	8010/8020	8260A
Sampler/Laboratory	STI	STI	NMED
Analyte Concentration	mg/m3*	mg/m3*	mg/m3*
Trichloroethene	3300	1800	6700
1,1,1-Trichloroethane	1100	430	960
1,1-Dichloroethene	ND <250	57	250
Toluene	ND <250	ND <5	740

Well Number	VR-3		
Method	8260	8010/8020	8260A
Sampler/Laboratory	STI	STI	NMED
Analyte Concentration	mg/m3*	mg/m3*	mg/m3*
Trichloroethene	1100	840	1200
1,1,1-Trichloroethane	480	370	340
1,1-Dichloroethene	72	33	78
Toluene	ND <50	ND <1.0	ND <50

**Table 2 Continued
Analytical Results For March 20, 1997
Sampling of Vapor Recovery Wells 1-5**

Well Number	VR-4		
	8260	8010/8020	8260A
Method	STI	STI	NMED
Sampler/Laboratory	STI	STI	NMED
Analyte Concentration	mg/m3*	mg/m3*	mg/m3*
Trichloroethene	1200	1200	2400
1,1,1-Trichloroethane	460	310	430
1,1-Dichloroethene	ND <250	41	120
Toluene	ND <250	ND <2.5	ND <50.0

Well Number	VR-5		
	8260	8010/8020	8260A
Method	STI	STI	NMED
Sampler/Laboratory	STI	STI	NMED
Analyte Concentration	mg/m3*	mg/m3*	mg/m3*
Trichloroethene	930	860	2400
1,1,1-Trichloroethane	400	170 E	530
1,1-Dichloroethene	ND <250	29	190
Toluene	ND <250	ND <2.5	ND <50.0

E = Estimated Value, overrange for instrumentation

J = Estimated value below the detection limit

ND = Not detected

STI = Sparton Technology, Inc.

Laboratory-American Environmental Network, Inc.

NMED = New Mexico Environmental Department

Laboratory-State Scientific Laboratory Division

* Note: mg/m3 is equivalent to ug/L (both are weight:volume relationships)

The conversion for a volume:volume relationship is

Concentration (ppmv) = 0.224*Concentration (ug/L) TCE

Concentration (ppmv) = 0.221*Concentration (ug/L) TCA

the extremely low detection limits (0.001 µg/l or approximately 0.0002 ppm_v)¹ available from this methodology.

As early as 1984, onsite soil gas data was collected. Soil gas data was collected again in 1987 and the study area was expanded offsite. The third investigation was conducted in June 1991, and included both onsite and offsite locations. Detailed information on these studies can be found in the RFI and CMS Reports.

In the 1984 onsite soil gas survey, TCE and TCA soil gas concentrations ranged from less than 1 µg/l to a maximum of 720 µg/l (0.2 to 160 ppm_v) in the solvent sump area. It should be noted that the 1984 soil gas survey was conducted within a year after the solvent sump was removed from service.

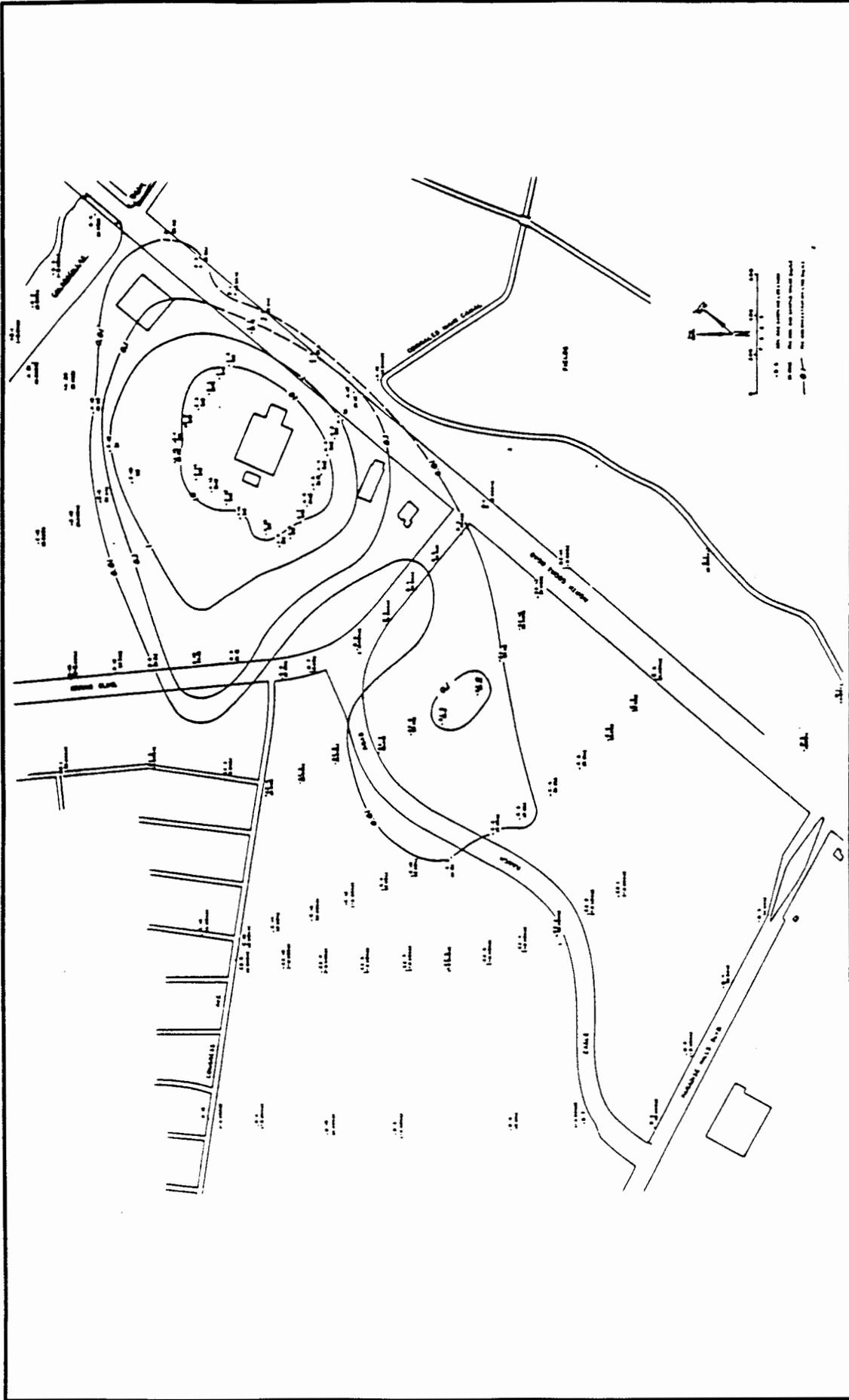
In the 1987 shallow soil gas survey, concentrations of either TCE or TCA above 1 ppm_v were limited to the Sparton property. Comparison of the 1987 data with the 1984 study showed over an order of magnitude decrease in concentration. The 1987 study results are given on Figures 3 and 4.

The 1991 shallow soil gas survey was conducted to supplement the 1991 RFI groundwater study. The results of the 1991 soil gas survey are shown on Figures 5 and 6. The 1991 study showed a continuing decrease in soil-gas concentration over the area surveyed in 1987. In the 1991 soil gas survey, only a single location with a concentration of 24 µg/l (5.4 ppm_v) exceeded a TCE concentration above 10 µg/l. TCA concentration had dropped as well, with a maximum concentration of 12 µg/l (2.7 ppm_v).

In April 1996, Sparton conducted a deep soil gas investigation using upper flow zone (UFZ) ground water monitoring wells screened across the top of the saturated zone. The deep soil gas results (from immediately above ground water) were consistent with earlier surface soil gas results. Highest soil gas VOC concentrations were recorded near the source area and decreased rapidly offsite (see Figure 7). Deep soil gas VOC concentrations were negligible offsite. Actual soil gas concentrations were compared to predicted equilibrium concentrations based on groundwater concentration and Henry's law. The actual deep soil gas results indicated that, with the possible exception of TCA in the pond/sump area, soil gas is not a source of constituents to the groundwater. In fact, ground water may be the source for deep soil gas VOC detections. The deep soil gas investigation was detailed in the CMS Report.

¹Concentration (ppm_v) on volume: volume basis = 0.224*Concentration (µg/l) TCE on weight: volume basis.

Concentration (ppm_v) on volume: volume basis = 0.221*Concentration (µg/l) TCA on weight: volume basis.



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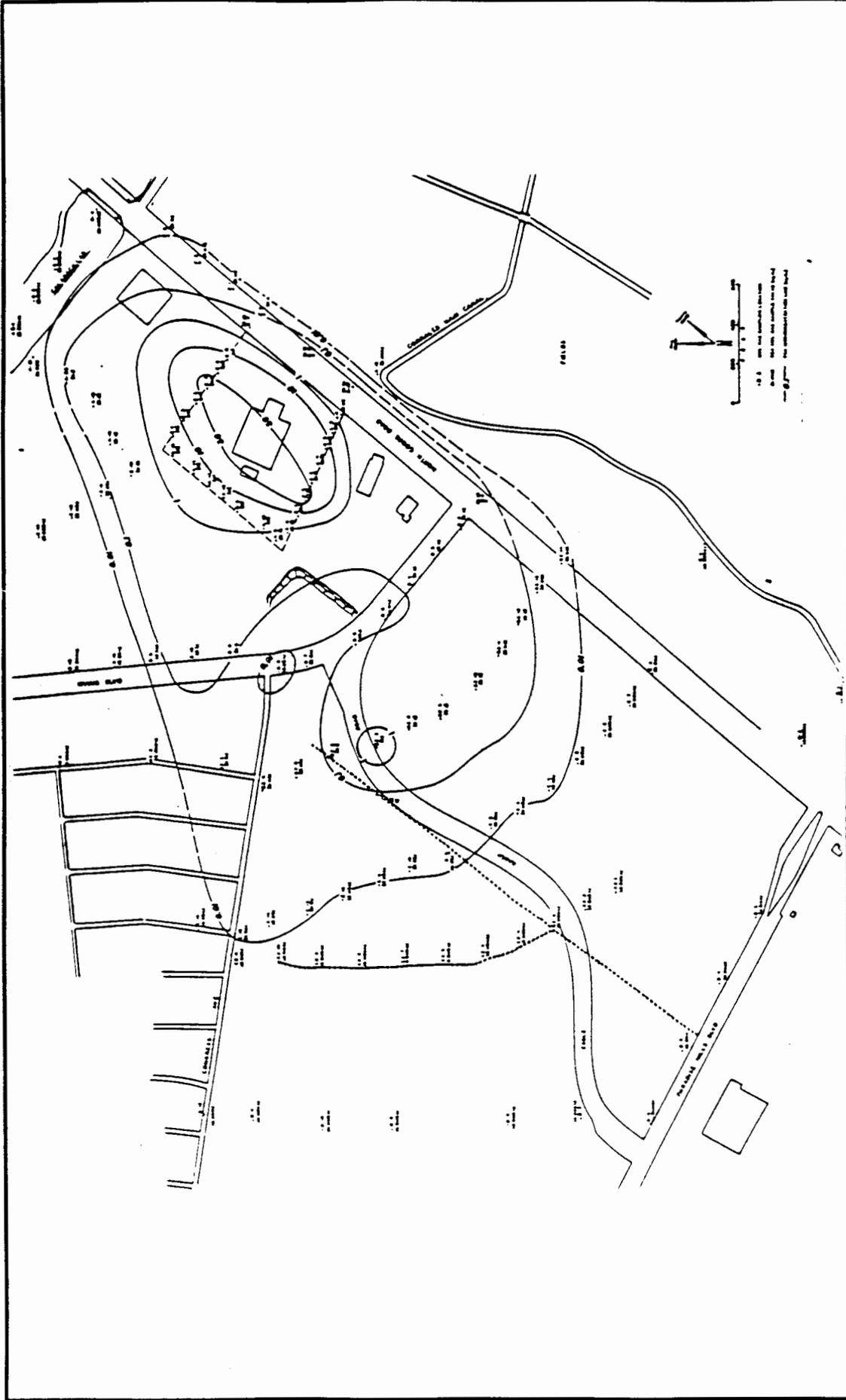
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FIGURE 3

TCE CONCENTRATION CONTOURS
1987

SPARTON TECHNOLOGY, INC.
COORS ROAD PLANT
ALBUQUERQUE, NEW MEXICO



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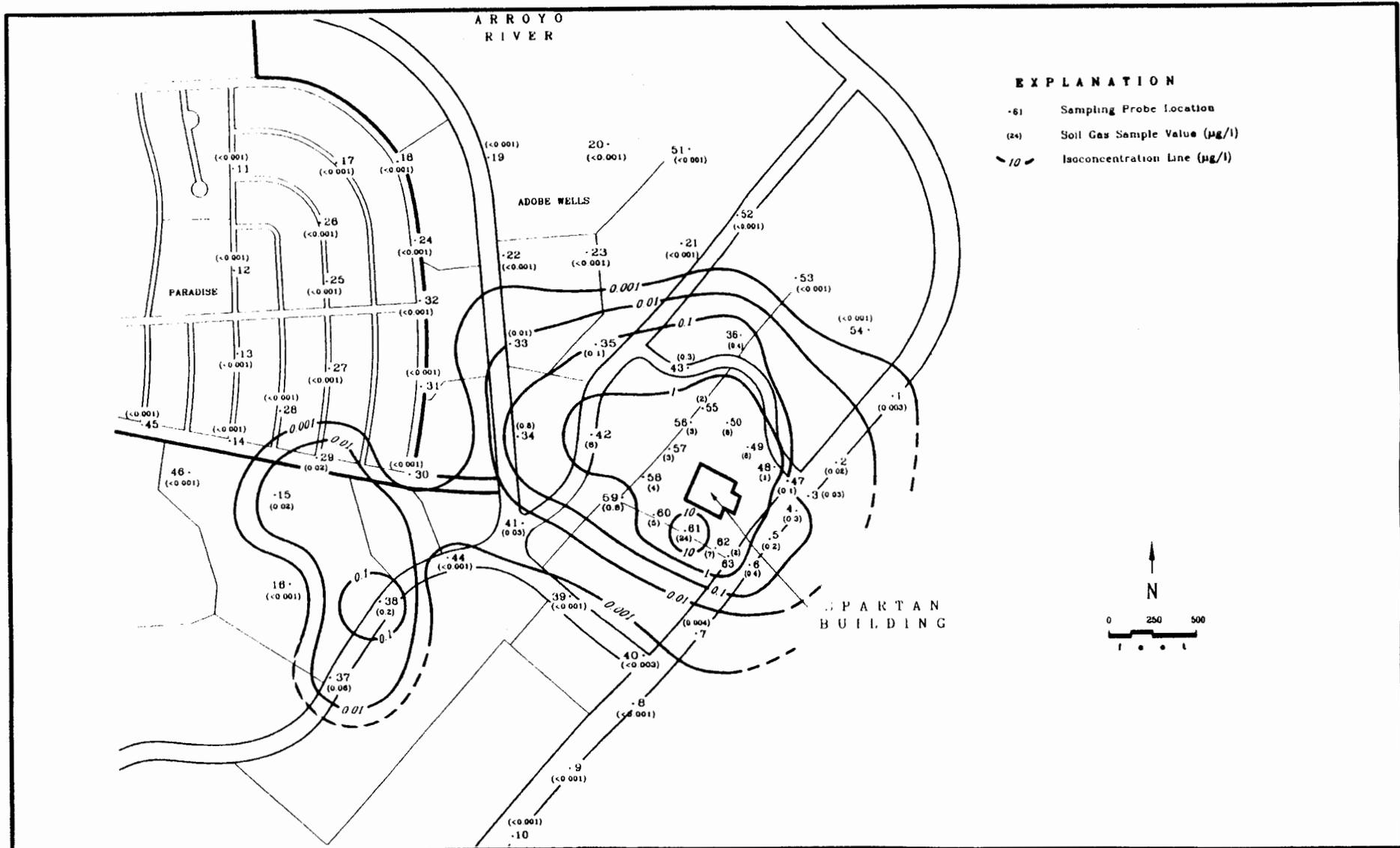
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FIGURE 4

TCA CONCENTRATION CONTOURS
1987

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COORS ROAD PLANT
ALBUQUERQUE, NEW MEXICO



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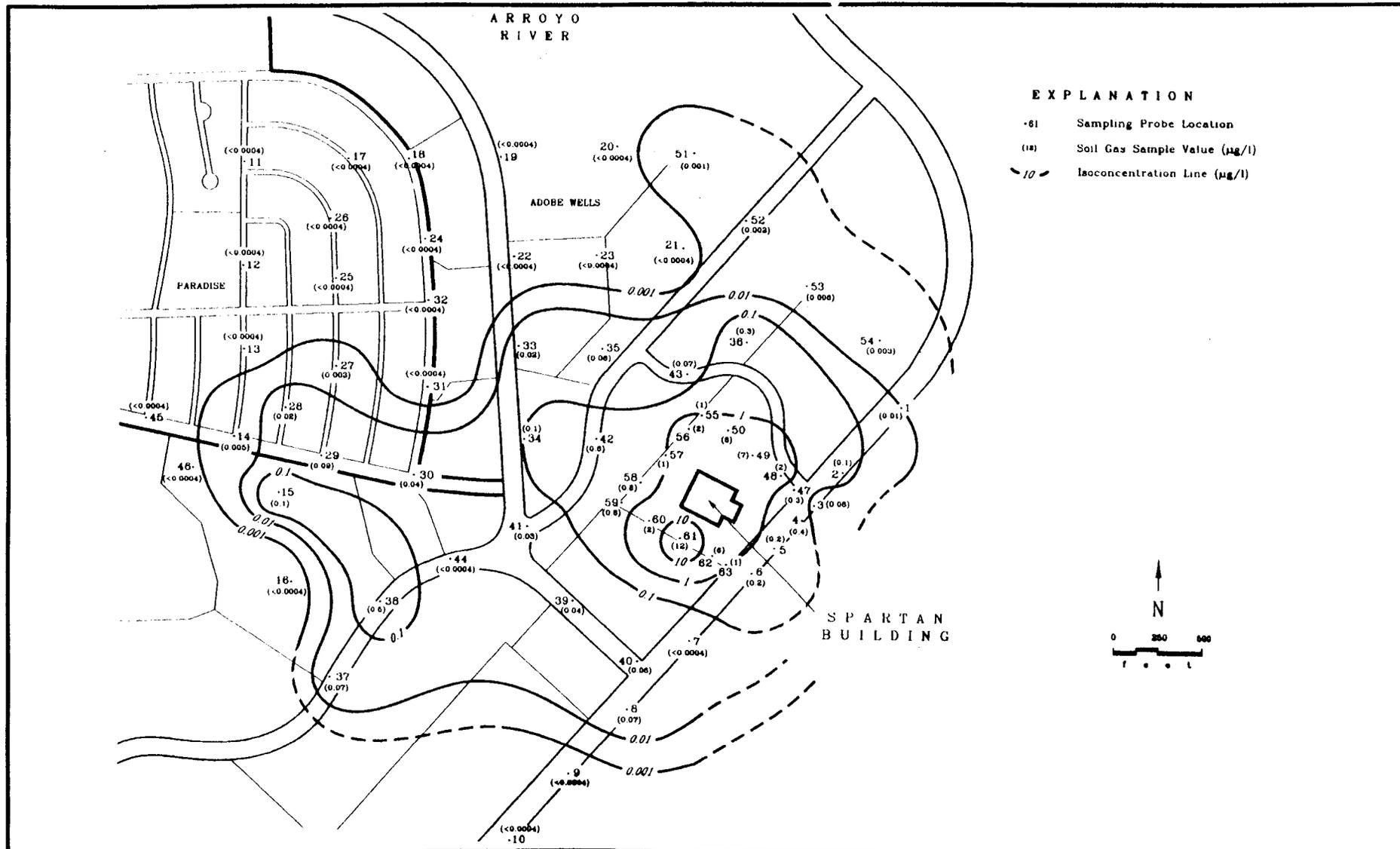


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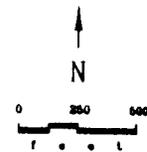
FIGURE 5

TCE CONCENTRATION CONTOURS
1991

SPARTON TECHNOLOGY, INC.
COORS ROAD PLANT
ALBUQUERQUE, NEW MEXICO



- EXPLANATION**
- 61 Sampling Probe Location
 - (12) Soil Gas Sample Value ($\mu\text{g}/\text{l}$)
 - 10 Isoconcentration Line ($\mu\text{g}/\text{l}$)



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FIGURE 6

TCA CONCENTRATION CONTOURS
1991

SPARTAN TECHNOLOGY, INC.
COORS ROAD PLANT
ALBUQUERQUE, NEW MEXICO

In June 1996, Sparton installed a vapor probe cluster (VP-1 through VP-6) near the closed solvent sump area. Installation details are given in Appendix 2. Subsequent soil gas samples were analyzed for VOC. The results showed a general increase in VOC concentration with depth, with isolated occurrences of higher VOC concentrations associated with clay/silt lenses (Table 3). These localized soil gas concentrations are believed to be related to residual VOC sorbed onto the finer-grained soil materials due to the correlation of high VOC concentration with silt/clay presence.

As a whole, the existing soil gas data suggests the following:

- Primary constituents are TCE and TCA.
- Highest soil gas VOC concentrations occur onsite, near the source (solvent sump) area.
- Shallow, near-surface soil gas VOC concentrations decrease rapidly with increasing horizontal distance from the source area.
- Shallow, near-surface soil gas VOC concentrations are in the single digit or less ppm_v range onsite.
- Shallow, near-surface soil gas VOC concentrations are negligible off site.
- Deep soil gas VOC concentrations are minimal off site and are related to off-gassing from the dissolved aqueous phase.

IV. UP-DATED SOIL GAS CHARACTERIZATION

Soil gas data obtained to date from all previous and recent investigation provides a consistent description of soil gas impact.

1. The area of soil gas impact is finite and within the boundaries of the Sparton property.
2. Primary constituents are TCE and TCA with lesser amounts of 1,1-DCE, PCE, and Toluene.
3. Soil gas concentrations are highest in the immediate vicinity of the original solvent sump.
4. Concentrations decrease rapidly with increasing horizontal distance from the original solvent sump area. Site data (and regression analysis) indicates that elevated (>10 ppm_v) soil gas concentrations extend out approximately 200 feet from the sump area.
5. Soil gas impact occurs through the entire unsaturated zone (≈70 feet) with highest concentrations corresponding to silt/clay layers with sorbed-phase contamination.

Table 3
Analytical Results For Vapor Probe Cluster (VP-1 Through VP-6)
Sampled June 25, 1996

Sampler/Laboratory	STI	NMED	STI								
Sampling Zone	1	1	2	2	3	3	4	4	5	5	6
Depth Below Surface, ft	10	10	20	20	30	30	40	40	50	50	60
Analyte Concentration	mg/m3*	ug/L*	mg/m3*								
Trichloroethene	18000	19000	21000	22000	24000	27000	22000	22000	8200	9400	8700
1,1,1-Trichloroethane	4800	6000	5800	7600	6500	8300	6300	6600	3100	2600	3300
1,1-Dichloroethene	150	1100	200	1400	230	1900	340	1500	360	1000	460
Tetrachloroethene	290	310	300	360	320	290	310	210	120	160	160
Toluene	1500	2100	6800	7800	4600	6000	110	103	70	ND <100.0	6.4
Xylene, total	350	420	710	810	610	510	140	70	ND <25	ND <100.0	ND <25
Ethylbenzene	260	300	220	250	220	170	100	47	ND <25	ND <100.0	ND <25
Trans 1,3-Dichloropropene	30	ND <200.0	ND <10	ND <200.0	32	ND <200.0	ND <10	ND <200.0	ND <10	ND <100.0	6.7
Benzene	ND <25	ND <200.0	62	ND <100.0	ND <25						
1,1-Dichloroethane	ND <15	ND <200.0	ND <15	ND <100.0	21						

ND = Not detected

STI = Sparton Technology, Inc.

Laboratory-American Environmental Network, Inc.

NMED = New Mexico Environmental Department

Laboratory-State Scientific Laboratory Division

* Note: mg/m3 is equivalent to ug/L (both are weight:volume relationships)

The conversion for a volume:volume relationship is

Concentration (ppmv) = 0.224*Concentration (ug/L) TCE

Concentration (ppmv) = 0.221*Concentration (ug/L) TCA

Available soil gas concentration data was plotted as a function of horizontal distance from the solvent sump. Because of the ongoing research into the variation between the analytical results on the five VR wells installed in February 1997, the data were plotted in two ways. In the first plot (Figure 8), an average of all data for each VR well was used. In the second plot (Figure 9), average NMED results for each VR well were plotted. However, choice or selection of data had little effect on the resulting regression analyses. Both Figure 8 and Figure 9 show a non-detect intercept just over 200 feet.

Based on all available soil gas information, there is sufficient characterization to implement soil vapor extraction on-site. Horizontal extent of the 10 ppm_v impact threshold has been adequately defined but not confirmed in the field; however, limited additional field investigation could provide this definition.

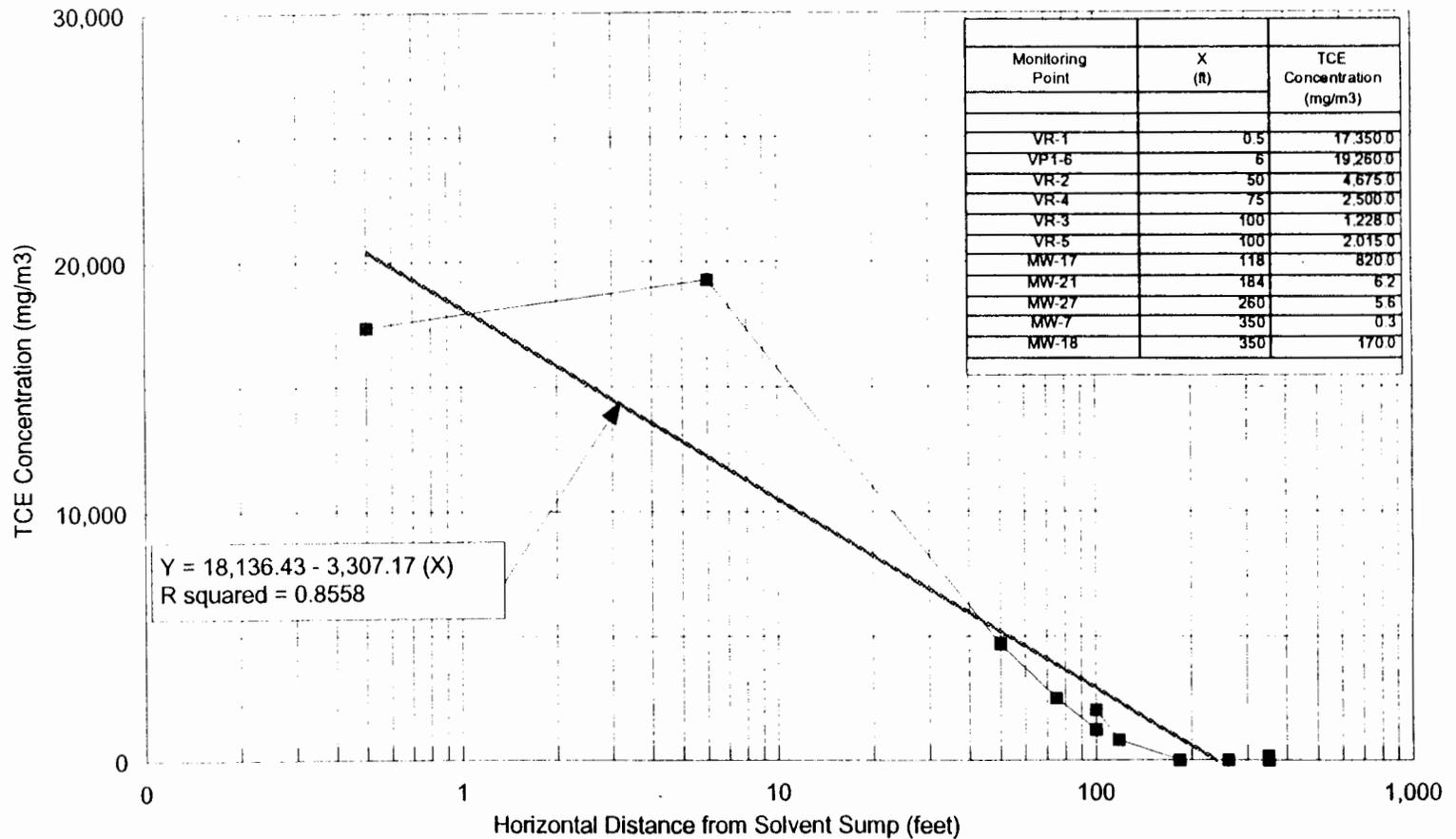
To fully define the 10 ppm_v limits in the field, additional sampling would be conducted using steel pipe probes at the locations shown on Figure 10. These steel pipe probes would be driven (or pushed) into the subsurface to drive-point refusal--approximately 25 to 30 feet bgs based on previous experience. Beginning with the 10-foot depth, soil gas would be analyzed using field screening instruments at approximately 5-foot intervals. After reaching drive-point refusal, the maximum field screening concentration would be used to select the depth of sampling and laboratory analysis for records purposes. This additional data would be used to reduce data/location gaps to acceptable levels.

V. SOIL VAPOR EXTRACTION PILOT TESTING

A soil vapor extraction (SVE) pilot test was conducted on site on February 27 and 28, 1997. Pilot testing was conducted by AcuVac Remediation, Inc.. AcuVac was selected on the basis of their previous experience in the Albuquerque area and because of the destructive efficiency of their VOC treatment system. The AcuVac System uses an internal combustion engine both as the prime mover for vapor extraction and for destruction of VOC in the produced vapor stream.

A detailed test report prepared by AcuVac is included in Appendix 3. Pilot test monitoring locations are shown on Figure 11. Pilot testing conducted at recovery well VR-1 demonstrated an effective (useable) radius of influence of 175 to 200 feet at a flow of 60 to 65 cfm and extraction well vacuum of 5 inches of water. Analyses of influent and effluent samples obtained during the pilot test (included in Appendix 3) indicated

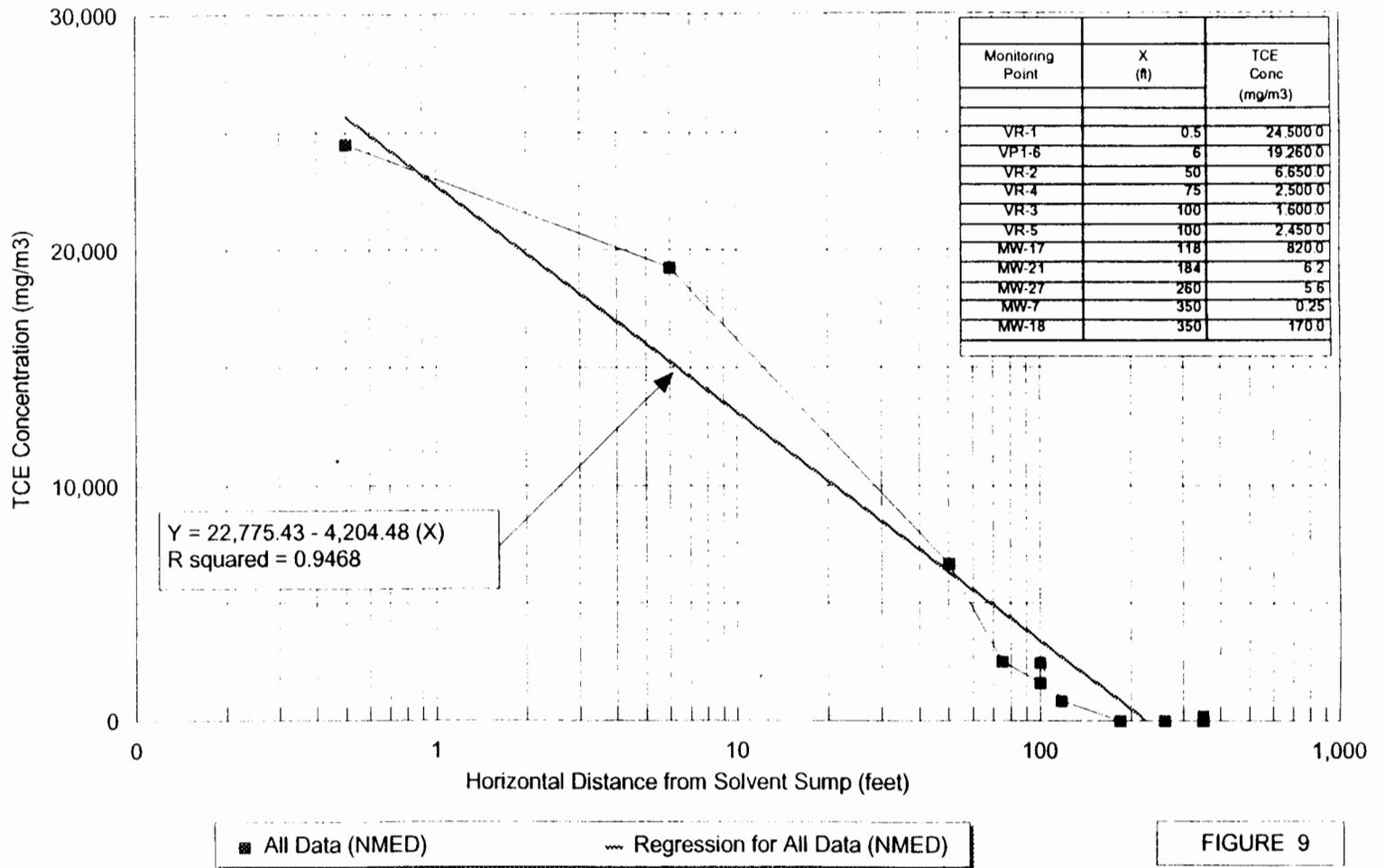
Sparton Technology, Inc.
Soil-Gas Vapor Data (Average)



■ All Data (Average) --- Regression for All Data (Average)

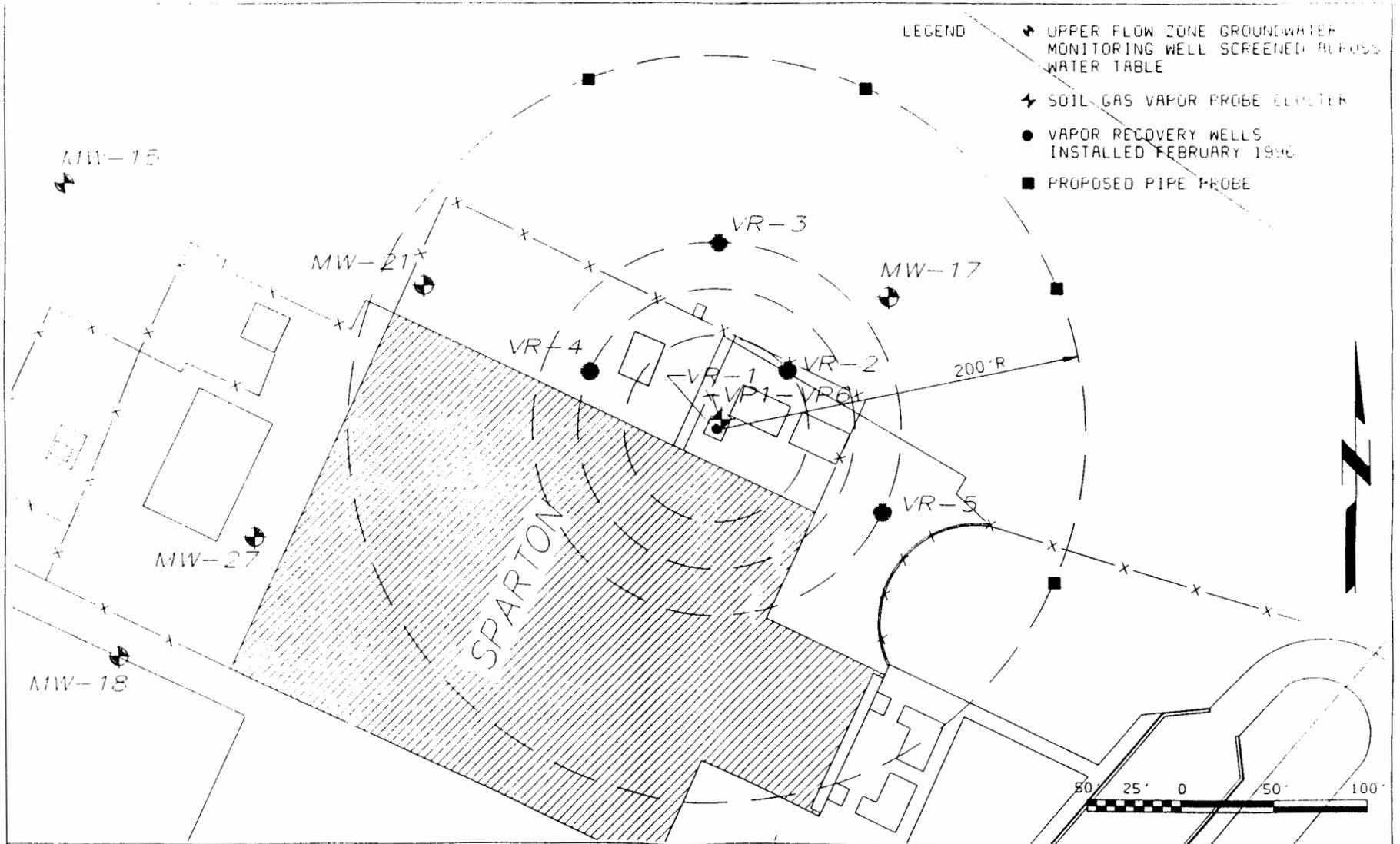
FIGURE 8

Sparton Technology, Inc.
Soil-Gas Vapor Data (NMED)



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26602-1100-FIGURE 4
 B00000G
 FB00000G



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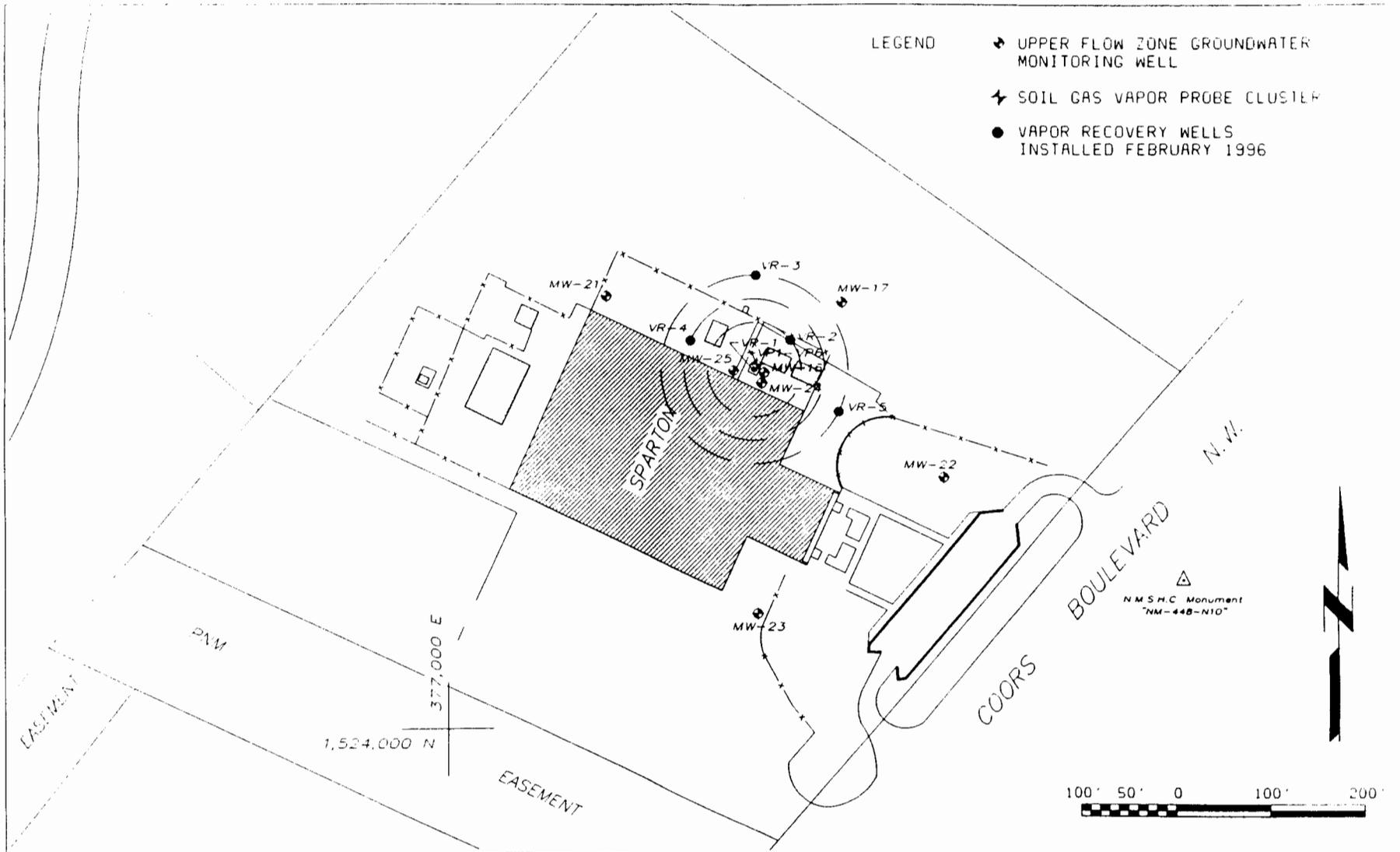
SPARTON TECHNOLOGY, INC.
 COORS ROAD PLANT
 ALBUQUERQUE, NEW MEXICO

PROPOSED SOIL GAS
 PIPE PROBE LOCATIONS

FIGURE 10

E-03 97 - 1010E102

26602-100-FIGURE3
B0000G
FB000CG



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COORS ROAD PLANT
ALBUQUERQUE, NEW MEXICO

PILOT TEST
MONITORING LOCATIONS

FIGURE 11

more than 96 percent destruction of VOC occurred in the internal combustion engine and/or exhaust catalytic converter.

The pilot test and associated sampling and analysis indicate that an SVE system could initially recover 90 to 100 pounds of VOC per day and treat the produced wastewater to emit less than 4 pounds per day (calculations are provided in Appendix 3). The recovery (and emission) rate would be expected to drop off exponentially with continued operation of the SVE system. The pilot test has also demonstrated the ability of extraction from VR-1 to effectively remove VOC from the entire area showing elevated soil gas concentration.

APPENDIX 1
VAPOR RECOVERY WELL COMPLETION REPORT

**VAPOR RECOVERY WELL
COMPLETION REPORT
SPARTON TECHNOLOGY, INC.
COORS ROAD PLANT**

**PREPARED FOR
SPARTON TECHNOLOGY, INC.
ALBUQUERQUE, NEW MEXICO**

**PREPARED BY
METRIC CORPORATION
ALBUQUERQUE, NEW MEXICO**

APRIL 1997

VAPOR RECOVERY WELL COMPLETION REPORT

As part of the Interim Corrective Action Proposal, Sparton Technology, Inc. (Sparton) installed five vapor recovery wells in the vicinity of the closed sump at their Coors Road Plant located in Albuquerque, New Mexico. The five vapor recovery wells were used to conduct a vapor recovery system pilot test at the facility.

WELL LOCATIONS

The vapor recovery wells were constructed between February 5, 1997 and February 12, 1997. Drilling and completion was performed by Rodgers & Co., Inc., Albuquerque, and supervision was provided by METRIC Corporation, Albuquerque, New Mexico. All work was conducted in accordance with the Coors Road Plant Site Health and Safety Plan.

The five vapor recovery wells are located on the north side of the main building as shown on FIGURE 1. Well VR-1 is located in the center of the closed sump and the other wells are located at varying radii from VR-1 as follows:

Well	Radius from Center of Sump (ft)
VR-1	0
VR-2	50
VR-3	100
VR-4	75
VR-5	100

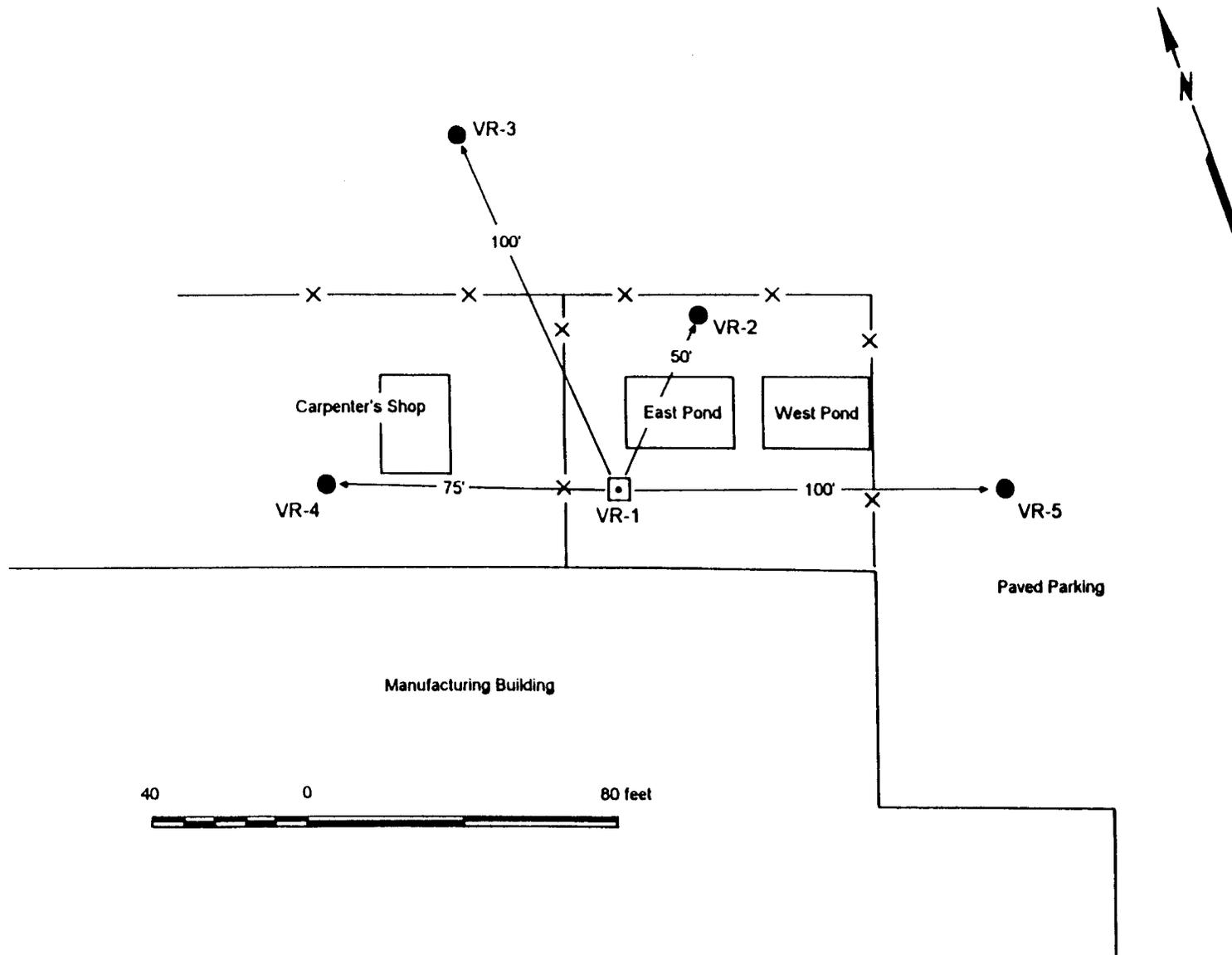


FIGURE 1

VAPOR RECOVERY WELL LOCATION MAP
SPARTON TECHNOLOGY, INC.

WELL CONSTRUCTION

The vapor recovery wells were installed using a hollow stem auger drilling rig. VR-1 was installed using 6¼" i.d. augers, and VR-2 through VR-5 were installed using 3¾" i.d. augers. The cuttings were placed in open-top 55 gallon poly drums as drilling progressed. As each drum became full, the top was installed. Construction diagrams for each of the wells are presented in FIGURES 2 through 6.

Cuttings samples were collected during installation of the wells at 5 ft. intervals. The samples were placed into ziplock sandwich bags, and headspace readings were measured using a Hnu Model PI-101 Photo Ionization Detector (PID). The PID meter was equipped with a 10.2 ev lamp and the span was set at 9.80. The relative organic vapor concentrations from the headspace readings are presented in TABLES 1 through 5.

SAFETY CONSIDERATIONS

During the drilling operations, the breathing zone was monitored with the PID meter. At wells VR-2, VR-3, VR-4 and VR-5 breathing zone levels remained below 1.0 ppm. At well VR-1 PID meter readings reached 4.0 ppm when the drilling progressed to 13 feet. At that point a large fan was placed adjacent to the bore hole and the crew was kept on the upwind side of the hole. With the fan in operation, breathing zone levels stayed below 3.0 ppm.

CUTTINGS DISPOSITION

As discussed earlier, the auger cuttings from each well were drummed. After the lids were in place on the drums for at least one day, the headspace in each drum was checked with the PID meter. The results are as follows:

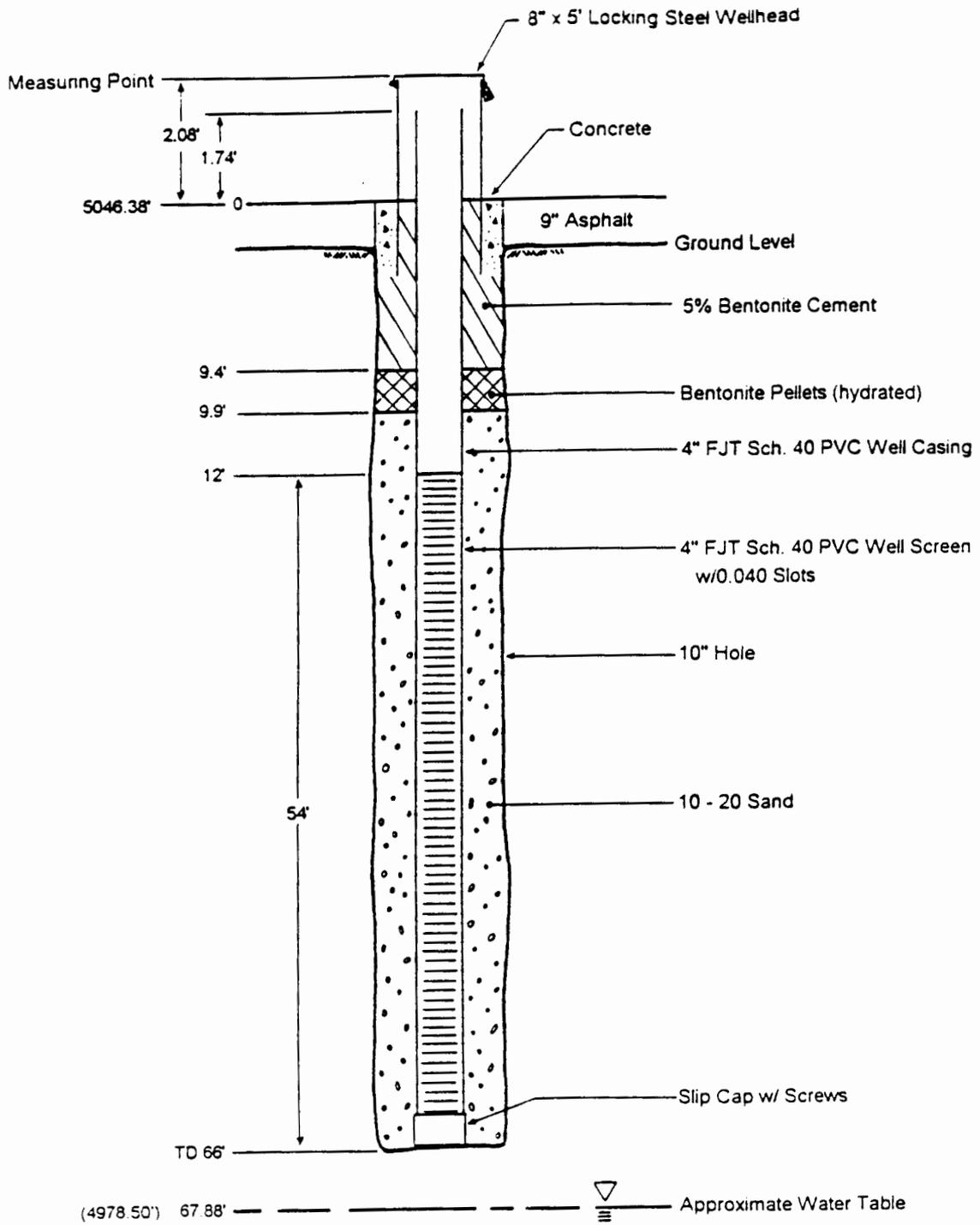


FIGURE 2
 VR-1 WELL CONSTRUCTION DIAGRAM
 SPARTON TECHNOLOGY, INC.

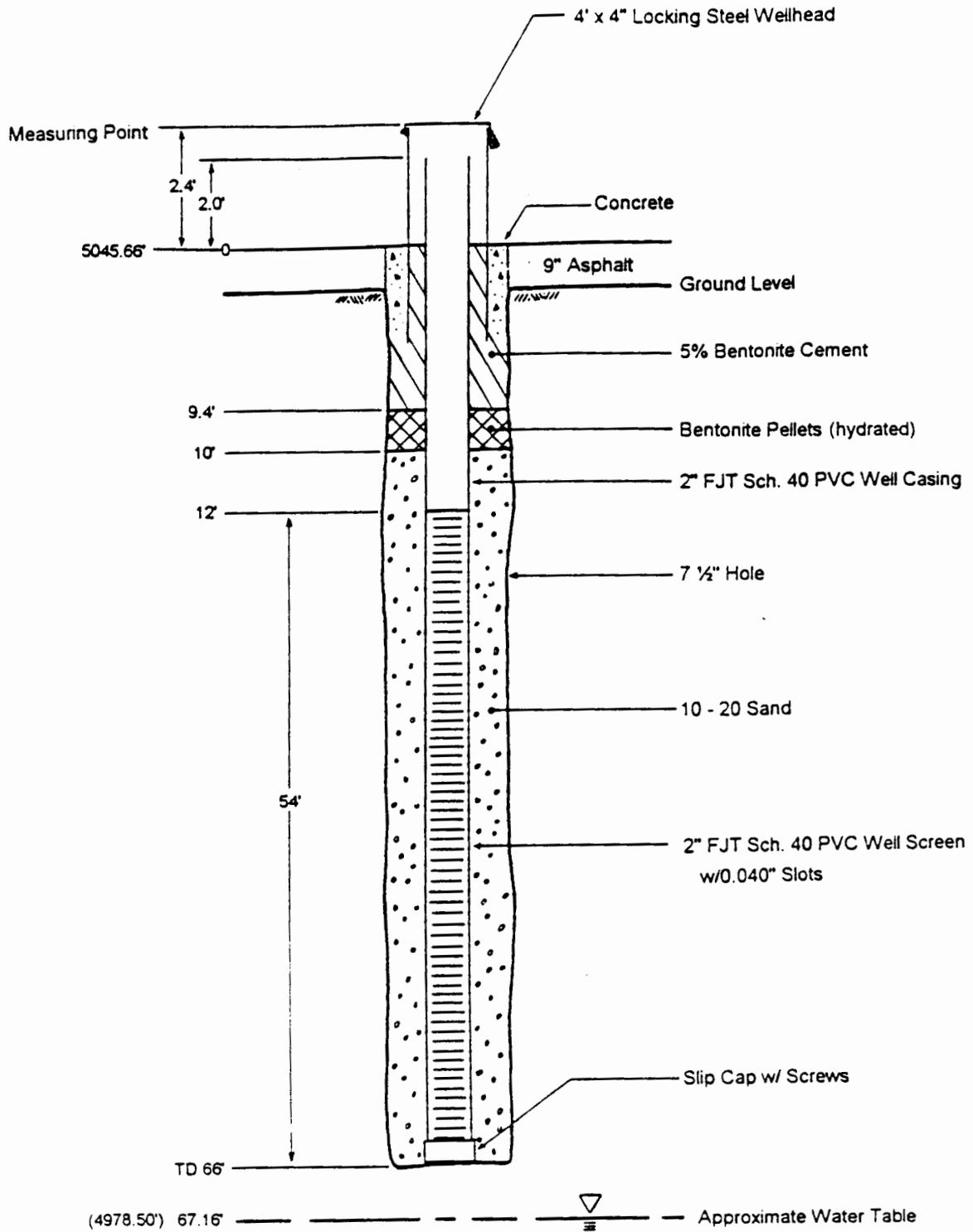


FIGURE 3
 VR-2 WELL CONSTRUCTION DIAGRAM
 SPARTON TECHNOLOGY, INC.

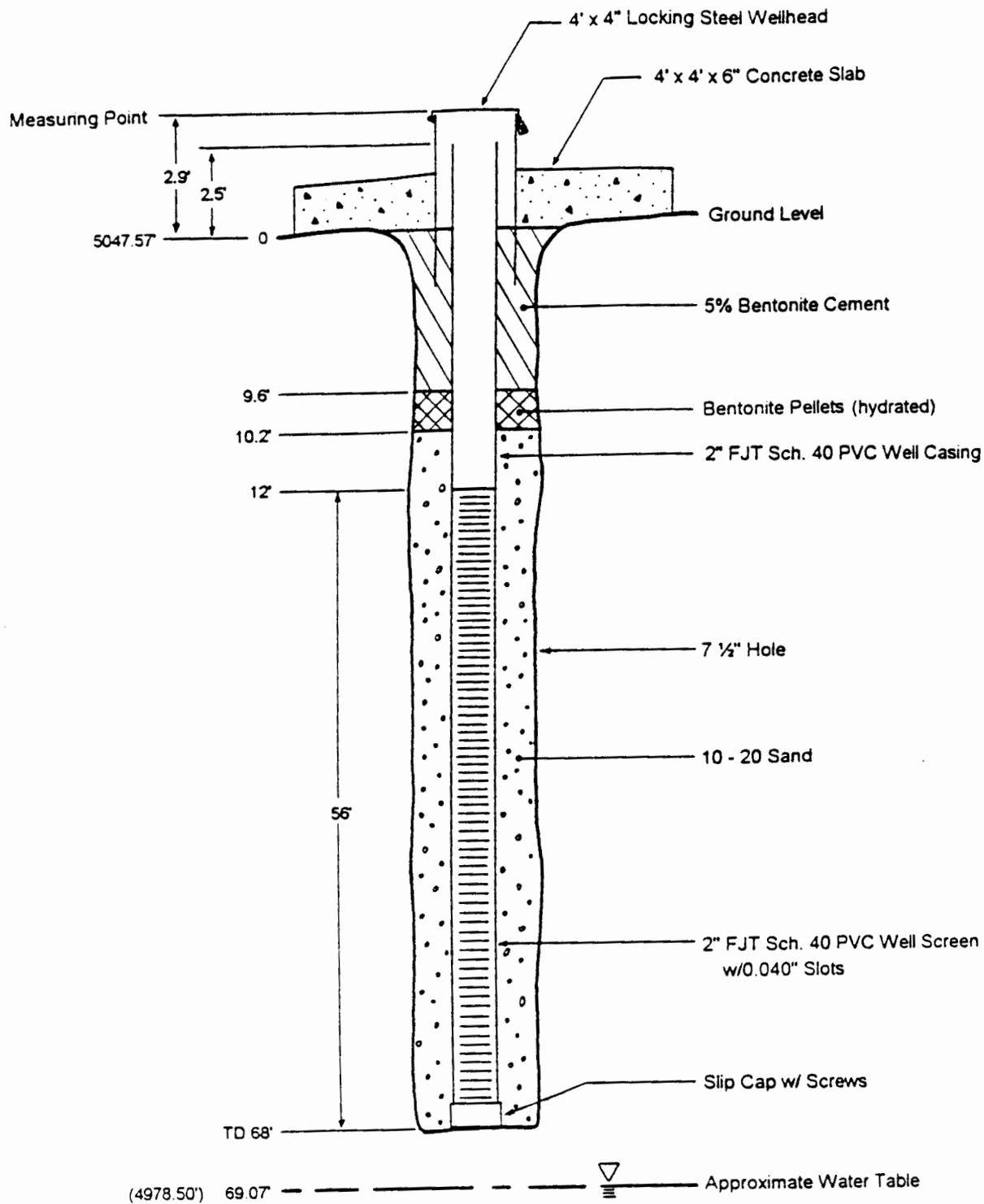


FIGURE 4
 VR-3 WELL CONSTRUCTION DIAGRAM
 SPARTON TECHNOLOGY, INC.

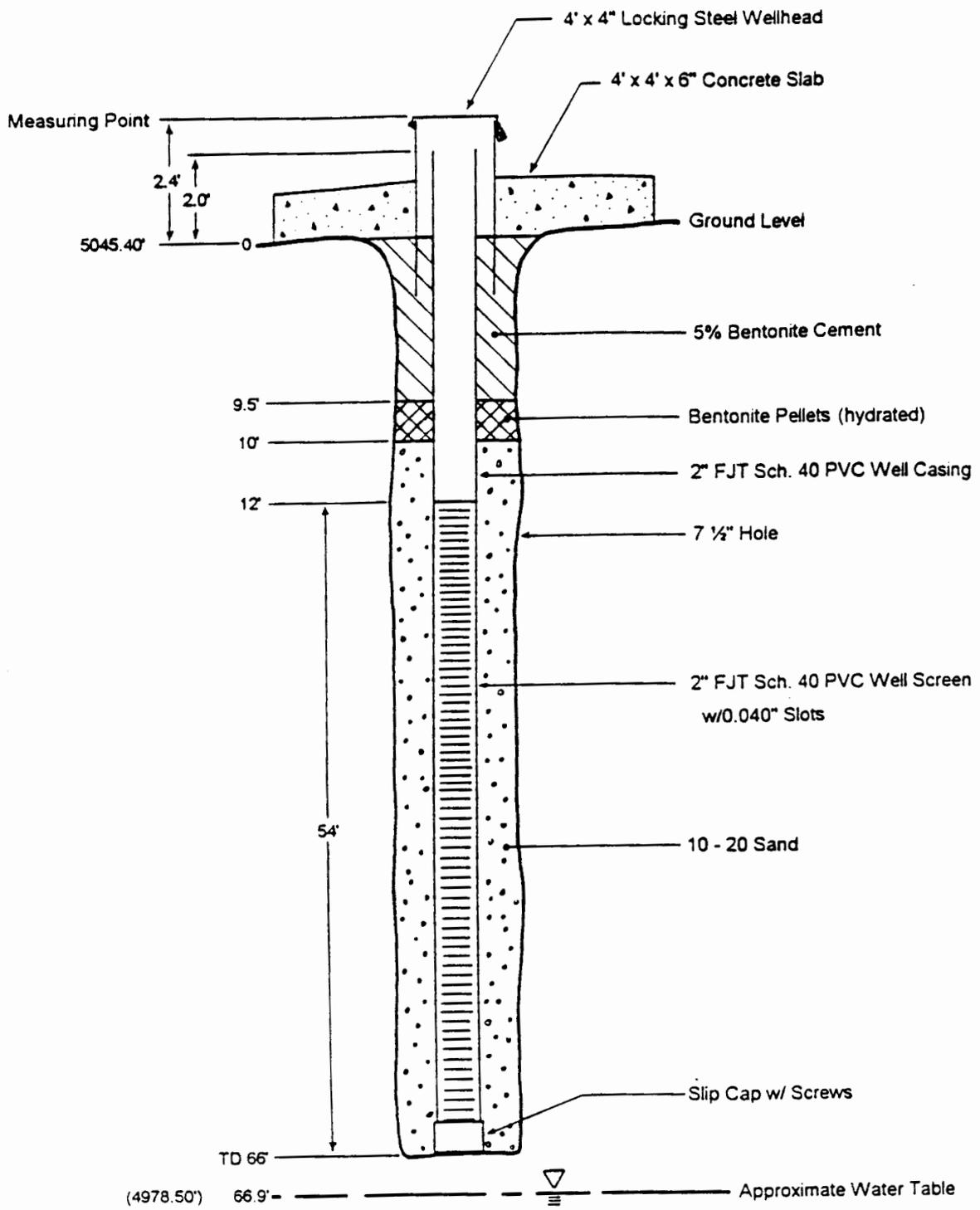


FIGURE 5

VR-4 WELL CONSTRUCTION DIAGRAM
 SPARTON TECHNOLOGY, INC.

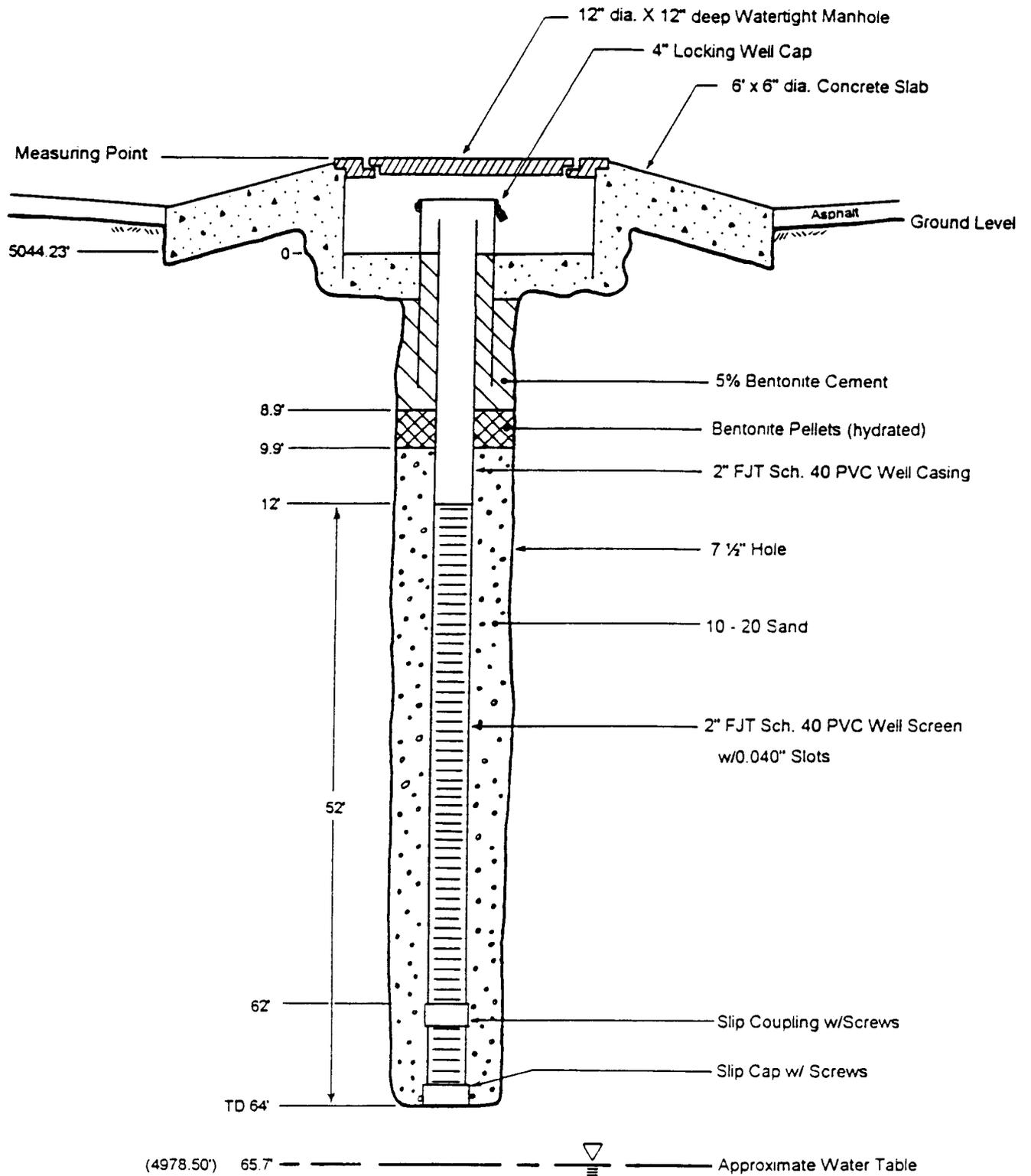


FIGURE 6
 VR-5 WELL CONSTRUCTION DIAGRAM
 SPARTON TECHNOLOGY, INC.

TABLE 1
HEADSPACE RESULTS
VAPOR RECOVERY WELL VR-1

DEPTH (ft)	OVA READING (ppm)*
3	30
8	120
13	260
18	260
23	280
28	220
33	230
38	280
43	150
48	100
53	150
58	180
63	140
66	240

* In volume:volume or ppm_v.

TABLE 2
HEADSPACE RESULTS
VAPOR RECOVERY WELL VR-2

DEPTH (ft)	OVA READING (ppm) *
3	0.0
8	Tr
13	0.6
18	0.6
23	0.5
28	0.2
33	0.4
38	0.3
43	0.2
48	0.5
53	0.6
58	0.6
63	0.3
66	1.0

* In volume:volume or ppm_v.

TABLE 3
HEADSPACE RESULTS
VAPOR RECOVERY WELL VR-3

DEPTH (ft)	OVA READING (ppm) *
3	0.0
8	0.0
13	0.0
18	0.0
23	0.2
28	0.1
33	0.1
38	0.2
43	0.2
48	0.2
53	0.2
61	0.2
63	0.1
68	0.3

* In volume:volume or ppm_v.

TABLE 4
HEADSPACE RESULTS
VAPOR RECOVERY WELL VR-4

DEPTH (ft)	OVA READING (ppm)*
3	0.0
8	0.0
13	0.0
18	0.0
23	0.0
28	0.0
33	0.0
38	0.0
43	0.1
48	0.3
53	0.2
58	0.0
63	0.0
66	0.0

* In volume:volume or ppm_v.

TABLE 5
HEADSPACE RESULTS
VAPOR RECOVERY WELL VR-5

DEPTH (ft)	OVA READING (ppm) *
3	1.2
8	1.6
13	2.2
18	2.6
23	0.0
28	0.1
33	0.2
38	1.9
43	0.6
48	0.3
53	1.0
58	0.3
63	No sample
64	3.4

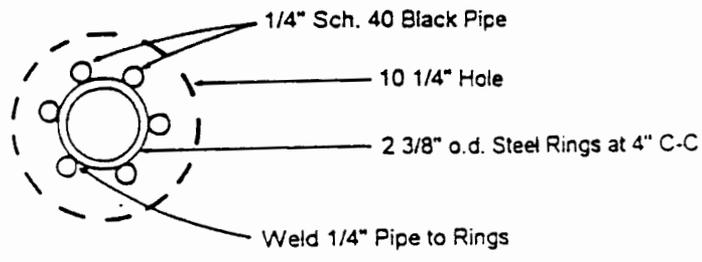
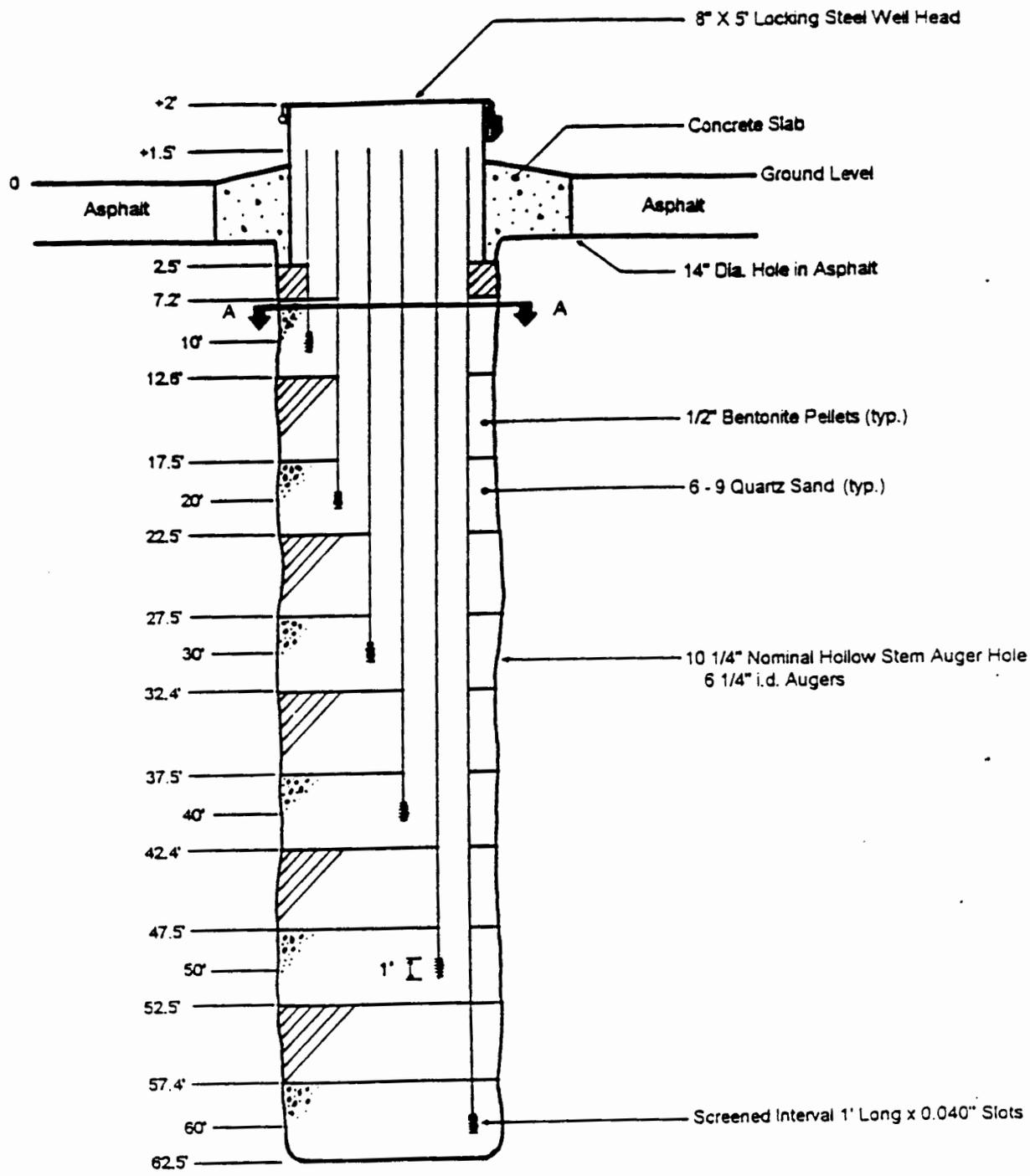
* In volume:volume or ppm_v.

WELL	# BARRELS	HEADSPACE READING (ppm)*
VR-1	8	400 - 550
VR-2	4	0.8 - 1.2
VR-3	4	<0.2
VR-4	4	0.2 - 1.0
VR-5	4	0.2 - 0.8

* In volume:volume or ppm_v.

Since the headspace in the drums from wells VR-2 through VR-5 was less than the maximum in clean empty poly drums (3.0 ppm), the cuttings from VR-2 through VR-5 were emptied on Sparton's property. The eight drums of cuttings from VR-1 will be disposed of at a licensed hazardous waste facility.

APPENDIX 2
VAPOR PROBE INSTALLATION DETAILS



Section A-A

FIGURE 1

VP CONSTRUCTION DIAGRAM

METRIC
Corporation

SAMPLE LOG

Borehole Number VP Borehole Location North of Building
Property Owner Sparton Technology, Inc.
Sample Logger Peter H. Metzner, Metric Corporation
Driller Rodgers Environmental Services, Inc.
Drilling Medium Hollow Stem Augers 6 1/4" i.d.
Date of Completion 6-13-96 Ground Elevation -

Depth (feet)	Thickness (feet)	Stratigraphic Description
0 - 8.0	8.0	Grayish orange (10YR 7/4), well sorted, sub-angular to sub-rounded, very fine sand to fine sand.
8.0 - 9.3	1.3	Moderate yellowish brown (10YR 5/4), medium sorted, sub-angular to sub-rounded, very fine sand to coarse sand.
9.3 - 10.0	0.7	Light olive brown (5Y 5/6), medium sorted, sub-angular to sub-rounded, very fine sand to coarse sand.
10.0 - 11.0	1.0	Moderate brown (5YR 3/4), poorly sorted, sub-rounded, very fine sand to very coarse sand with some small pebble gravel, slightly cemented.
11.0 - 14.0	3.0	Moderate yellowish brown (10YR 5/4), well sorted, sub-rounded to rounded, very fine sand to medium sand.
14.0 - 16.5	2.5	Moderate yellowish brown (10YR 5/4), poorly sorted, sub-rounded to rounded, very fine sand to very coarse sand.

METRIC
Corporation

SAMPLE LOG
Continued

Borehole Number VP Borehole Location North of Building

Depth (feet)	Thickness (feet)	Stratigraphic Description
16.5 - 17.9	1.4	Moderate yellowish brown (10YR 5/4) and light olive gray (5Y 5/2), poorly sorted, sub-rounded to rounded, very fine sand to very coarse sand.
17.9 - 21.2	3.3	Moderate yellowish brown (10YR 5/4), medium sorted, sub-angular to sub-rounded, very fine sand to medium sand.
21.2 - 25.0	3.8	Yellowish gray (5YR 8/1), medium sorted, sub-angular to sub-rounded, very fine sand to medium sand.
25.0 - 27.2	2.2	Grayish orange (10YR 7/4), well sorted, sub-angular to sub-rounded, fine sand.
27.2 - 29.8	2.6	Grayish orange (10YR 7/4), medium sorted, sub-rounded, very fine sand to coarse sand.
29.8 - 31.1	1.3	Yellowish gray (5Y 8/1), well sorted, sub-rounded, fine sand to medium sand.
31.1 - 32.4	1.3	Light olive gray (5Y 5/2), well sorted, sub-angular to sub-rounded, very fine sand to fine sand, slightly clayey.
32.4 - 40.0	7.6	Grayish orange (10YR 7/4), medium sorted, sub-angular to sub-rounded, very fine sand to medium sand.
40.0 - 41.0	1.0	Pale yellowish brown (10YR 6/2), poorly sorted, sub-rounded, very fine sand to coarse sand, slightly clayey.

METRIC
Corporation

SAMPLE LOG
Continued

Borehole Number VP Borehole Location North of Building

<u>Depth (feet)</u>	<u>Thickness (feet)</u>	<u>Stratigraphic Description</u>
41.0 - 42.4	1.4	Moderate yellowish brown(10YR 5/4), medium sorted, sub-rounded, very fine sand to medium sand.
42.4 - 45.5	3.1	Grayish orange (10YR 7/4), well sorted, sub-angular to sub-rounded, clayey very fine sand to fine sand.
45.5 - 50.0	4.5	Pale yellowish brown (10YR 6/2), medium sorted, sub-angular to sub-rounded, fine sand to coarse sand.
50.0 - 54.5	4.5	Pale yellowish brown (10YR 6/2), poorly sorted, sub-angular to sub-rounded, fine sand to cobble gravel.
54.5 - 58.0	3.5	Pale yellowish brown (10YR 6/2), well sorted, sub-angular to sub-rounded, very fine sand to cobble gravel.
58.0 - 62.5	4.5	Pale yellowish brown (10YR 6/2), poorly sorted, sub-angular to sub-rounded, fine sand to cobble gravel.

**APPENDIX 3
ACUVAC PILOT TEST REPORT**



AcuVac Remediation Inc.

March 6, 1997

9111 Katy Freeway
Suite 303
Houston, TX 77024
(713) 468-6688: TEL
(713) 468-6689: FAX

Mr Pierce L. Chandler Jr. P.E.
Project Manager
Black & Veatch
5728 LBJ Fwy, Ste 300
Dallas, TX 75240

Re: Pilot Test - Sparton Technology, Inc., Coors Road Plant, Rio Rancho, NM

Dear Pierce:

Enclosed is the report on Soil Vapor Extraction (SVE) Pilot Testing performed on February 27 & 28, 1997, at the above referenced location. The test was conducted using AcuVac's SVE I-6 System, with Roots RAI-33 blower, various instrumentation, including the HORIBA Analyzer, Micro Max O₂ and LEL Meter, magnehelic gauges, flow gauges, aircraft altimeter to determine barometric pressure, and other special equipment. The report is divided into three separate tests.

Introduction

The vacuum extraction portion of the AcuVac SVE System consists of a vacuum pump driven by a six cylinder internal combustion (IC) engine. The vacuum pump is connected to the extraction well and the vacuum created on the extraction well causes hydrocarbons in the soil to volatilize and flow through a moisture knockout tank to the vacuum pump and the IC engine where they are burned as part of the normal combustion process. Propane is used as an auxiliary fuel to help power the engine if the well vapors do not provide the required BTU.

Emissions from the engine are passed through three catalytic converters to ensure maximum destruction of removed hydrocarbon vapors. If chlorinated hydrocarbons are part of the contaminant, acid gas may be present in the exhaust emissions. The engine's air to fuel ratio can be adjusted to maintain efficient combustion. Because the engine is the power source for all equipment, all systems stop when the engine stops. This eliminates any uncontrolled release of hydrocarbons. Since the System is held entirely under vacuum, any leaks in the seals or connections are leaked into the System and not emitted into the atmosphere. The engine is automatically shut down by vacuum loss, low oil pressure or overheating.

System parameters are monitored during tests using Magnehelic vacuum gauges, VISI-Float flowmeters and/or Flow Sensors, HORIBA Analyzer and flow and pressure controls on the AcuVac System.

Project Scope:

- Connect the AcuVac SVE System to extraction well (EW) VR-1, record the static well data, well size, TD, screen intervals on all wells and then apply vacuum. Record the vacuum and well flow, all System data (including fuel flow of propane), influent and ambient air temperatures and barometric pressure.
- The test procedure is to provide variable rates of vacuum and flow over the initial test period and record the data at a selected interval of time.
- Install and observe the magnehelic gauges on the outer observation wells to determine if the selected EW is in vacuum communication with the outer observation wells. Record the vacuum/pressure at a selected interval of time.
- Take influent vapor samples to provide on-site HORIBA Analyzer data and for laboratory analysis.
- Record the distances from the selected extraction wells to the outer wells.
- Operate the SVE System in such a manner that all well vapors are passed through the engine and catalytic converters, to destruct the contaminants and exhausted, to meet air emission standards. Comply with all safety regulations.
- Complete the tests by providing a report consisting of operating and analytical data and projection of vacuum radius of influence.

Fuel Use Information

The primary fuel for the IC engine is the hydrocarbon contaminant in the influent vapors and the auxiliary fuel is propane. However, due to the much lower influent vapor concentrations associated with chlorinated hydrocarbons, propane provides the higher percentage of the total fuel requirement.

The fuel requirement, at 5,000 ft altitude, for the I-6 engine at 2,200 to 2,400 rpm at the h.p. requirement during average SVE test conditions is 2.32 gals/hr of propane. The calculated (by volume) amount of propane used during the total test time was 34.45 gallons, or 2.09 gals/hr. Therefore, the influent well vapors provided fuel equivalent to 0.23 gals/hr of propane or 9.91%. The hydrocarbons in the influent vapors provided fuel at 0.059 gals/hr and the chlorinated hydrocarbons provided a fuel value of 0.171 gals/hr. These energy balance calculations are estimates based on engine test data of specific fuel consumption at a given RPM with a continuous brake horsepower. The margin of error will increase if brake horsepower increases or decreases during the test period.

Summary of Data - 3 Tests (See Attached Schedule A)

Graphic Summary of Data - SVE (See Attached Summary)

Well Data Information:

TABLE #1

Well #	Distance From VR-1 in Feet	Total Depth in Feet	Screen Interval in Feet
VP-1	6.0	10.5	9.5 - 10.5
VP-2	6.0	20.5	19.5 - 20.5
VP-3	6.0	30.5	29.5 - 30.5
VP-4	6.0	40.5	39.5 - 40.5
VP-5	6.0	50.5	49.5 - 50.5
VP-6	6.0	60.5	59.5 - 60.5
MW-16	18.0	71.7	66.7 - 71.7
MW-24	24.0	70.9	65.9 - 70.9
MW-25	23.0	69.7	64.7 - 69.7
VR-2	50.0	66.0	12.0 - 66.0
VR-4	75.0	66.0	12.0 - 66.0
MW-21	184.0	66.1	61.1 - 66.1
VR-3	100.0	68.1	12.0 - 68.0
MW-17	118.0	70.4	65.4 - 70.4
VR-5	100.0	64.0	12.0 - 64.0
MW-22	235.0	73.9	68.9 - 73.9
MW-23	204.0	74.0	69.0 - 74.0

DTGW - MW-16 (Near VR-1) = 67.8 ft

VP = Vapor probes (0.5" schedule 40 black pipe with 1.0 ft screen), referred to as inner wells

VR = Vapor recovery wells (approximately 1.0 ft above groundwater), referred to as outer wells

MW = Monitoring wells (screened across groundwater), referred to as outer wells

Discussion of Data:

Prior to starting these tests, all the SVE systems are checked for normal operation. Each magnehelic gauge is checked and calibrated to "0". The inner and outer observation wells are plugged with expandable well plugs designed to accept magnehelic gauges. The inner wells are the six vapor probes (VP wells). Static well data is recorded from all wells prior to engaging the SVE System. The propane tank fuel level is recorded so an accurate fuel consumption can be estimated for the total test period. The HORIBA Analyzer is set for the local altitude and calibrated with SPAN gas.

Test #1 was a 8.8 hour SVE test (not including Static Time) conducted from well VR-1 as the extraction well (EW). Static well data indicated that the selected inner and outer observation wells were recording a slight vacuum ranging from 0 to 0.04" H₂O, with the exception of MW-24 & 25 which were recording slight well pressures. The barometric pressure was at 29.74" Hg and the ambient air temperature was 42°F. At the start of the test, the initial EW vacuum was set at 1.8" H₂O, with a flow of 25 cfm. The observation wells immediately recorded an increased vacuum with the exception of wells MW-24 & 25 which recorded increased pressures. This was, most likely, the result of rising groundwater in MW-24 & 25 when the pneumatic pumps were removed.

The purpose of a variable rate flow test is to define the pressure/flow characteristics of the subsurface soils around the extraction well and to estimate potential conditions for operational SVE Systems. Starting a test with a low vacuum and flow, with variable rates of increase, allows the EW and outer

wells sufficient time to adjust and stabilize, and minimizes the risk of channeling. This will also assist the development of newly installed extraction wells. Extended testing periods may be required under each of the variable rates to achieve steady state conditions when barometric pressure oscillations are occurring. After the initial recorded vacuum, the inner VP wells continued on an increasing vacuum trend while the outer wells were stable or indicating a slight decreasing trend. During the first two hours of the test, the barometric pressure decreased 0.03" Hg, or 0.409" H₂O. Due to the high permeability of the sub-surface, barometric pressure oscillations were resulting in immediate changes in vacuums/pressures recorded on the observation wells.

The EW vacuum was increased to 2.6" H₂O, with a flow 35 cfm. The inner VP wells immediately responded to the EW increase and then stabilized for the next 0.5 hr. With the exception of VR-2, the outer wells were indicating a decreasing vacuum or increasing pressure trend. The influent vapor temperature remained nearly constant at 55°F.

HORIBA data from influent vapor samples indicated the HC (hydrocarbon concentration) ranges were from 550 to 352 ppm, with CO₂ ranging from 4.94 to 3.98% and O₂ ranging from 16.9 to 15.8%. The HORIBA is more accurate with petroleum hydrocarbons whereas the HNU analytical instrument was calibrated for chlorinated hydrocarbons. The HNU was recording concentrations in the 500 ppm range.

The EW vacuum was increased to 3.6" H₂O, with a flow of 50 cfm and remained steady for 1.0 hour. During this period, the barometric pressure decreased an additional 0.06" Hg, or 0.817" H₂O. Since the start of this test, the barometric pressure has decreased 0.17" Hg, or 2.315" H₂O. This is reflected on outer wells MW-22 & 23 which are the most distant wells from VR-1 (EW) and most likely would have minimal influence from SVE.

During this period, it was difficult to establish a baseline for SVE and required continuing the test until the barometric pressure established some stability.

HORIBA data indicated the HC level of the air emissions was initially at 75 ppm at the lower EW flow rate and increased to 175 ppm at the higher rate of 68 cfm. The 175 ppm would equate to an emission level of 0.14 lbs per hour. This can be adjusted lower on a continuous operation since it is most likely propane blow-by. Additional HORIBA data on the influent vapors indicated the HC range was 308 to 284 ppm, CO₂ was 3.52 to 3.42% and O₂ was 16.9%. The HNU recorded an influent vapor concentration in the 600 ppm range.

During the last 1.0 hour of the test, the barometric pressure began to stabilize and actually recorded a slight increase. All of the inner and outer wells immediately recorded an increasing vacuum trend. The EW vacuum and flow was steady at 5.4" H₂O and 68 cfm. The data recorded during the last 1.5 hours of testing is considered the most representative of steady state conditions.

The inner VP wells provided the best supporting data. VP-3 was consistently recording very low vacuums and is screened in a stratigraphic area of very fine to fine, slightly clayey soil. VP-1, which is screened in the upper zone, recorded lower vacuums than the remaining vapor probes, most likely due to slight short circuiting near the surface and that VR-1 is screened from 12.0 to 66.0 ft. Although the surface was covered with asphalt, short circuiting can occur. VP-2, 4, 5 & 6 recorded vacuums substantially in the same range.

Static well data was recorded 0.5 hours after the SVE was discontinued on the EW. Almost all the wells recorded a slight vacuum ranging from 0.02 to 0.12" H₂O. MW-24 & 25 continued to record higher vacuums while MW-22 & 23 recorded well pressures. The MW wells had 4.0 to 6.0 ft of screen above the groundwater and were much slower to adjust to static conditions.

Test #2 was a 2.6 hour SVE test (not including Static Time) conducted from well VR-1 (EW) the following day. Static well data indicated the inner (VP wells) and outer observation wells were recording vacuums near "0" with the exception of MW-17 which was recording a slight pressure of 0.02" H₂O. Barometric pressure was 29.48" Hg and the ambient air temperature was 38°F. The selected EW flow was 68 cfm, with the initial vacuum at 4.8" H₂O and steadily increasing to 5.5". All the inner and outer wells immediately recorded a vacuum when SVE was engaged and continued on an increasing vacuum trend for 1.5 hours. The recorded data was very similar to the data recorded during the last 1.0 hour of Test #1. The influent vapor temperature was constant at 55°F and the air temperature increased to 44°F.

During the first 1.0 hour of testing, the barometric pressure increased by 0.09" Hg, or 1.23" H₂O. During the last 0.5 hour, the barometric pressure stabilized and the recorded data reflected a slight decrease in vacuum.

HORIBA data indicated the HC level in the influent vapors varied between 264 and 246 ppm, with CO₂ at 3.42 to 2.94% and O₂ at 17.2%. The HNU recorded influent concentrations between 620 and 600 ppm.

Since the barometric pressure was indicating some stabilization, it was decided to stop the test, record the static well data and start Test #3 with new background data.

Static well data recorded 0.5 hours after the SVE was discontinued, indicated all the inner and outer wells were recording a slight vacuum. As in Test #1, the MW wells did not adjust as quickly to static conditions as the VP and VR wells. After the static data was recorded, all the wells were vented to atmosphere prior to the start of Test #3.

Test #3 was a 3.6 hour test (not including Static Time) conducted from well VR-1 as the extraction well (EW). After the wells had been vented to atmosphere and the vents closed, the static well data indicated all the inner and outer wells were recording slight vacuums to slight pressures ranging from "0" to 0.05" H₂O. The barometric pressure was mostly steady at 29.56 to 29.57" Hg and the ambient air temperature was 46°F. At the start of the test, the well flow (EW) was set at 68 cfm, with a vacuum of 5.0" H₂O. An immediate vacuum increase was recorded on all inner and outer wells except MW-22 & 23 which recorded well pressures. The recorded vacuum continued on an increasing trend for 1.5 hours, with some stabilization observed during the last 0.5 hours.

During this period, the barometric pressure decreased 0.03" Hg, or 0.409" H₂O. This is reflected in wells MW-22 & 23 which recorded well pressure increases similar to the barometric pressure decrease. With wells screened across the groundwater that have a limited amount of well screen above the groundwater, a decreasing barometric pressure will allow the groundwater level to rise; thus reflecting an increased air/vapor pressure on a well that is, in effect, a closed end tube.

HORIBA data indicated the HC levels of the influent vapors varied between 278 to 242 ppm, with CO₂ between 3.02 to 2.78%. The O₂ level increased from 17.6 to 19.7%. The HNU Analyzer indicated the

23 changing from a recorded well pressure to a vacuum. This provided excellent data to support Tests #1 & 2 and to use in the calculation of a vacuum radius of influence.

The static well data recorded 0.75 hours after the SVE was discontinued indicated all the wells, except MW-16, 24 & 25, were recording a slight vacuum of between "0" to 0.10" H₂O. During this period, the wells were **not vented** to atmosphere. Again, the MW wells were slower to adjust to atmospheric conditions. When they were vented, they immediately adjusted.

The advantage of the three SVE tests conducted over two days was to provide a method for checks and balances on the recorded data, especially when large barometric pressure oscillations occur.

Additional Information (this should be read as a part of the report):

- Summary of Operating Data
- Graphic Summary of Data, SVE Tests
- Figure 1 - Plot of Observed Vacuum versus Distance at the Facility
- Field Operating Data and Notes
- Site Map
- Site Photographs

Conclusion

Pilot Tests are conducted to provide information on short term tests that can be projected into a long term remedial plan. These feasibility tests indicated that soil vacuum extraction (SVE) would be an effective method of remediation for this facility. Although the observed vacuum on some of the outer observation wells was relatively low, the duration of the pilot tests was short compared to continuous operation. However, the results provide sufficient data to indicate that the observed and reported wells were in vacuum communication with the selected SVE extraction well. The radius of influence defines the region within which the vapor in the vadose or vented zone flows to the extraction well under the influence of a vacuum. The radius of influence depends on soil properties of the vented zone, properties of surrounding soil layers, the depth at which the well is screened, well installation and the presence of any impermeable boundaries such as the water table, clay layers, surface seal, building basements and the presence of such areas as tank pits with backfill and underground utilities.

Figure #1 indicated that the effective vacuum radius of influence would be from 175 to 200 ft, with extraction well flow of 60 to 65 cfm, and extraction well vacuum in the 5.0" H₂O. This projection of the radius of influence was determined by plotting the observed (as modified) radial pressure distribution data. An approximation of the radius of influence may be obtained by determining the point at which the measured vacuum is 0.18 to 0.22" H₂O. It is assumed that beyond the lower point, the pressure gradient (driving force) is negligible to effectively transport vaporized contaminants to the extraction well. Under continuous operation, vacuum and radius of influence may continue to increase.

To calculate SVE well placement, the equation we use is as follows;

$$l = 2 R_i \cos 30^\circ; \quad L = \text{distance between wells}; \quad R_i = \text{radius of influence}$$

All other data, including the groundwater depth, well placement, extraction well screened intervals and SVE recovery rate, must be considered in the final design for a remedial plan.

The AcuVac System performed as represented and should be considered a viable technology to use for the remediation of this location. The system with the 300 CID, 6 cylinder engine can provide total extraction

well flow of approximately 80 scfm, with a vacuum up to 20" Hg. These Systems are designed to consume heavy concentrations of VOCs and meet all air emission standards. Special engines with enhanced metallurgy are required for the remediation of chlorinated hydrocarbons. A special, blended synthetic oil is also required. The auxiliary fuel can be propane or natural gas. Electrical connections are not required. Air injection, if required, can supply hydrocarbon free air from a 16 cfm air compressor with oil/moisture filters of 30 - 40 cfm Roots RAI 22 blower, both engine driven. AcuVac can supply a custom building designed for security, reduction of noise, and can be color coordinated to provide aesthetic value.

AcuVac also sells, leases and services, electrical driven, bio-vent SVE and Air Injection/Sparge Systems. These Systems are designed and manufactured to specific specifications.

Once you have reviewed the report, please call me if you have any questions.

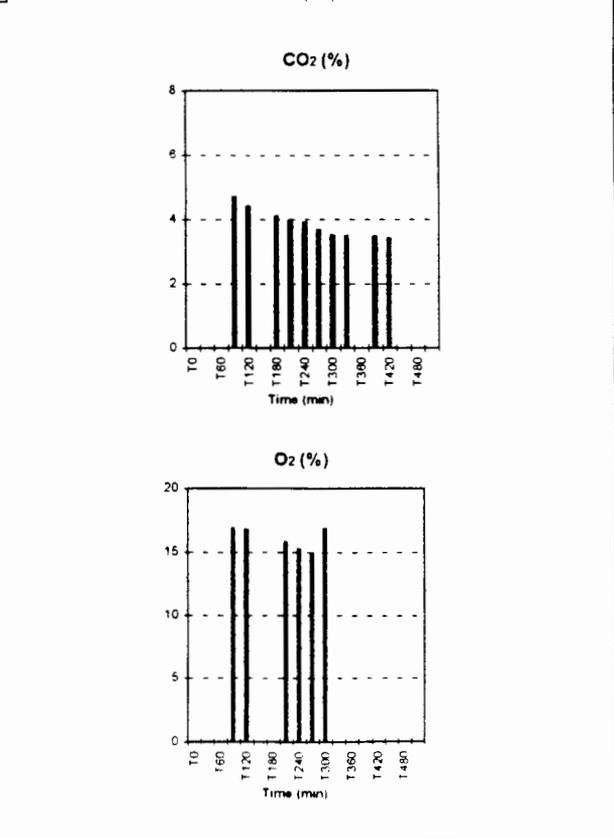
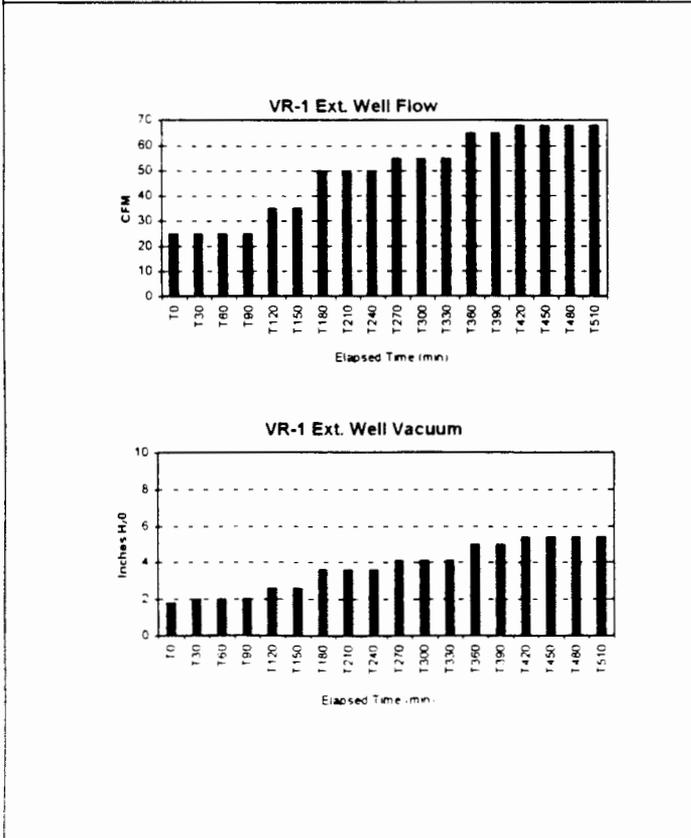
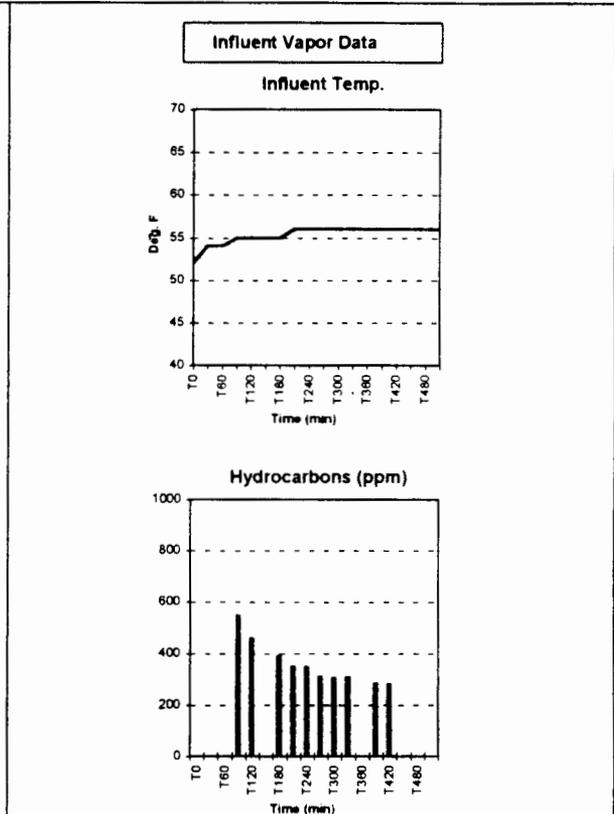
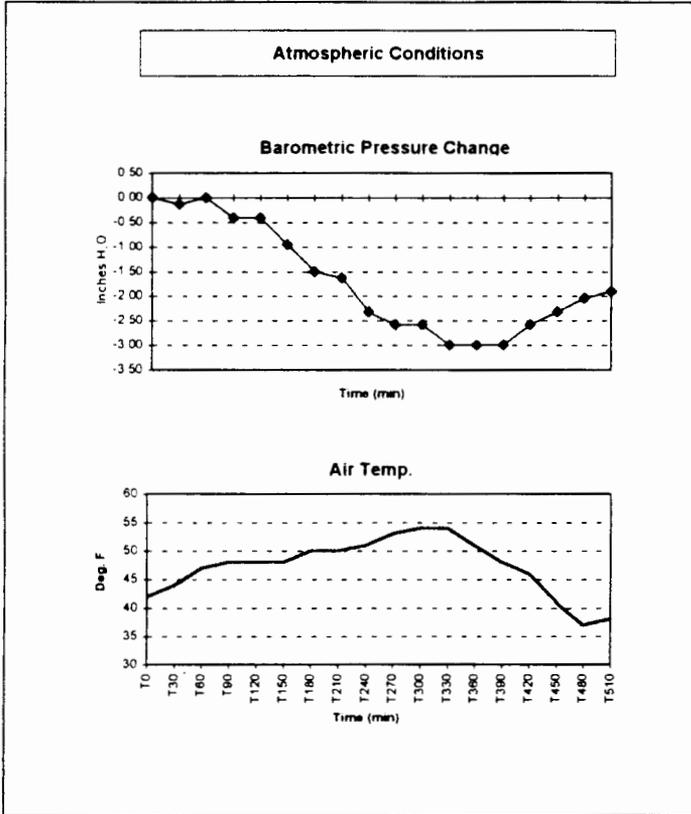
Sincerely,

A handwritten signature in black ink, appearing to read "James E. Sadler", written over a horizontal line.

James E. Sadler
Engineer/Environmental

SCHEDULE B
Summary of ACUVAC SVE TEST #1

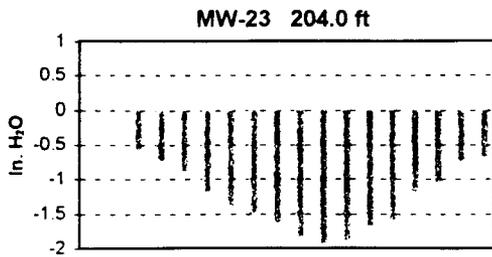
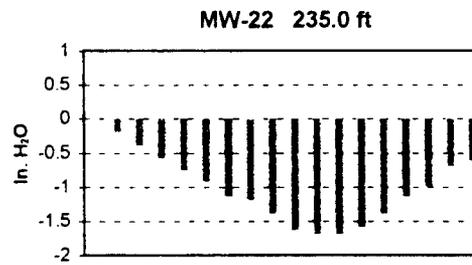
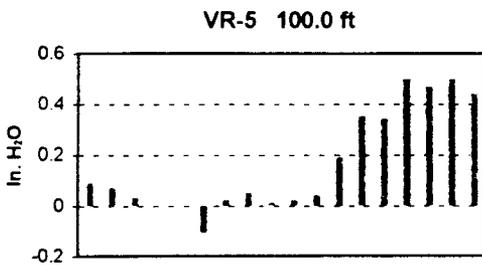
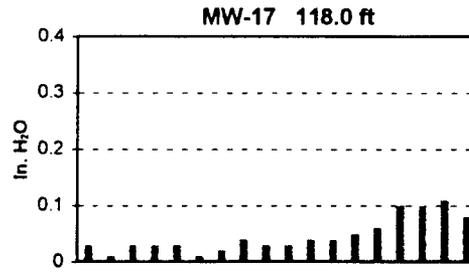
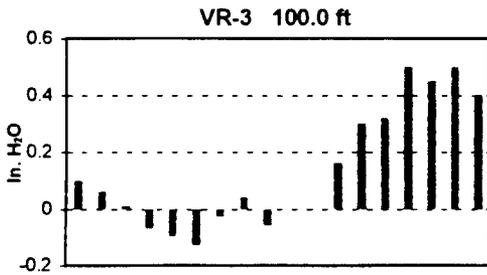
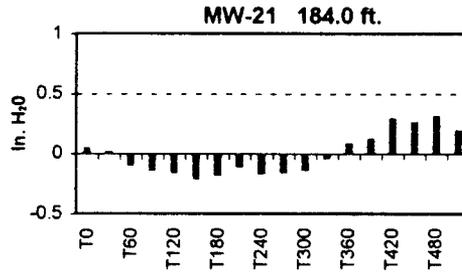
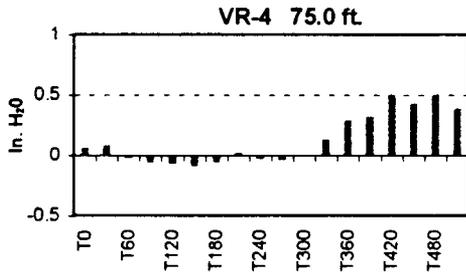
AcuVac Remediation Inc
 SPARTON TECHNOLOGY
 February 27, 1997



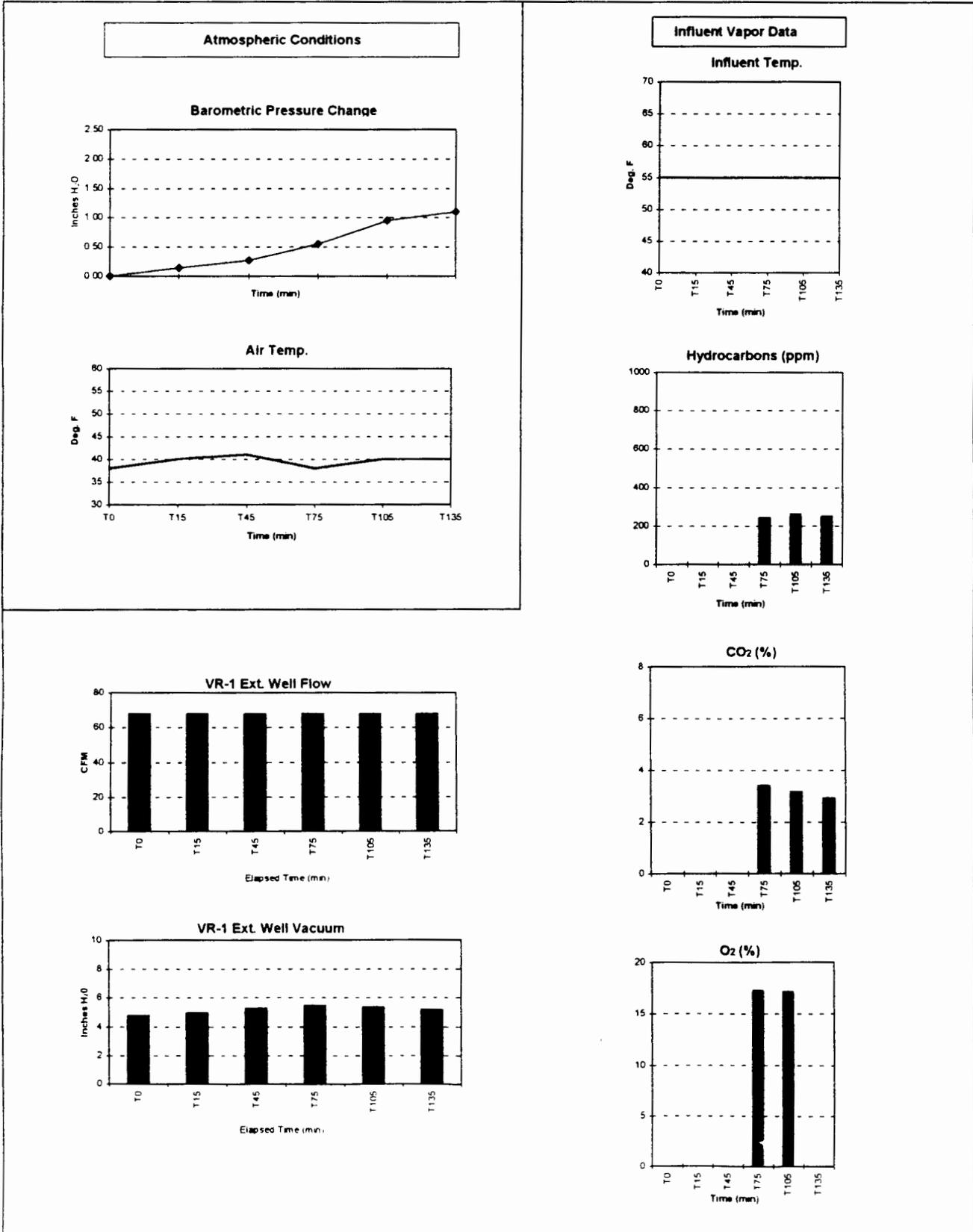
SCHEDULE B Summary of ACUVAC SVE TEST #1

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SPARTON TECHNOLOGY
February 27, 1997

Recorded Well Vacuums and/or Pressures

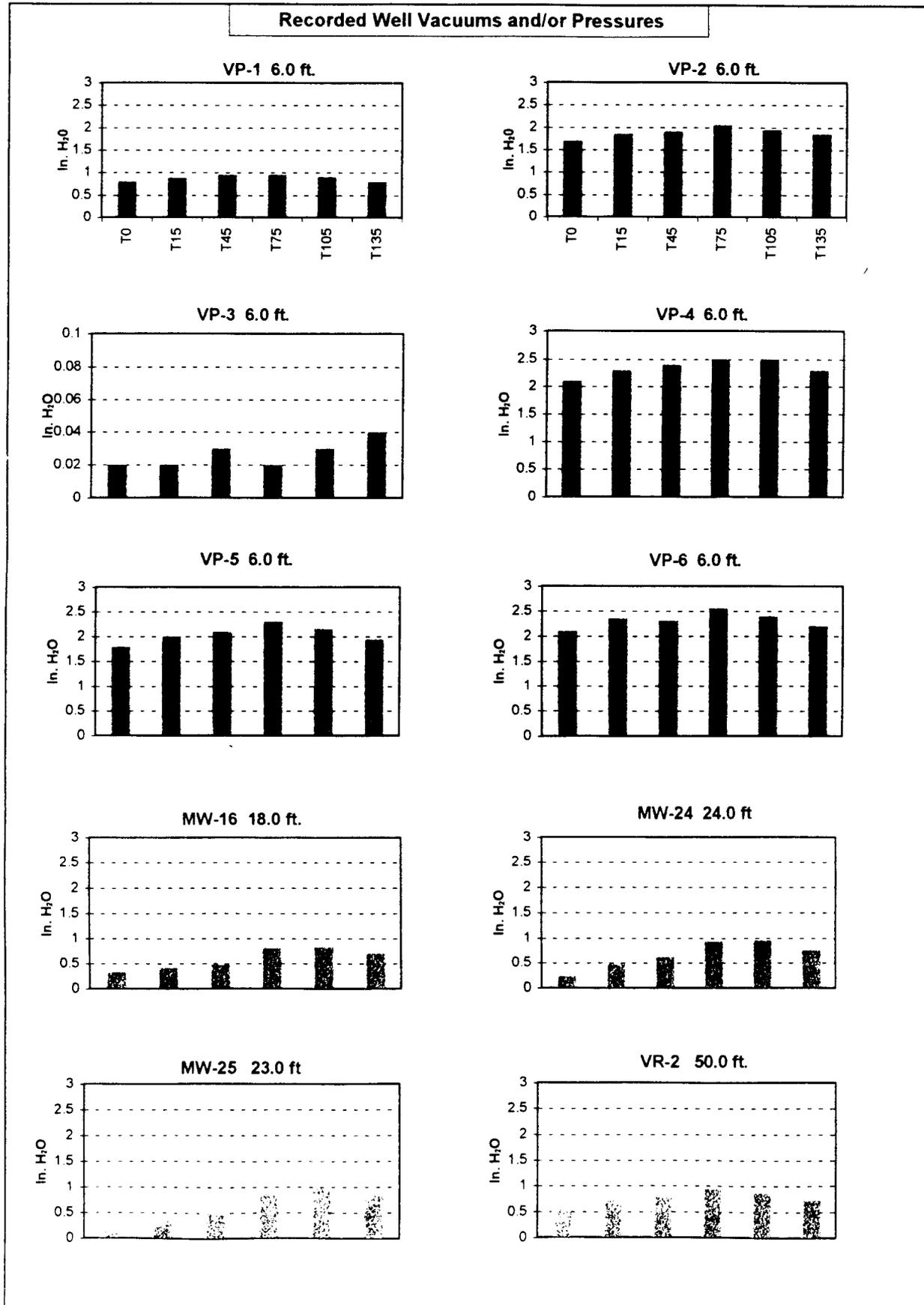


SCHEDULE B
Summary of ACUVAC SVE TEST #2



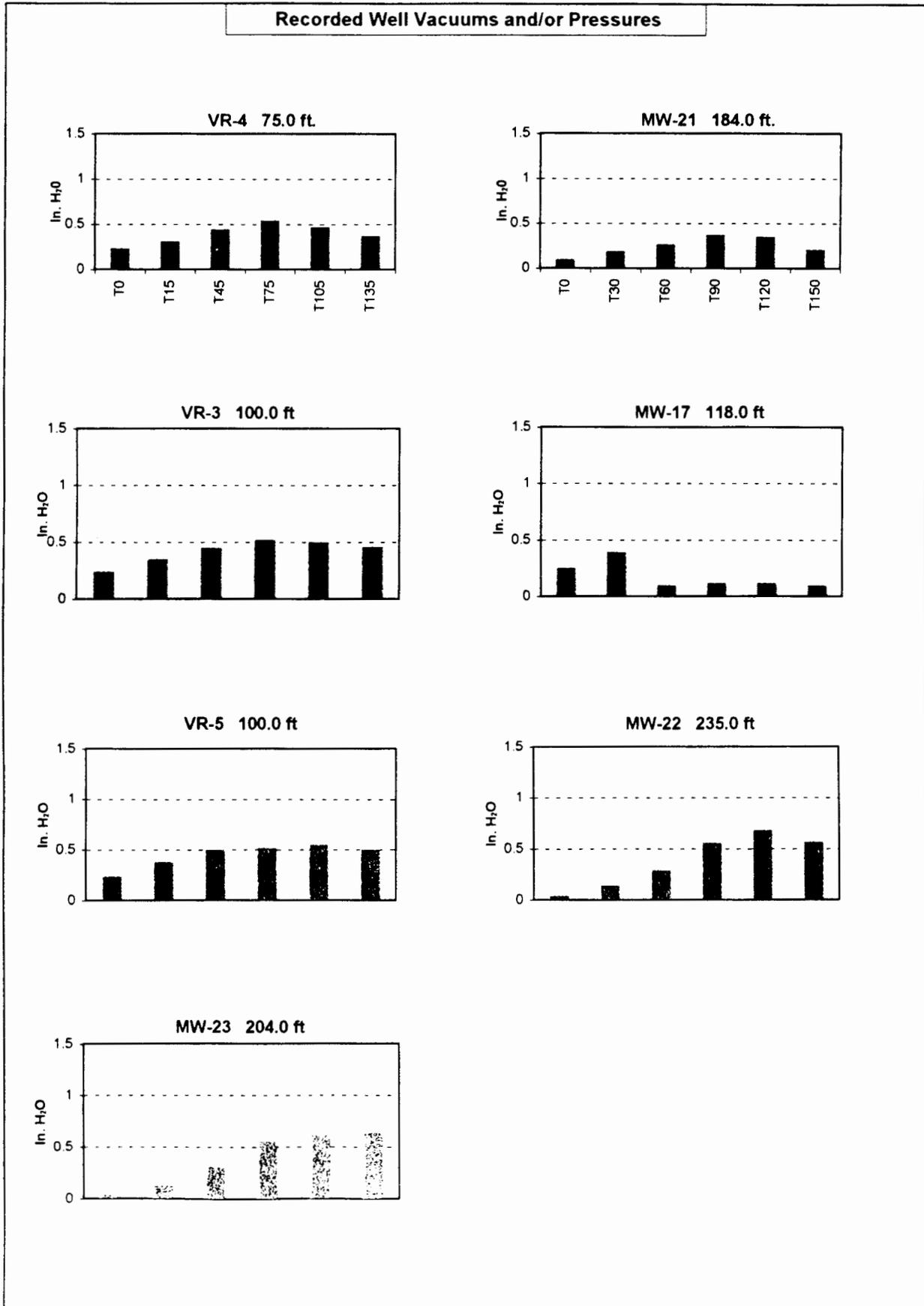
SCHEDULE B Summary of ACUVAC SVE TEST #2

AcuVac Remediation Inc.
SPARTON TECHNOLOGY
February 28, 1997

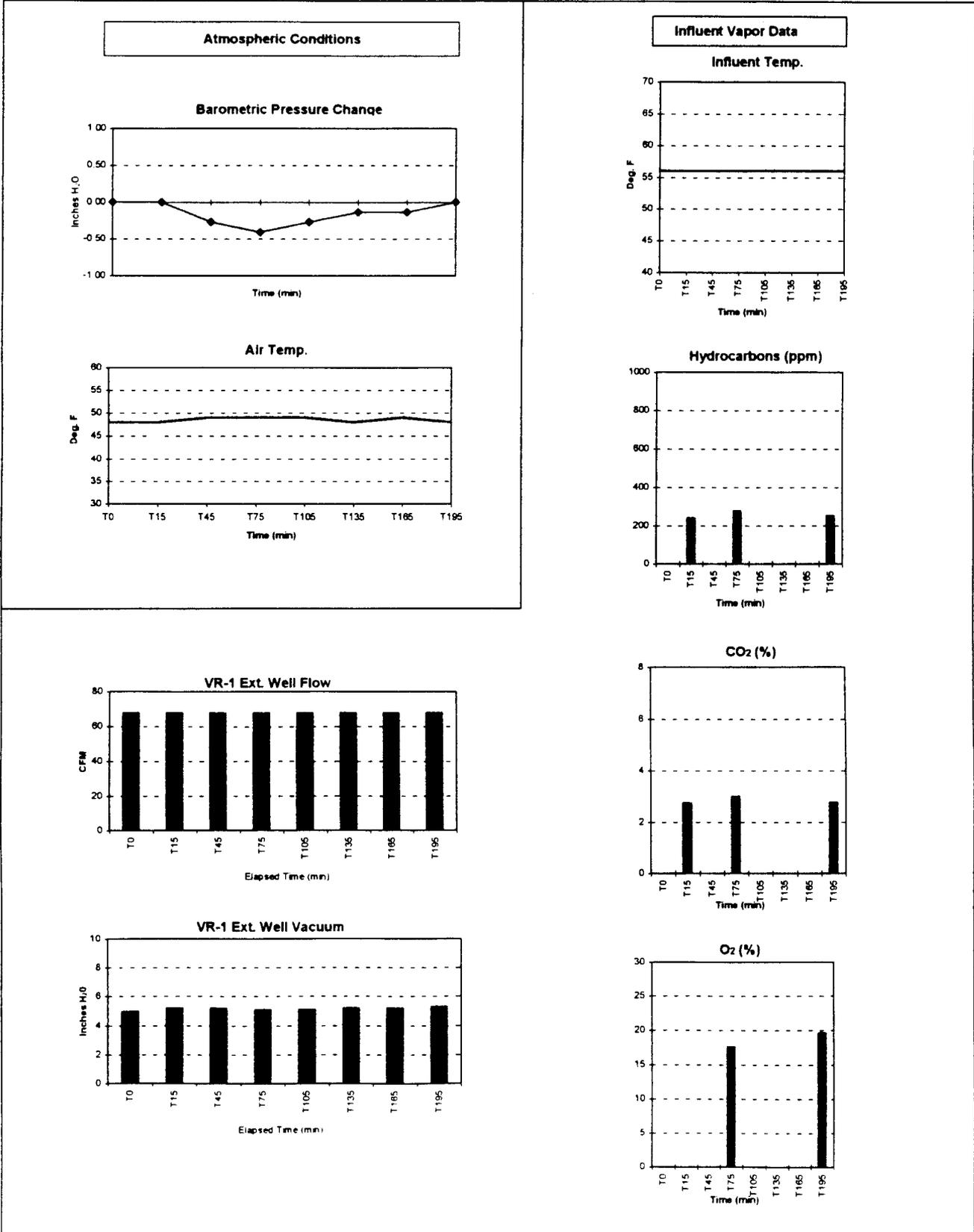


SCHEDULE B Summary of ACUVAC SVE TEST #2

AcuVac Remediation Inc.
SPARTON TECHNOLOGY
February 28, 1997

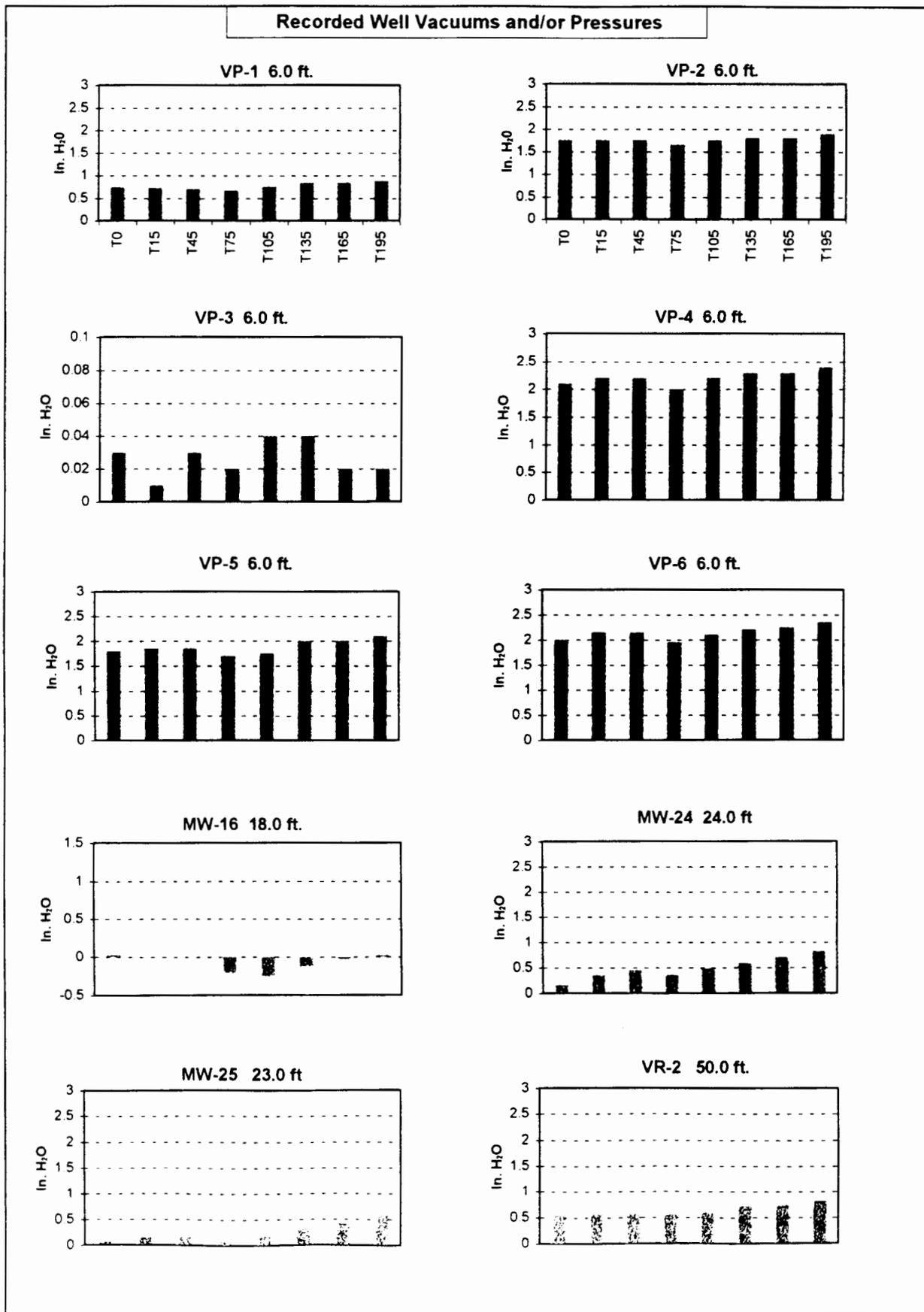


SCHEDULE B
Summary of ACUVAC SVE TEST #3



SCHEDULE B
Summary of ACUVAC SVE TEST #3

AcuVac Remediation Inc.
 SPARTON TECHNOLOGY
 February 28, 1997



2/27/97	Static Data Time 0740	First Data Time 0845	Second Data Time 0915	Third Data Time 0945	Fourth Data Time 1015	Fifth Data Time 1045	Sixth Data Time 1115
Horiba HC ppm	-	ND	ND	ND	550	462	ND
Horiba CO ₂ %	-	ND	ND	ND	4.74	4.42	ND
Horiba O ₂ %	-	ND	ND	ND	16.9	16.8	ND
Influent Vapor Temp °F	-	52	54	54	55	55	55
Barometric Pressure *Hg	29.74	29.75	29.74	29.75	29.72	29.72	29.68
Extraction Well Flow CFM Well VR-1	-	25	25	25	25	35	35
Extraction Well Vacuum CFM Well VR-1	-	1.8	2.0	2.0	2.0	2.6	2.6
Well VP-1 Vacuum *H ₂ O Dist. 6.0 ft	0.03	0.20	0.30	0.26	0.25	0.36	0.36
Well VP-2 Vacuum *H ₂ O Dist. 6.0 ft	0.04	0.56	0.70	0.62	0.64	0.86	0.86
Well VP-3 Vacuum *H ₂ O Dist. 6.0 ft	0.03	0.03	0.02	0.01	0	-(.01)	0.01
Well VP-4 Vacuum *H ₂ O Dist. 6.0 ft	0.03	0.64	0.86	0.76	0.78	1.00	1.02
Well VP-5 Vacuum *H ₂ O Dist. 6.0 ft	0.05	0.66	0.72	0.64	0.60	0.84	0.82
Well VP-6 Vacuum *H ₂ O Dist. 6.0 ft	0.03	0.76	0.82	0.74	0.72	0.98	0.96
Well MW-16 Vacuum *H ₂ O Dist. 18.0 ft	0	0.04	0.02	-(.24)	-(.39)	-(.56)	-(.74)
Well MW-24 Vacuum *H ₂ O Dist. 24.0 ft	-(.04)	-(.16)	-(.32)	-(.11)	-(.19)	-(.16)	-(.14)
Well MW-25 Vacuum *H ₂ O Dist. 23.0 ft	-(.01)	-(.03)	-(.10)	-(.34)	-(.20)	-(.26)	-(.37)
Well VR-2 Vacuum *H ₂ O Dist. 50.0 ft	0.04	0.21	0.22	0.15	0.11	0.15	0.12
Well VR-4 Vacuum *H ₂ O Dist. 75.0 ft	0.04	0.06	0.08	-(.03)	-(.07)	-(.08)	-(.10)
Well MW-21 Vacuum *H ₂ O Dist. 184.0 ft	0.04	0.05	0.02	-(.11)	-(.15)	-(.17)	-(.22)
Well VR-3 Vacuum *H ₂ O Dist. 100.0 ft	0.04	0.10	0.06	0.01	-(.07)	-(.10)	-(.13)
Well MW-17 Vacuum *H ₂ O Dist. 118.0 ft	0.02	0.03	0.01	0.03	0.03	0.03	0.01
Well VR-5 Vacuum *H ₂ O Dist. 100.0 ft	0.03	0.09	0.07	0.03	0	0	-(.11)
Well MW-22 Vacuum *H ₂ O Dist. 235.0 ft	0.01	0	-(.20)	-(.40)	-(.58)	-(.76)	-(.93)
Well MW-23 Vacuum *H ₂ O Dist. 204.0 ft	-	-	-	-(.58)	-(.74)	-(.90)	-(1.20)

-() Indicates Well Pressure

2/27/97	Seventh Data Time 1145	Eighth Data Time 1215	Ninth Data Time 1245	Tenth Data Time 1315	Eleventh Data Time 1345	Twelfth Data Time 1415	Thirteenth Data Time 1445
Horiba HC ppm	392	352	352	312	308	310	ND
Horiba CO ₂ %	4.12	3.98	3.92	3.70	3.52	3.50	ND
Horiba O ₂ %	ND	15.8	15.3	15.0	16.9	ND	ND
Influent Vapor Temp °F	55	56	56	56	56	56	56
Barometric Pressure "Hg	29.64	29.63	29.58	29.56	29.56	29.53	29.53
Extraction Well Flow CFM Well VR-1	50	50	50	55	55	55	65
Extraction Well Vacuum CFM Well VR-1	3.6	3.6	3.6	4.1	4.1	4.1	5.0
Well VP-1 Vacuum "H ₂ O Dist. 6.0 ft	0.45	0.50	0.52	0.54	0.54	0.62	0.78
Well VP-2 Vacuum "H ₂ O Dist. 6.0 ft	1.05	1.15	1.20	1.30	1.30	1.42	1.75
Well VP-3 Vacuum "H ₂ O Dist. 6.0 ft	0.01	0.01	0.01	0.01	0.01	0.01	0.02
Well VP-4 Vacuum "H ₂ O Dist. 6.0 ft	1.30	1.45	1.50	1.60	1.60	1.75	2.18
Well VP-5 Vacuum "H ₂ O Dist. 6.0 ft	1.05	1.15	1.20	1.25	1.30	1.43	1.80
Well VP-6 Vacuum "H ₂ O Dist. 6.0 ft	1.25	1.35	1.40	1.50	1.55	1.65	2.10
Well MW-16 Vacuum "H ₂ O Dist. 18.0 ft	0	0.03	0.02	0.03	0.02	0.03	0.03
Well MW-24 Vacuum "H ₂ O Dist. 24.0 ft	-(.19)	0	0	-(.05)	0	0.12	0.48
Well MW-25 Vacuum "H ₂ O Dist. 23.0 ft	-(.50)	-(.48)	-(.56)	-(.66)	-(.74)	-(.66)	-(.26)
Well VR-2 Vacuum "H ₂ O Dist. 50.0 ft	0.20	0.30	0.30	0.32	0.32	0.43	0.66
Well VR-4 Vacuum "H ₂ O Dist. 75.0 ft	-(.07)	0.02	-(.04)	-(.05)	0	0.13	0.29
Well MW-21 Vacuum "H ₂ O Dist. 184.0 ft	-(.19)	-(.12)	-(.18)	-(.17)	-(.15)	-(.05)	0.09
Well VR-3 Vacuum "H ₂ O Dist. 100.0 ft	-(.03)	0.04	-0.06	0	0	0.16	0.30
Well MW-17 Vacuum "H ₂ O Dist. 118.0 ft	0.02	0.04	0.03	0.03	0.04	0.04	0.05
Well VR-5 Vacuum "H ₂ O Dist. 100.0 ft	0.02	0.05	0.01	0.02	0.04	0.19	0.35
Well MW-22 Vacuum "H ₂ O Dist. 235.0 ft	-(1.15)	-(1.20)	-(1.40)	-(1.65)	-(1.70)	-(1.70)	-(1.60)
Well MW-23 Vacuum "H ₂ O Dist. 204.0 ft	-(1.40)	-(1.50)	-(1.65)	-(1.85)	-(1.95)	-(1.90)	-(1.70)

-() Indicates Well Pressure

2/27/97	Fourteenth Data Time 1515	Fifteenth Data Time 1545	Sixteenth Data Time 1615	Seventeenth Data Time 1645	Eighteenth Data Time 1715	Static Data Time 1745	Average Data 8.8 Hrs	Maximum Data
Horiba HC ppm	286	284	ND	ND	ND	-	361	550
Horiba CO ₂ %	3.48	3.42	ND	ND	ND	-	3.88	3.74
Horiba O ₂ %	ND	ND	ND	ND	ND	-	16.12	16.9
Influent Vapor Temp °F	56	56	56	56	56	-	49.28	56
Barometric Pressure *Hg	29.53	29.56	29.58	29.60	29.61	29.61	29.63	29.75
Extraction Well Flow CFM Well VR-1	65	68	68	68	68	-	49.28	68
Extraction Well Vacuum CFM Well VR-1	5.0	5.4	5.4	5.4	5.4	-	3.76	5.4
Well VP-1 Vacuum *H ₂ O Dist. 6.0 ft	0.76	0.87	0.81	0.90	0.82	0.05	0.55	0.90
Well VP-2 Vacuum *H ₂ O Dist. 6.0 ft	1.75	1.85	1.80	1.95	1.85	0.08	1.26	1.95
Well VP-3 Vacuum *H ₂ O Dist. 6.0 ft	0.02	0.03	0.02	0.07	0.02	0.02	0.02	0.07
Well VP-4 Vacuum *H ₂ O Dist. 6.0 ft	2.20	2.35	2.35	2.50	2.30	0.12	1.56	2.50
Well VP-5 Vacuum *H ₂ O Dist. 6.0 ft	1.90	2.00	2.00	2.15	2.00	0.12	1.31	2.15
Well VP-6 Vacuum *H ₂ O Dist. 6.0 ft	2.15	2.30	2.30	2.40	2.30	0.12	1.51	2.40
Well MW-16 Vacuum *H ₂ O Dist. 18.0 ft	0.03	0.04	0.14	0.47	0.48	0.16	-(.03)	0.48
Well MW-24 Vacuum *H ₂ O Dist. 24.0 ft	0.57	0.82	0.92	1.00	0.90	0.48	0.19	1.00
Well MW-25 Vacuum *H ₂ O Dist. 23.0 ft	-(.03)	0.31	0.52	0.85	0.90	0.50	-(.15)	0.90
Well VR-2 Vacuum *H ₂ O Dist. 50.0 ft	0.65	0.84	0.80	0.90	0.75	0.13	0.41	0.90
Well VR-4 Vacuum *H ₂ O Dist. 75.0 ft	0.32	0.49	0.43	0.49	0.39	0.12	0.13	0.49
Well MW-21 Vacuum *H ₂ O Dist. 184.0 ft	0.13	0.30	0.27	0.32	0.20	0.08	-(.01)	0.32
Well VR-3 Vacuum *H ₂ O Dist. 100.0 ft	0.32	0.50	0.45	0.50	0.40	0.08	0.14	0.50
Well MW-17 Vacuum *H ₂ O Dist. 118.0 ft	0.06	0.10	0.10	0.11	0.08	0.02	0.05	0.11
Well VR-5 Vacuum *H ₂ O Dist. 100.0 ft	0.34	0.50	0.47	0.50	0.44	0.02	0.17	0.50
Well MW-22 Vacuum *H ₂ O Dist. 235.0 ft	-(1.40)	-(1.15)	-(1.00)	-(.70)	-(.62)	-(.60)	-(1.01)	0.01
Well MW-23 Vacuum *H ₂ O Dist. 204.0 ft	-(1.60)	-(1.20)	-(1.05)	-(.75)	-(.70)	-(.64)	-(1.29)	-(.58)

-() Indicates Well Pressure

2/28/97	Static Data Time 0730	First Data Time 0745	Second Data Time 0800	Third Data Time 0830	Fourth Data Time 0900	Fifth Data Time 0930
Horiba HC ppm	-	ND	ND	ND	246	264
Horiba CO ₂ %	-	ND	ND	ND	3.42	3.20
Horiba O ₂ %	-	ND	ND	ND	17.3	17.2
Influent Vapor Temp °F	-	55	55	55	55	55
Barometric Pressure "Hg	29.48	29.48	29.49	29.50	29.52	29.55
Extraction Well Flow CFM Well VR-1	-	68	68	68	68	68
Extraction Well Vacuum CFM Well VR-1	-	4.8	5.0	5.3	5.5	5.4
Well VP-1 Vacuum "H ₂ O Dist. 6.0 ft	0.01	0.80	0.88	0.95	0.95	0.90
Well VP-2 Vacuum "H ₂ O Dist. 6.0 ft	0.01	1.70	1.85	1.90	2.05	1.95
Well VP-3 Vacuum "H ₂ O Dist. 6.0 ft	0.02	0.02	0.02	0.03	0.02	0.03
Well VP-4 Vacuum "H ₂ O Dist. 6.0 ft	0	2.10	2.30	2.40	2.50	2.50
Well VP-5 Vacuum "H ₂ O Dist. 6.0 ft	0	1.80	2.00	2.10	2.30	2.15
Well VP-6 Vacuum "H ₂ O Dist. 6.0 ft	0	2.10	2.35	2.30	2.55	2.40
Well MW-16 Vacuum "H ₂ O Dist. 18.0 ft	0	0.33	0.41	0.47	0.81	0.83
Well MW-24 Vacuum "H ₂ O Dist. 24.0 ft	0.02	0.23	0.47	0.62	0.93	0.95
Well MW-25 Vacuum "H ₂ O Dist. 23.0 ft	0	0.15	0.35	0.50	0.88	0.97
Well VR-2 Vacuum "H ₂ O Dist. 50.0 ft	0.02	0.58	0.72	0.80	0.94	0.87
Well VR-4 Vacuum "H ₂ O Dist. 75.0 ft	0.02	0.23	0.31	0.44	0.54	0.47
Well MW-21 Vacuum "H ₂ O Dist. 184.0 ft	0.01	0.10	0.19	0.27	0.37	0.35
Well VR-3 Vacuum "H ₂ O Dist. 100.0 ft	0.01	0.24	0.35	0.45	0.52	0.50
Well MW-17 Vacuum "H ₂ O Dist. 118.0 ft	-(.02)	0.25	0.39	0.10	0.12	0.12
Well VR-5 Vacuum "H ₂ O Dist. 100.0 ft	0	0.24	0.38	0.50	0.52	0.55
Well MW-22 Vacuum "H ₂ O Dist. 235.0 ft	0	0.04	0.14	0.29	0.56	0.68
Well MW-23 Vacuum "H ₂ O Dist. 204.0 ft	0.02	0.04	0.13	0.31	0.56	0.62

-() Indicates Well Pressure

ND - No Data

2/28/97	Sixth Data Time 1000	Static Data Time 1045	Average Data 2.6 Hrs	Maximum Data
Horiba HC ppm	252	-	254	264
Horiba CO ₂ %	2.94	-	3.19	3.42
Horiba O ₂ %	ND	-	17.25	17.3
Influent Vapor Temp °F	55	-	55	55
Barometric Pressure *Hg	29.56	29.57	29.52	29.57
Extraction Well Flow CFM Well VR-1	68	-	68	68
Extraction Well Vacuum CFM Well VR-1	5.2	-	5.2	5.5
Well VP-1 Vacuum *H ₂ O Dist. 6.0 ft	0.80	0.01	0.88	0.95
Well VP-2 Vacuum *H ₂ O Dist. 6.0 ft	1.85	0	1.88	2.05
Well VP-3 Vacuum *H ₂ O Dist. 6.0 ft	0.04	0	0.03	0.03
Well VP-4 Vacuum *H ₂ O Dist. 6.0 ft	2.30	0.01	2.35	2.50
Well VP-5 Vacuum *H ₂ O Dist. 6.0 ft	1.95	0.02	2.05	2.30
Well VP-6 Vacuum *H ₂ O Dist. 6.0 ft	2.20	0.02	2.32	2.55
Well MW-16 Vacuum *H ₂ O Dist. 18.0 ft	0.70	0.33	0.59	0.83
Well MW-24 Vacuum *H ₂ O Dist. 24.0 ft	0.76	0.20	0.66	0.95
Well MW-25 Vacuum *H ₂ O Dist. 23.0 ft	0.85	0.50	0.62	0.97
Well VR-2 Vacuum *H ₂ O Dist. 50.0 ft	0.72	0.06	0.77	0.94
Well VR-4 Vacuum *H ₂ O Dist. 75.0 ft	0.37	0.07	0.39	0.54
Well MW-21 Vacuum *H ₂ O Dist. 184.0 ft	0.21	0.05	0.25	0.37
Well VR-3 Vacuum *H ₂ O Dist. 100.0 ft	0.46	0.08	0.42	0.52
Well MW-17 Vacuum *H ₂ O Dist. 118.0 ft	0.10	0.01	0.18	0.12
Well VR-5 Vacuum *H ₂ O Dist. 100.0 ft	0.50	0.09	0.45	0.55
Well MW-22 Vacuum *H ₂ O Dist. 235.0 ft	0.57	0.52	0.38	0.68
Well MW-23 Vacuum *H ₂ O Dist. 204.0 ft	0.64	0.52	0.38	0.64

-() Indicates Well Pressure

ND - No Data

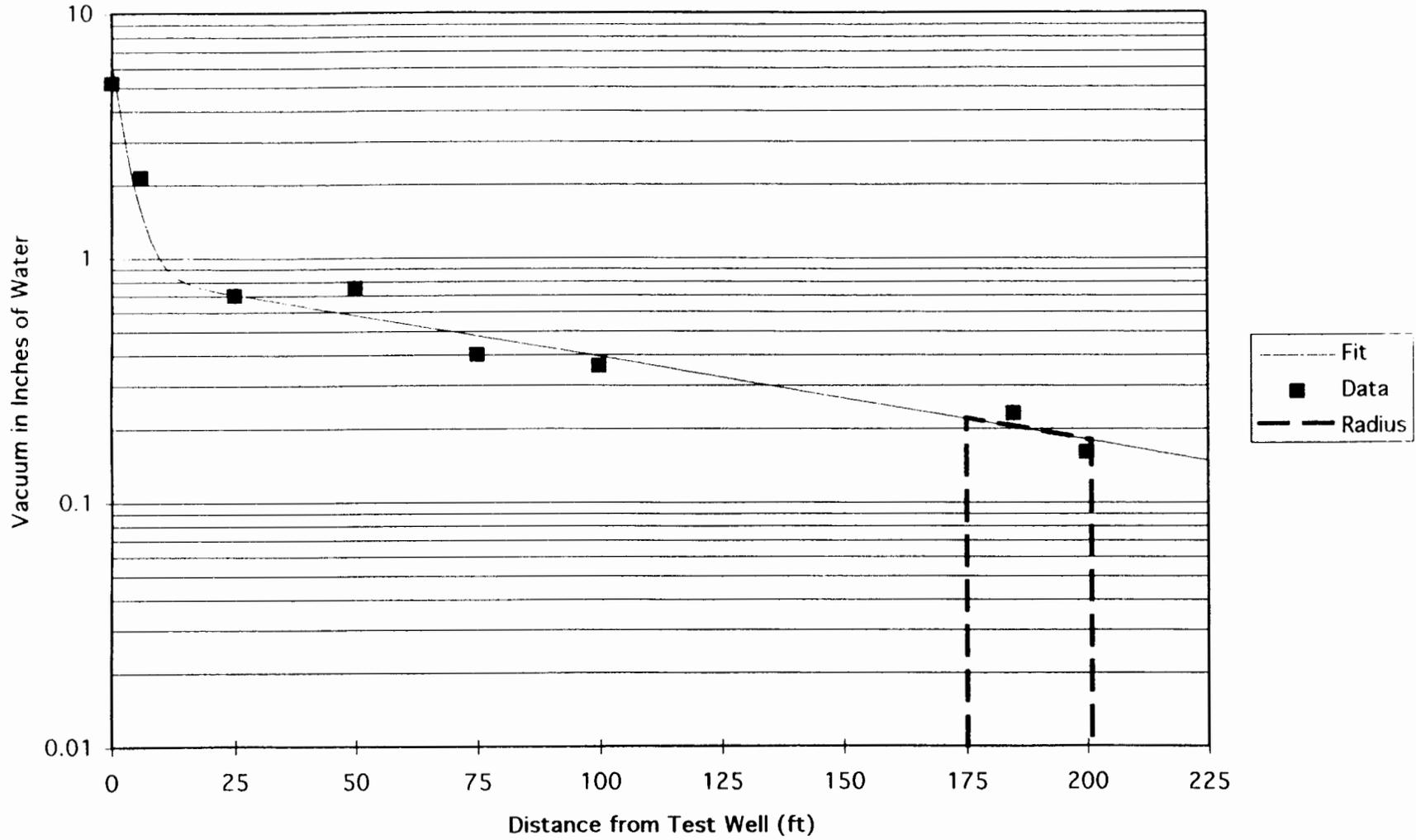
2/28/97	Static Data Time 1115	First Data Time 1145	Second Data Time 1200	Third Data Time 1230	Fourth Data Time 1300	Fifth Data Time 1330
Horiba HC ppm	-	ND	242	ND	278	ND
Horiba CO ₂ %	-	ND	2.76	ND	3.02	ND
Horiba O ₂ %	-	ND	ND	ND	17.6	ND
Influent Vapor Temp °F	-	56	56	56	56	56
Barometric Pressure *Hg	29.57	29.56	29.56	29.54	29.53	29.54
Extraction Well Flow CFM Well VR-1	-	68	68	68	68	68
Extraction Well Vacuum CFM Well VR-1	-	5.0	5.2	5.2	5.1	5.1
Well VP-1 Vacuum *H ₂ O Dist. 6.0 ft	0	0.74	0.72	0.70	0.67	0.75
Well VP-2 Vacuum *H ₂ O Dist. 6.0 ft	0	1.75	1.75	1.75	1.65	1.75
Well VP-3 Vacuum *H ₂ O Dist. 6.0 ft	0.01	0.03	0.01	0.03	0.02	0.04
Well VP-4 Vacuum *H ₂ O Dist. 6.0 ft	0	2.10	2.20	2.20	2.00	2.20
Well VP-5 Vacuum *H ₂ O Dist. 6.0 ft	0	1.80	1.85	1.85	1.70	1.75
Well VP-6 Vacuum *H ₂ O Dist. 6.0 ft	0	2.00	2.15	2.15	1.95	2.10
Well MW-16 Vacuum *H ₂ O Dist. 18.0 ft	0.01	0.03	0	0	-(.22)	-(.26)
Well MW-24 Vacuum *H ₂ O Dist. 24.0 ft	-(.02)	0.17	0.35	0.45	0.36	0.48
Well MW-25 Vacuum *H ₂ O Dist. 23.0 ft	-(.01)	0.08	0.16	0.17	0.09	0.20
Well VR-2 Vacuum *H ₂ O Dist. 50.0 ft	0	0.54	0.58	0.58	0.55	0.60
Well VR-4 Vacuum *H ₂ O Dist. 75.0 ft	0.01	0.15	0.21	0.22	0.13	0.22
Well MW-21 Vacuum *H ₂ O Dist. 184.0 ft	-(.05)	0.02	0.05	0.02	-(.12)	0.04
Well VR-3 Vacuum *H ₂ O Dist. 100.0 ft	0	0.16	0.22	0.21	0.15	0.26
Well MW-17 Vacuum *H ₂ O Dist. 118.0 ft	0.01	0.04	0.04	0.06	0.07	0.05
Well VR-5 Vacuum *H ₂ O Dist. 100.0 ft	-(.05)	0.19	0.25	0.22	0.15	0.32
Well MW-22 Vacuum *H ₂ O Dist. 235.0 ft	0.02	-(.10)	-(.17)	-(.22)	-(.40)	-(.37)
Well MW-23 Vacuum *H ₂ O Dist. 204.0 ft	0.02	-(.12)	-(.16)	-(.30)	-(.36)	-(.34)

-() Indicates Well Pressure

2/28/97	Sixth Data Time 1400	Seventh Data Time 1430	Eighth Data Time 1500	Static Data Time 1545	Average Data 3.6 Hrs	Maximum Data
Horiba HC ppm	ND	ND	254	-	258	278
Horiba CO ₂ %	ND	ND	2.78	-	2.85	3.02
Horiba O ₂ %	ND	ND	19.7	-	18.65	19.7
Influent Vapor Temp °F	56	56	56	-	56	56
Barometric Pressure *Hg	29.55	29.55	29.56	29.57	29.55	29.57
Extraction Well Flow CFM Well VR-1	68	68	68	-	68	68
Extraction Well Vacuum CFM Well VR-1	5.2	5.2	5.3	-	5.16	5.3
Well VP-1 Vacuum *H ₂ O Dist. 6.0 ft	0.84	0.83	0.88	0.03	0.77	0.88
Well VP-2 Vacuum *H ₂ O Dist. 6.0 ft	1.80	1.80	1.90	0.03	1.77	1.90
Well VP-3 Vacuum *H ₂ O Dist. 6.0 ft	0.04	0.02	0.02	0	0.03	0.04
Well VP-4 Vacuum *H ₂ O Dist. 6.0 ft	2.30	2.30	2.40	0.04	2.21	2.40
Well VP-5 Vacuum *H ₂ O Dist. 6.0 ft	2.00	2.00	2.10	0.06	1.88	2.10
Well VP-6 Vacuum *H ₂ O Dist. 6.0 ft	2.20	2.25	2.35	0.06	2.14	2.35
Well MW-16 Vacuum *H ₂ O Dist. 18.0 ft	-(.14)	-(.04)	0.02	-(.03)	-(.08)	0.03
Well MW-24 Vacuum *H ₂ O Dist. 24.0 ft	0.58	0.70	0.82	0.43	0.49	0.82
Well MW-25 Vacuum *H ₂ O Dist. 23.0 ft	0.32	0.44	0.60	0.43	0.26	0.60
Well VR-2 Vacuum *H ₂ O Dist. 50.0 ft	0.72	0.74	0.82	0.10	0.64	0.82
Well VR-4 Vacuum *H ₂ O Dist. 75.0 ft	0.37	0.43	0.47	0.06	0.28	0.47
Well MW-21 Vacuum *H ₂ O Dist. 184.0 ft	0.16	0.18	0.24	0.07	0.07	0.24
Well VR-3 Vacuum *H ₂ O Dist. 100.0 ft	0.38	0.38	0.49	0.08	0.28	0.49
Well MW-17 Vacuum *H ₂ O Dist. 118.0 ft	0.06	0.10	0.15	0	0.07	0.15
Well VR-5 Vacuum *H ₂ O Dist. 100.0 ft	0.38	0.41	0.49	0.09	0.30	0.49
Well MW-22 Vacuum *H ₂ O Dist. 235.0 ft	-(.25)	-(.14)	0.06	0.10	-(.20)	0.06
Well MW-23 Vacuum *H ₂ O Dist. 204.0 ft	-(.24)	-(.15)	0.03	0.07	-(.21)	0.03

-() Indicates Well Pressure

Radius of Influence Data from Tests #1, 2 & 3





Location: SPARTON TECHNOLOGY, INC. - RIO RANCHO NM Project Engr: SADLER / LUNDEREN								
Date:		02-27-97	-	-	-	-	-	
Parameters	Time	0740	0845	0915	0945	1015	1045	
	Hr Meter	1058.5	1058.8	1059.3	1059.8	1060.3	1060.8	
ENGINE/BLOWER	R.P.M.	1800	2150	1800	1800	2150	2150	
	Oil Pressure	psi	50	50	50	50	50	
	Water Temp	°F	140	160	160	160	160	
	Volts		14	14	14	14	14	
	Intake Vac	"Hg	17	16	14	14	15	14
	Gas Flow Fuel/Propane	cfh	120	135	120	120	150	135
ATMOSPHERE/VAPORS/AIR	Fresh Air Flow	cfm	.5 / 38	.15 / 20	.15 / 20	.15 / 20	.15 / 20	.1 / 17
	Extraction Well Flow VR-1	cfm	-	.2 / 25	.2 / 25	.2 / 25	.2 / 25	.4 / 35
	Extraction Well Vac VR-1	"H ₂ O	-	1.8	2.0	2.0	2.0	2.6
	Influent Vapor Temp VR-1	°F	-	52	54	54	55	55
	Air Temp	°F	42	42	44	47	48	48
	Barometric Pressure	"Hg	29.74	29.75	29.74	29.75	29.72	29.72
	MONITOR WELL VACUUM	VP-1	"H ₂ O	.03	.20	.30	.26	.25
VP-2		"H ₂ O	.04	.56	.70	.62	.64	.86
VP-3		"H ₂ O	.03	.03	.02	.01	.0	(.01)
VP-4		"H ₂ O	.03	.64	.86	.76	.78	1.00
VP-5		"H ₂ O	.05	.66	.72	.64	.60	.84
VP-6		"H ₂ O	.03	.76	.82	.74	.72	.98
MW-16		"H ₂ O	0	.04	.02	(.24)	(.39)	(.56)
MW-24		"H ₂ O	(.04)	(.16)	(.32)	(.11)	(.19)	(.16)
MW-25		"H ₂ O	(.01)	(.03)	(.10)	(.34)	(.20)	(.26)
VR-2		"H ₂ O	.04	.21	.22	.15	.11	.15
VR-4		"H ₂ O	.04	.06	.08	(.03)	(.07)	(.08)
MW-21		"H ₂ O	.04	.05	.02	(.11)	(.15)	(.17)
VR-3		"H ₂ O	.04	.10	.06	.01	(.07)	(.10)
MW-17		"H ₂ O	.02	.03	.01	.03	.03	.03
VR-5		"H ₂ O	.03	.09	.07	.03	0	0
MW-22		"H ₂ O	.01	0	(.20)	(.40)	(.58)	(.76)
MW-23	"H ₂ O	-	-	-	(.58)	(.74)	(.90)	
MANIFOLD	SVE	On/Off	OFF	ON	ON	ON	ON	ON
	Air Injection Pressure	psi	N/A	-	-	-	-	-
	Air Injection Flow	cfm	N/A	-	-	-	-	-
Samples								

TEST	Instrument	HORIBA	HORIBA	HORIBA	HORIBA		
	Time	0910	0930	1000	1030		
VAPOR/INFLUENT	HC ppm	550	462		392		
	CO ₂ %	4.74	4.42		4.12		
	CO %	0	0				
	O ₂ %	16.9	16.8				
EMISSIONS	HC ppm			75			
	CO ₂ %			2.50			
	CO %			.36			
	Air/Fuel Ratio %						

OPERATING DATA AND NOTES

DATE: 02/27/97

TEST NO: 1 Page No: 1

0620	Arrived at location - Positioned SUE System near VR-1 as the extraction well (EW)
0700	Opened all wells - Fitted outer wells with plugs
0715	Calibrated instruments
0740	STARTED SUE System for check and warm up Recorded static well data
0845	START TEST #1 ^{HAS-1058^{LD}} - EW set @ 25cfm - Voe @ 1.8 "H ₂ O - Initial response on outer wells EGT = 950°F
0910	HORIBA Data - Influent Vapors - HC @ 550ppm, CO ₂ = 4.74%
0915	Recorded data - EW steady @ 2.0" H ₂ O Flow @ 25cfm Interwells steady - Outer wells decreasing
0930	HORIBA Data - HC @ 462 ppm CO ₂ = 4.42 CO = 0
0945	Recorded data - Inter and outer wells indicating decreasing trend
1015	Recorded data - Wells mostly stabilized - All Systems steady
1030	HORIBA Data - HC @ 392 ppm, CO ₂ @ 4.12%
1035	Increased EW flow to 35cfm, Voe @ 2.5" H ₂ O
1045	Recorded Data - Interwells on increasing trend - outer wells decreasing



Location: SPARTON TECHNOLOGY, INC - - RIO RANCHO, NM Project Engr: SADLER / LUNDGREN								
Date:		02-27-97	-	-	-	-		
Parameters	Time	1115	1145	1215	1245	1315	1345	
	Hr Meter	1061.3	1061.8	1062.3	1062.8	1063.3	1063.8	
ENGINE/BLOWER	R.P.M.	2000	2100	2100	2100	2400	2400	
	Oil Pressure	psi	50	50	50	50	50	
	Water Temp	°F	160	160	160	160	170	170
	Volts		14	14	14	14	14	14
	Intake Vac	*Hg	14	13	13	13	13	13
	Gas Flow Fuel/Propane	cfh	135	145	145	145	160	160
ATMOSPHERE/VAPORS/AIR	Fresh Air Flow	cfm	11	0	0	0	0	
	Extraction Well Flow VR-1	cfm	.4 / 35	.81 / 50	.81 / 50	.81 / 50	.10 / 55	.11 / 55
	Extraction Well Vac VR-1	*H ₂ O	2.6	3.6	3.6	3.6	4.1	4.1
	Influent Vapor Temp VR-1	°F	55	55	56	56	56	56
	Air Temp	°F	48	50	50	51	53	54
	Barometric Pressure	*Hg	29.68	29.64	29.63	29.58	29.56	29.54
MONITOR WELL VACUUM	VP-1	*H ₂ O	.36	.45	.50	.52	.54	.54
	VP-2	*H ₂ O	.86	1.05	1.15	1.20	1.30	1.30
	VP-3	*H ₂ O	.01	.01	.01	.01	.01	.01
	VP-4	*H ₂ O	1.02	1.30	1.45	1.50	1.40	1.60
	VP-5	*H ₂ O	.82	1.05	1.15	1.20	1.25	1.30
	VP-6	*H ₂ O	.96	1.25	1.35	1.40	1.50	1.55
	MW-16	*H ₂ O	(.74)	0	.03	.02	.03	.02
	MW-24	*H ₂ O	(.14)	(.19)	0	0	(.05)	0.0
	MW-25	*H ₂ O	(.37)	(.50)	(.48)	(.56)	(.66)	(.74)
	VR-2	*H ₂ O	.12	.20	.30	.30	.32	.32
	VR-4	*H ₂ O	(.10)	(.07)	.02	(.04)	(.05)	0.0
	MW-21	*H ₂ O	(.22)	(.19)	(.12)	(.18)	(.17)	(.15)
	VR-3	*H ₂ O	(.13)	(.03)	.04	(.06)	0	0.0
	MW-17	*H ₂ O	.01	.02	.04	.03	.03	0.04
	VR-5	*H ₂ O	(.11)	.02	.05	.01	.02	.04
	MW-22	*H ₂ O	(.43)	(1.15)	(1.20)	(1.40)	(1.65)	(1.70)
MW-23	*H ₂ O	(1.20)	(1.40)	(1.50)	(1.65)	(1.85)	(1.95)	
MANIFOLD	SVE	On/Off	ON	ON	ON	ON	ON	
	Air Injection Pressure	psi	N/A	-	-	-	-	
	Air Injection Flow	cfm	N/A	-	-	-	-	
Samples								

TEST	Instrument	HORIBA	HORIBA	HORIBA			
	Time	1100	1140	1300			
VAPOR/INFLUENT	HC ppm	352	352	312			
	CO ₂ %	3.48	3.96	3.70			
	CO %	0	0	0			
	O ₂ %	15.8	15.3	15.0			
EMISSIONS	HC ppm						
	CO ₂ %						
	CO %						
	Air/Fuel Ratio %						

OPERATING DATA AND NOTES

DATE: 02/27/97

TEST NO: 1 Page No: 2

1100	HORIBA DATA - HC @ 352, CO ₂ @ 3.48% - HNU 610 ppm
1115	Recorded data - Barometric pressure decreasing rapidly All observation wells being influenced - EW flow = 35 cfm, Vac = 2.6" H ₂ O
1130	Increased EW flow to 50 cfm, Vacuum @ 3.40" H ₂ O
1140	HORIBA DATA - HC = 352 ppm CO ₂ = 3.46% O ₂ = 15.3 HNU = 560 ppm
1145	Recorded data - Increased Flow and Vac affecting all wells - on increasing trend - EW flow @ 50 cfm, Vac @ 3.6" H ₂ O Barometric pressure still on decreasing trend
1215	Recorded data - All inter and most outer wells on increasing vacuum trend - Slight decrease in Barometric press
1245	Recorded data - Barometric pressure on rapid decrease - Affecting all wells - Flow @ 50 cfm - Vac @ 3.6" H ₂ O
1300	HORIBA Data HC @ 312 ppm, CO ₂ @ 3.70% O ₂ @ 15% HNU 520 ppm
1310	Increased well flow to 55 cfm - Vac @ 4" H ₂ O
1315	Recorded data - Inter wells on slight increasing vac. trend - Other steady to decreasing - Barometric press decreasing trend
1345	Recorded data - All wells mostly steady - EW Flow @ 55 cfm Vac @ 4.1" H ₂ O - All Systems normal Barometric ↓



Location: SPARTON TECHNOLOGY, INC. - RIO RANCHO NM Project Engr: SADLER / LUNDGREN							
Date:		02-27-97	-	-			
Parameters	Time	1415	1445	1515	1545	1615	1645
	Hr Meter	1064.3	1064.8	1065.3	1065.8	1066.3	1066.8
ENGINE/BLOWER	R.P.M.	2400	2400	2400	2400	2400	2400
	Oil Pressure psi	50	50	50	50	50	50
	Water Temp °F	170	170	170	170	170	160
	Volts	14	14	14	14	14	14
	Intake Vac "Hg	13	11	11	11	11	11
	Gas Flow Fuel/Propane cfh	150	150	150	160	160	160
ATMOSPHERE/VAPORS/AIR	Fresh Air Flow cfm	0	0	0	0	-	0
	Extraction Well Flow VR-1 cfm	1.1/55	1.5/65	1.5/65	1.6/68	1.6/65	1.6/68
	Extraction Well Vac VR-1 "H ₂ O	4.1	5.0	5.0	5.4	5.4	5.4
	Influent Vapor Temp VR-1 °F	56	56	56	56	56	56
	Air Temp °F	54	51	48	46	41	37
	Barometric Pressure "Hg	29.53	29.53	29.53	29.56	29.58	29.60
MONITOR WELL VACUUM	VP-1 "H ₂ O	.62	.78	.76	.87	.61	.90
	VP-2 "H ₂ O	1.42	1.75	1.75	1.85	1.80	1.95
	VP-3 "H ₂ O	.01	.02	.02	.03	.02	.07
	VP-4 "H ₂ O	1.75	2.18	2.20	2.35	2.35	2.50
	VP-5 "H ₂ O	1.43	1.80	1.90	2.00	2.00	2.15
	VP-6 "H ₂ O	1.65	2.10	2.15	2.30	2.30	2.40
	MW-16 "H ₂ O	.03	.03	.03	.04	.14	.47
	MW-24 "H ₂ O	.12	.48	.57	.82	.92	1.00
	MW-25 "H ₂ O	(.66)	(.26)	(.03)	.31	.52	.85
	VR-2 "H ₂ O	.43	.66	.65	.84	.80	.90
	VR-4 "H ₂ O	.13	.29	.32	.49	.43	.49
	MW-21 "H ₂ O	(.05)	.09	.13	.30	.27	.32
	VR-3 "H ₂ O	.16	.30	.32	.50	.45	.50
	MW-17 "H ₂ O	.04	.05	.06	.10	.10	.11
	VR-5 "H ₂ O	.19	.35	.34	.50	.47	.50
MW-22 "H ₂ O	(1.70)	(1.60)	(1.40)	(1.15)	(1.00)	(.70)	
MW-23 "H ₂ O	(1.90)	(1.70)	(1.60)	(1.20)	(1.05)	(.75)	
MANIFOLD	SVE On/Off	ON	ON	ON	ON		
	Air Injection Pressure psi	N/A	-	-	-	-	-
	Air Injection Flow cfm	N/A	-	-	-	-	-
Samples							

TEST	Instrument	HORIBA	HORIBA	HORIBA	HORIBA		
	Time	1400	1435	1530	1535		
VAPOR/INFLUENT	HC ppm	308	310	286	284		
	CO ₂ %	3.52	3.56	3.48	3.42		
	CO %	0	0	0	0		
	O ₂ %	16.9	-				
EMISSIONS	HC ppm				175		
	CO ₂ %				10.23		
	CO %				.25		
	Air/Fuel Ratio %				20.1		

OPERATING DATA AND NOTES

DATE: 02/27/97

TEST NO: 1 Page No: 3

1400	HORIBA Data - HC @ 308 ppm, CO ₂ @ 3.52% O ₂ @ 16.9% H ₂ O = 620
1415	Recorded Data - Outer & Inter wells indicating increasing vacuum trend MW-22 & 23 used for reference ↓
1420	Increased EW Flow to 65 cfm, Vac @ 5.0" H ₂ O
1435	HORIBA Data - HC @ 310, CO ₂ @ 3.50 CO = 0 H ₂ O @ 620 ppm
1445	Recorded Data - All wells on increasing vacuum trend - Barometric pressure steady - EW flow @ 65 cfm, Vac @ 5.0" H ₂ O
1515	Recorded Data - Outer and Inter wells steady to slight increasing trend - Barometric pressure steady
1530	Increased EW flow to 68 cfm, Vacuum @ 5.2" H ₂ O
1530	HORIBA Data - HC @ 286 ppm - CO ₂ @ 3.48 O ₂ @ 7% H ₂ O @ 600 ppm
1535	HORIBA Data - Emissions
1545	Recorded data - All wells on increasing vacuum trend - Barometric press increasing - EW flow @ 68 cfm - Vac @ 5.4" H ₂ O
1615	Recorded data - All wells steady to slight variations EW vacuum @ 5.4" H ₂ O, flow @ 68 cfm BAR PRESS ↑
1645	Recorded data - All wells indicating increasing vacuum trend. BAR PRESS ↑ - All systems steady



Location: SPARTON TECHNOLOGY, INC. - RIO RANCHO UM Project Engr: SADLER / LUNDEREN							
Date:		02-27-97	-				
Parameters	Time	1715	1745	Time	Time	Time	Time
	Hr Meter	1067.3	1067.8	Hr Meter	Hr Meter	Hr Meter	Hr Meter
ENGINE/BLOWER	R.P.M.	2400	1800				
	Oil Pressure	psi	50	50			
	Water Temp	°F	160	160			
	Volts		14	14			
	Intake Vac	*Hg	11	17			
	Gas Flow Fuel/Propane	cfh	150	100			
ATMOSPHERE/VAPORS/AIR	Fresh Air Flow	cfm	0	0			
	Extraction Well Flow VR-1	cfm	16 / 68	30			
	Extraction Well Vac VR-1	*H ₂ O	5.4	-			
	Influent Vapor Temp VR-1	°F	56	-			
	Air Temp	°F	38	46			
	Barometric Pressure	*Hg	29.61	29.61			
MONITOR WELL VACUUM	VP-1	*H ₂ O	.82	.05	STATIC WELLS DATA		
	VP-2	*H ₂ O	1.85	.08			
	VP-3	*H ₂ O	.02	.03			
	VP-4	*H ₂ O	2.30	.12			
	VP-5	*H ₂ O	2.00	.12			
	VP-6	*H ₂ O	2.30	.12			
	MW-16	*H ₂ O	.48	.16			
	MW-24	*H ₂ O	.90	.48			
	MW-25	*H ₂ O	.90	.50			
	VR-2	*H ₂ O	.75	.13			
	VR-4	*H ₂ O	.39	.12			
	MW-21	*H ₂ O	.20	.08			
	VR-3	*H ₂ O	.40	.08			
	MW-17	*H ₂ O	.08	.02			
	VR-5	*H ₂ O	.44	.02			
	MW-22	*H ₂ O	(.62)	(.60)			
MW-23	*H ₂ O	(.70)	(.64)				
	*H ₂ O						
MANIFOLD	SVE	On/Off	ON	OFF			
	Air Injection Pressure	psi	N/A	-	-	-	-
	Air Injection Flow	cfm	N/A	-	-	-	-
Samples							

TEST	Instrument						
	Time						
VAPOR/INFLUENT	HC	ppm					
	CO ₂	%					
	CO	%					
	O ₂	%					
EMISSIONS	HC	ppm					
	CO ₂	%					
	CO	%					
	Air/Fuel Ratio	%					

OPERATING DATA AND NOTES

DATE: 02/27/97

TEST NO: 1 Page No: 4

1715	Recorded data - All well indicating slight variations, steady to off slightly - Slight increase in Barometric pressure - EW flow and vacuum steady
1720	Shut off SUE on well UR-1 All wells remained plugged
1745	Recorded static well data - Residual vacuums remained on all wells x MW 22-23 which remained under pressure, Barometric pressure was steady
	TEST # 1 Completed - 9.3 Hrs
0630	Closed and secured all outside wells - Departed site.



Location: SPARTON TECHNOLOGY, INC. - RIO RANCHO UM Project Engr: SADLER / LUNDGREN						
Date:		02-28-97	-	-	-	-
Parameters	Time	Time	Time	Time	Time	Time
	Hr Meter	Hr Meter	Hr Meter	Hr Meter	Hr Meter	Hr Meter
	0730	0745	0800	0830	0900	0930
	1068.2	1068.4	1068.7	1069.2	1069.8	1170.3
ENGINE/BLOWER	R.P.M.	1400	2400	2400	2400	2400
	Oil Pressure psi	60	50	50	50	50
	Water Temp °F	140	160	160	160	160
	Volts	14	14	14	14	14
	Intake Vac *Hg	17	11	11	11	11
	Gas Flow Fuel/Propane cfh	105	150	155	155	155
ATMOSPHERE/VAPORS/AIR	Fresh Air Flow cfm	33	0	0	0	0
	Extraction Well Flow VR-1 cfm	-	1.55/68	1.55/68	1.6/68	1.6/68
	Extraction Well Vac VR-1 *H ₂ O	-	4.8	5.0	5.3	5.5
	Influent Vapor Temp VR-1 °F	-	55	55	55	55
	Air Temp °F	38	38	40	41	38
	Barometric Pressure *Hg	29.48	29.48	29.49	29.50	29.52
MONITOR WELL VACUUM	VP-1 *H ₂ O	.01	.80	.88	.45	.95
	VP-2 *H ₂ O	.01	1.70	1.85	1.90	1.95
	VP-3 *H ₂ O	.02	.02	.02	.03	.02
	VP-4 *H ₂ O	0	2.10	2.30	2.40	2.50
	VP-5 *H ₂ O	0	1.80	2.00	2.10	2.30
	VP-6 *H ₂ O	0	2.10	2.35	2.30	2.55
	MW-16 *H ₂ O	0	.33	.41	.47	.81
	MW-24 *H ₂ O	.02	.23	.47	.62	.93
	MW-25 *H ₂ O	0	.15	.35	.50	.88
	VR-2 *H ₂ O	.02	.58	.72	.80	.94
	VR-4 *H ₂ O	.02	.23	.31	.44	.54
	MW-21 *H ₂ O	.01	.10	.19	.27	.37
	VR-3 *H ₂ O	.01	.24	.35	.45	.52
	MW-17 *H ₂ O	(.02)	.25	.39	.10	.12
	VR-5 *H ₂ O	0	.24	.38	.50	.52
	MW-22 *H ₂ O	0	.04	.14	.29	.56
MW-23 *H ₂ O	.02	.04	.13	.31	.56	
MANIFOLD	SVE On/Off	OFF	ON	ON	ON	ON
	Air Injection Pressure psi	N/A	-	-	-	-
	Air Injection Flow cfm	N/A	-	-	-	-
Samples						

TEST	Instrument		Horiba	Horiba			
	Time		0900	0930			
VAPOR/INFLUENT	HC	ppm	246	264			
	CO ₂	%	3.42	3.20			
	CO	%	0	0			
	O ₂	%	17.3	17.2			
EMISSIONS	HC	ppm					
	CO ₂	%					
	CO	%					
	Air/Fuel Ratio	%					

OPERATING DATA AND NOTES

DATE: 02/28/97

TEST NO: 2 Page No: 1

0700	Arrived at site - Made system ready - Calibrated instruments - Plugged outer wells
0730	Recorded static well data - START TEST # ^{HRS = 1068.2} 2 - Flow @ 68 CFM - Vacuum at 4.8" H ₂ O
0745	Recorded data - All wells indicated an immediate response to the initial EW flow & vacuum, Bar Press - Steady
0800	Recorded data - EW vac @ 5.2" H ₂ O, flow @ 68 CFM All wells continue on increasing vacuum trend Barometric pressure on slight increase
0815	HORIBA Data - HC = 246 ppm CO ₂ = 3.42% O ₂ = 17.3% H ₂ U = 600
0830	Recorded Data - Barometric pressure increasing, up 102" Hg All wells on increasing vacuum trend - System promotes steady
0900	Recorded Data - Barometric increased 102" Hg - All wells continue on increasing trend. - All System promotes steady
0930	HORIBA DATA - HC = 264 ppm, CO ₂ = 3.20% CO = 0% O ₂ = 17.2% H ₂ U = 600 ppm
0930	Recorded data - Barometric pressure on increasing trend - Outer and Inner wells steady to slight increases - Note vac increase on MW - 22 & 23



Location: SPARTON TECHNOLOGY, INC. - RIO RANCHO NM Project Engr: SADLER / LUNDGREN							
Date:		02-28-91	-				
Parameters	Time	Time	Time	Time	Time	Time	Time
	1000	1045					
	Hr Meter	Hr Meter	Hr Meter	Hr Meter	Hr Meter	Hr Meter	Hr Meter
	1170.8	1071.4					
ENGINE/BLOWER	R.P.M.	2400	1800				
	Oil Pressure psi	50	50				
	Water Temp °F	160	160				
	Volts	14	14				
	Intake Vac "Hg	11	16				
	Gas Flow Fuel/Propane cfh	155	110				
ATMOSPHERE VAPORS/AIR	Fresh Air Flow cfm	0	36				
	Extraction Well Flow VR-1 cfm	1.6 / 68	-				
	Extraction Well Vac VR-1 "H ₂ O	5.2	-				
	Influent Vapor Temp VR-1 °F	55	-				
	Air Temp °F	40	44				
	Barometric Pressure "Hg	29.56	29.57				
MONITOR WELL VACUUM	VP-1 "H ₂ O	.80	.01				
	VP-2 "H ₂ O	1.85	0				
	VP-3 "H ₂ O	.04	0				
	VP-4 "H ₂ O	2.30	.01				
	VP-5 "H ₂ O	1.95	.02				
	VP-6 "H ₂ O	2.20	.02				
	MW-16 "H ₂ O	.70	.33				
	MW-24 "H ₂ O	.76	.20				
	MW-25 "H ₂ O	.85	.50				
	VR-2 "H ₂ O	.72	.06				
	VR-4 "H ₂ O	.37	.07				
	MW-21 "H ₂ O	.21	.05				
	VR-3 "H ₂ O	.46	.08				
	MW-17 "H ₂ O	.10	.01				
	VR-5 "H ₂ O	.50	.09				
	MW-22 "H ₂ O	.57	.52				
MW-23 "H ₂ O	.64	.52					
	"H ₂ O						
MANIFOLD	SVE On/Off	ON	OFF				
	Air Injection Pressure psi	N/A	-	-	-	-	-
	Air Injection Flow cfm	N/A	-	-	-	-	-
Samples							

STATIC WELL DATA



Location: SPARTON TECHNOLOGY, INC - RIO RANCHO, NM Project Engr: SAILER / LUNDGREN							
Date:		02-28-97	-	-	-		
Parameters	Time	1115	1145	1200	1230	1300	1330
	Hr Meter	1072.0	1072.5	1072.8	1073.3	1073.8	1074.3
ENGINE/BLOWER	R.P.M.	1400	2400	2400	2400	2400	2400
	Oil Pressure psi	50	50	50	50	50	50
	Water Temp °F	160	170	170	170	170	170
	Volts	14	14	14	14	14	14
	Intake Vac *Hg	16	11	11	11	11	11
	Gas Flow Fuel/Propane cfm	100	170	170	170	170	170
ATMOSPHERE/VAPORS/AIR	Fresh Air Flow cfm	31	0	0	0	0	0
	Extraction Well Flow VR-1 cfm	—	1.6/68	1.6/68	1.6/68	1.6/68	1.6/68
	Extraction Well Vac VR-1 *H ₂ O	—	5.0	5.2	5.2	5.1	5.1
	Influent Vapor Temp VR-1 °F	—	56	56	56	56	56
	Air Temp °F	46	48	48	49	49	49
	Barometric Pressure *Hg	29.57	29.56	29.56	29.54	29.53	29.54
MONITOR WELL VACUUM	VP-1 *H ₂ O	0	.74	.72	.70	.67	.75
	VP-2 *H ₂ O	0	1.75	1.75	1.75	1.65	1.75
	VP-3 *H ₂ O	.01	.03	.01	.03	.02	.04
	VP-4 *H ₂ O	0	2.10	2.20	2.20	2.00	2.20
	VP-5 *H ₂ O	0	1.80	1.85	1.85	1.70	1.75
	VP-6 *H ₂ O	0	2.00	2.15	2.15	1.95	2.10
	MW-16 *H ₂ O	.01	.03	0	0	(.22)	(.26)
	MW-24 *H ₂ O	(.02)	.17	.35	.45	.36	.48
	MW-25 *H ₂ O	(.01)	.08	.16	.17	.09	.20
	VR-2 *H ₂ O	0	.54	.58	.58	.55	.60
	VR-4 *H ₂ O	.01	.15	.21	.22	.13	.22
	MW-21 *H ₂ O	(.05)	.02	.05	.02	(.12)	.04
	VR-3 *H ₂ O	0	.16	.22	.21	.15	.26
	MW-17 *H ₂ O	.01	.04	.04	.06	.07	.05
	VR-5 *H ₂ O	(.05)	.19	.25	.22	.15	.32
	MW-22 *H ₂ O	(.02)	(.10)	(.17)	(.22)	(.40)	(.37)
MW-23 *H ₂ O	(.02)	(.12)	(.16)	(.30)	(.36)	(.34)	
	*H ₂ O						
MANIFOLD	SVE On/Off	OFF	ON	ON	ON	ON	ON
	Air Injection Pressure psi	N/A	—	—	—	—	—
	Air Injection Flow cfm	N/A	—	—	—	—	—
Samples							

TEST	Instrument	HORIBA	HORIBA				
	Time	1200	1315				
VAPOR/INFLUENT	HC	ppm	242	278			
	CO ₂	%	2.76	3.02			
	CO	%	0	0			
	O ₂	%	—	17.6			
EMISSIONS	HC	ppm					
	CO ₂	%					
	CO	%					
	Air/Fuel Ratio	%					

OPERATING DATA AND NOTES

DATE: 02/28/97

TEST NO: 3 Page No: 1

1115	Recorded static well data
1130	START TEST # 3 - EW Flow @ 68cfm, initial vacuum @ 4.5 "H ₂ O
1145	Recorded data - All wells ^{1072.2} responding to the EW flow and vacuum - Barometric pressure steady to slight decrease - All systems normal EW vac @ 5.0 "H ₂ O
1200	Recorded data - Barometric pressure steady - EW flow @ 68cfm, vac @ 5.2" - All wells, K MW-19-22 & 23, are indicating an increasing vacuum trend
1230	Recorded data - Outer and inner wells mostly steady Barometric pressure on decreasing trend - All systems parameters steady
1300	Recorded data - Barometric press. continues on decreasing trend with direct affect on all wells. All wells on a decreasing vacuum trend. System parameters - steady
1315	HORIBA Data - HC 278 ppm, CO ₂ 3.02%, CO 0% O ₂ 17.6% HWU 720 ppm
1330	Recorded Data - All wells on an increasing vacuum trend - BAR PRESS trending up - Systems normal



Location: SPARTON TECHNOLOGY, INC. - RIO RANCHO, NM Project Engr: SALLIER / LUNDGREN						
Date:		02-28-97	-	-	-	-
Parameters	Time	Time	Time	Time	Time	Time
	1400	1430	1500	1545	1600	
	Hr Meter	Hr Meter	Hr Meter	Hr Meter	Hr Meter	Hr Meter
	1074.8	1075.3	1075.8	1076.0		
ENGINE/BLOWER	R.P.M.	2400	2400	2400	-	
	Oil Pressure psi	50	50	50	-	
	Water Temp °F	170	170	170	-	
	Volts	14	14	14	-	
	Intake Vac *Hg	11	11	11	-	
	Gas Flow Fuel/Propane cfm	165	165	165	-	
ATMOSPHERE/VAPORS/AIR	Fresh Air Flow cfm	0	0	0	-	
	Extraction Well Flow VR-1 cfm	1.6/68	1.6/68	1.6/68	-	
	Extraction Well Vac VR-1 *H ₂ O	5.2	5.2	5.3	-	
	Influent Vapor Temp VR-1 °F	56	56	56	-	
	Air Temp °F	48	49	48	47	
	Barometric Pressure *Hg	29.55	29.55	29.56	29.57	
MONITOR WELL VACUUM	VP-1 *H ₂ O	.84	.83	.88	.03	
	VP-2 *H ₂ O	1.80	1.80	1.90	.03	
	VP-3 *H ₂ O	.04	.02	.02	.0	
	VP-4 *H ₂ O	2.30	2.30	2.40	.04	
	VP-5 *H ₂ O	2.00	2.00	2.10	.06	
	VP-6 *H ₂ O	2.20	2.25	2.35	.06	
	MW-16 *H ₂ O	(.14)	(.04)	.02	(.03)	
	MW-24 *H ₂ O	.58	.70	.82	.43	.03
	MW-25 *H ₂ O	.32	.44	.60	.43	.03
	VR-2 *H ₂ O	.72	.74	.82	.10	
	VR-4 *H ₂ O	.37	.43	.47	.06	
	MW-21 *H ₂ O	.16	.18	.24	.07	
	VR-3 *H ₂ O	.38	.38	.49	.08	
	MW-17 *H ₂ O	.06	.10	.15	.00	
	VR-5 *H ₂ O	.38	.41	.49	.09	
	MW-22 *H ₂ O	(.25)	(.14)	.06 v	.10 v	
MW-23 *H ₂ O	(.24)	(.15)	.03 v	.07 v		
	*H ₂ O					
MANIFOLD	SVE On/Off	ON	ON	ON	OFF	
	Air Injection Pressure psi	N/A	-	-	-	-
	Air Injection Flow cfm	N/A	-	-	-	-
Samples						

STATIC WELL DATA - NOT VIEWED

STATIC WELL DATA - VENTED

TEST	Instrument	HORIBA					
	Time	1450					
VAPOR/INFLUENT	HC ppm	254					
	CO ₂ %	2.78					
	CO %	0					
	O ₂ %	14.7					
EMISSIONS	HC ppm						
	CO ₂ %						
	CO %						
	Air/Fuel Ratio %						

OPERATING DATA AND NOTES

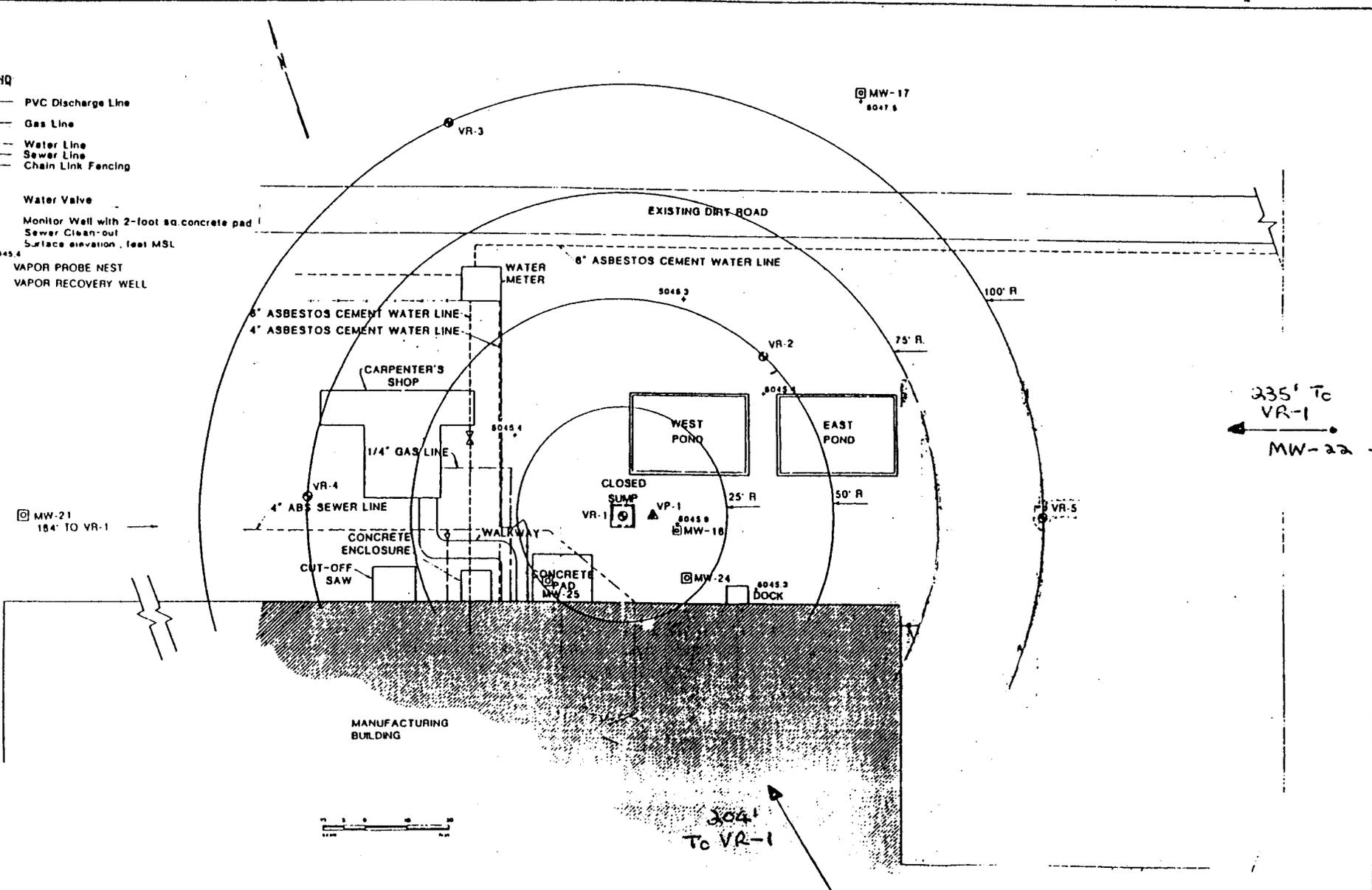
DATE: 02/28/97

TEST NO: 3 Page No: 2

1400	Recorded data - All wells indicating an increasing vacuum trend, barometric pressure recorded slight increase. All system parameter steady - EW steady @ 68 CFM, 53" H ₂ O
1430	Recorded data, System parameters steady - Barometric pressure steady, Vacuum on actu and inhar wells mostly steady
1450	HORIBA DATA - HC = 254 ppm, CO ₂ = 2.78%, O ₂ = 14.7%, H ₂ O = 730 ppm
1500	Recorded data - All wells indicating an increasing vacuum trend, Slight increase in barometric pressure - Note wells M-22 & 23 now receiving vacuum
1505	Opened well UR-2 to atmosphere - Did not affect EW vacuum
1515	Shot off S/E to well UR-1 (EW) to allow all wells to stabilize
1545	Recorded static well data - Wells remained plugged (not vented to atmosphere) - Vented MW-24 & 25
1600	Recorded static well data on MW-24 & 25 after venting
	TEST # 3 completed - H ₂ 1076.2
1700	Loaded equipment - All wells were secured - Departed site

LEGEND

- PVC Discharge Line
- Gas Line
- Water Line
- Sewer Line
- - - Chain Link Fencing
- ⊗ Water Valve
- ⊕ Monitor Well with 2-foot sq concrete pad
Sewer Clean-out
Surface elevation, feet MSL
- ⊕ VAPOR PROBE NEST
- ⊕ VAPOR RECOVERY WELL



235' To
VR-1
← MW-22

304'
To VR-1

MAP SOURCE: RCRA POST-CLOSURE PERMIT APPLICATION
HARDING LAWSON ASSOCIATES, MARCH 1986

MW-23

DATE	BY	CHKD BY	APP'D BY



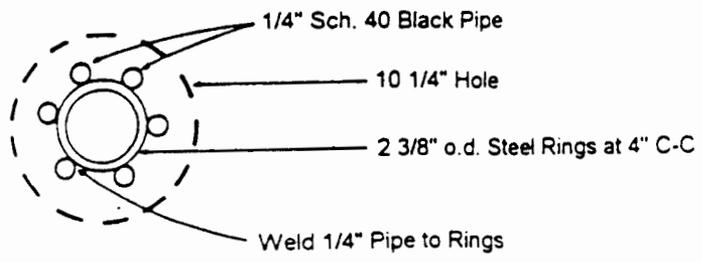
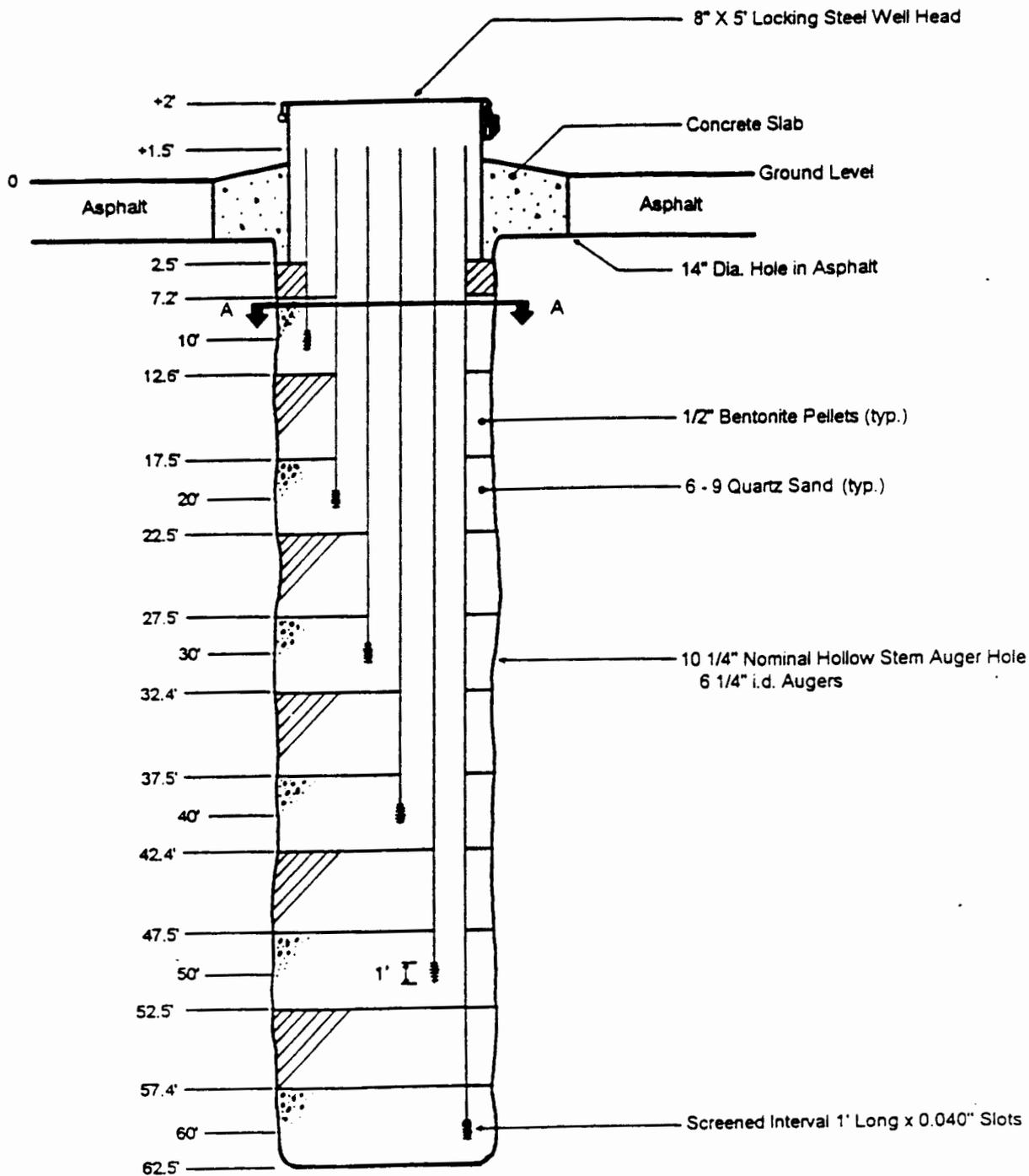
Revised
Checked
Approved
Date

PROJECT NO.

SPARTON TECHNOLOGY, INC.
COORS ROAD FACILITY
VES - PILOT TEST

FIGURE 1

CONTRACT NO.
SHEET NO.



Section A-A

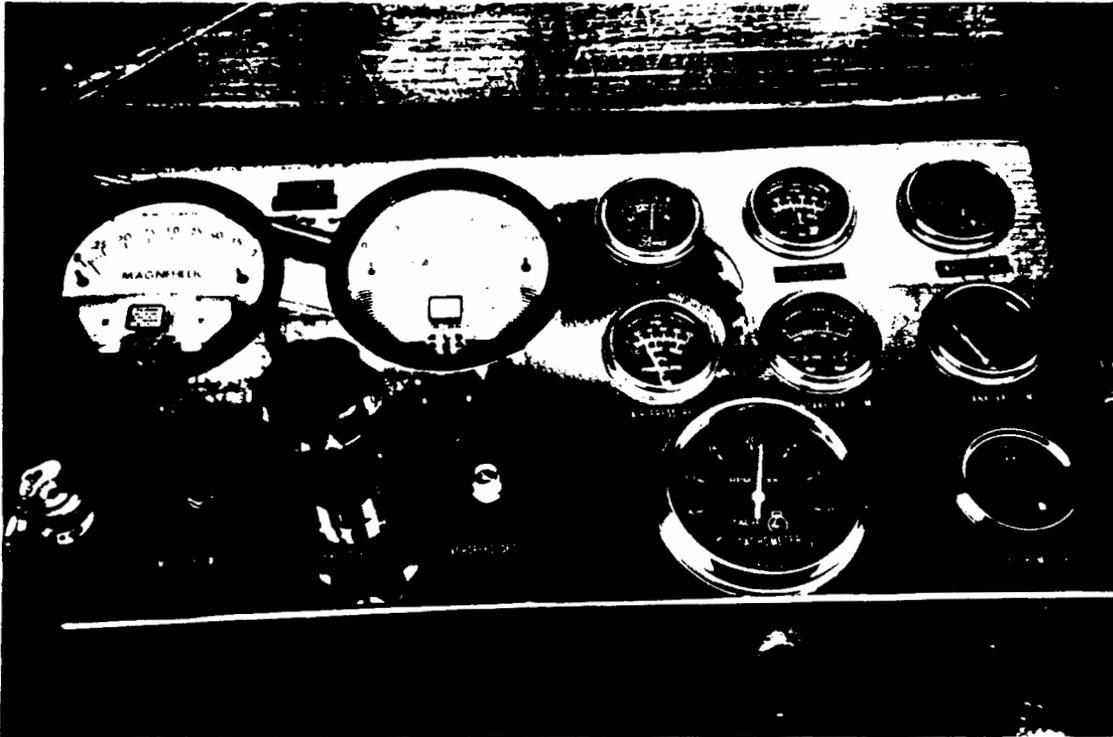
FIGURE 1

VP CONSTRUCTION DIAGRAM

Sparton Technology, Inc.
Coors Road Facility, Rio Rancho, NM



Sparton Technology, Inc.
Coors Road Facility, Rio Rancho, NM



Sparton Technology, Inc.
Coors Road Facility, Rio Rancho, NM



BLACK &
VEATCH



Owner SPARTON TECHNOLOGY Computed By PLC
 Plant COORS ROAD Unit _____ Date FEB 27 19 97
 Project No. 026602 File No. _____ Verified By _____
 Title SVE PILOT TEST Date _____ 19 ____
FIELD SCREENING Page _____ of _____

TIME (HRS)	FLOW RATE (CFM)	HORIBA TPH (ppm)	HORIBA CO ₂ (%)	HNU VOC (ppm)	COMMENTS
0910	30	550	4.74	550	START
0935	30	462	4.42	620	SAMPLED VRI Initial
1000	30	75	2.50	60	<u>EFFLUENT</u>
1030	30	394	4.12	540	
1100	35	352	3.98	610	
1130	50	352	3.96	560	SAMPLED VRI SECOND
1300	50	312	3.70	520	
1330	55	314	3.36	600	SAMPLED VRI THIRD
1400	55	308	3.52	620	
1430	65	310	3.50	600	
1530	65	286	3.48	600	
1545	65	-	-	40	<u>EFFLUENT</u> , SAMPLED
1600	65	284	3.42	550	SAMPLED VRI FOURTH SHUTDOWN

DO NOT WRITE IN THIS SPACE

PGN-172B

BLACK &
VEATCH



Owner SPARTON TECHNOLOGY Computed By PLC
 Plant COORS ROAD Unit _____ Date FEB 28 19 97
 Project No. 026602 File No. _____ Verified By _____
 Title SUE PILOT TEST Date _____ 19 ____
FIELD SCREENING Page _____ of _____

TIME (HRS)	FLOW RATE (CFM)	HORIBA TMH (ppm)	HORIBA CO2 (%)	HNu VOC (ppm)	COMMENTS
0730	65	246	3.32	620	START
0930	65	264	3.21	640	SAMPLED URI DAY 2 INT.
1015	65	252	2.94	645	SHUTDOWN
1130	65	242	2.72	645	RESTART
1200	65	278	3.02	700	
1450	65	254	2.78	680	SHUTDOWN

DO NOT WRITE IN THIS SPACE

PCN-172B

American Environmental Network, Inc.

1Q 1997
SVE Pilot Test

AEN I.D. 702365

March 5, 1997

SPARTON TECHNOLOGIES
9621 COORS RD.
ALBUQUERQUE, NM 87114

Project Name SVE PILOT TEST
Project Number 22797

Attention: JOHN M. WAKEFIELD

On 2/28/97 American Environmental Network (NM), Inc. (ADHS License No. AZ0015), received a request to analyze air samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

Per client instruction, HCl was not analyzed.

Samples "VR-1 Initial" and "Acuvac Emission" had limited sample present, indicating that a small leak in the air bag may have been present.

Samples were analyzed by EPA method 8010/8020, but target analytes that were over instrument range were analyzed by EPA method 8240 in order to produce results that were within linear range.

If you have any questions or comments, please do not hesitate to contact us at (505)344-3777.

Kimberly D. McNeill
Project Manager

H. Mitchell Rubenstein, Ph. D.
General Manager

MR: mt
Enclosure

American Environmental Network, Inc.

CLIENT	: SPARTON TECHNOLOGIES	AEN I.D.	: 702365
PROJECT #	: 22797	DATE RECEIVED	: 2/28/97
PROJECT NAME	: SVE PILOT TEST	REPORT DATE	: 3/5/97
<hr/>			
AEN			DATE
ID. #	CLIENT DESCRIPTION	MATRIX	COLLECTED
01	VR-1 INITIAL	AIR	2/27/97
02	VR-1 SECOND	AIR	2/27/97
03	VR-1 THIRD	AIR	2/27/97
04	ACUVAC EMISSION	AIR	2/27/97
05	VR-1 FOURTH	AIR	2/27/97
06	VR-1 DAY 2 INITIAL	AIR	2/28/97

American Environmental Network, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : PURGEABLE HALOCARBONS / AROMATICS (EPA 8010/8020)
 CLIENT : SPARTON TECHNOLOGIES AEN I.D.: 702365
 PROJECT # : 22797
 PROJECT NAME : SVE PILOT TEST

SAMPLE		DATE	DATE	DATE	DIL.
ID. #	CLIENT I.D.	SAMPLED	EXTRACTED	ANALYZED	FACTOR
01	VR-1 INITIAL	2/27/97	NA	2/28/97	200
02	VR-1 SECOND	2/27/97	NA	2/28/97	200
03	VR-1 THIRD	2/27/97	NA	2/28/97	200
PARAMETER	DET. LIMIT	UNITS	01	02	03
BENZENE	0.05	MG/M ³	< 10	< 10	< 10
BROMODICHLORMETHANE	0.02	MG/M ³	< 4.0	< 4.0	< 4.0
BROMOFORM	0.05	MG/M ³	< 10	< 10	< 10
BROMOMETHANE	0.10	MG/M ³	< 20	< 20	< 20
CARBON TETRACHLORIDE	0.02	MG/M ³	< 4.0	< 4.0	4.4
CHLOROBENZENE	0.05	MG/M ³	< 10	< 10	< 10
CHLOROETHANE	0.05	MG/M ³	< 10	< 10	< 10
CHLOROFORM	0.05	MG/M ³	< 10	< 10	< 10
CHLOROMETHANE	0.10	MG/M ³	< 20	< 20	< 20
DIBROMOCHLOROMETHANE	0.02	MG/M ³	< 4.0	< 4.0	< 4.0
1,2-DIBROMOETHANE (EDB)	0.02	MG/M ³	< 4.0	< 4.0	< 4.0
1,2-DICHLOROENZENE	0.05	MG/M ³	< 10	< 10	< 10
1,3-DICHLOROENZENE	0.05	MG/M ³	< 10	< 10	< 10
1,4-DICHLOROENZENE	0.05	MG/M ³	< 10	< 10	< 10
1,1-DICHLOROETHANE	0.03	MG/M ³	< 6.0	< 6.0	< 6.0
1,2-DICHLOROETHANE (EDC)	0.05	MG/M ³	< 10	< 10	< 10
1,1-DICHLOROETHENE	0.02	MG/M ³	260	310	310
cis-1,2-DICHLOROETHENE	0.02	MG/M ³	< 4.0	< 4.0	< 4.0
trans-1,2-DICHLOROETHENE	0.10	MG/M ³	< 20	< 20	< 20
1,2-DICHLOROPROPANE	0.02	MG/M ³	< 4.0	< 4.0	< 4.0
cis-1,3-DICHLOROPROPENE	0.05	MG/M ³	< 10	< 10	< 10
trans-1,3-DICHLOROPROPENE	0.02	MG/M ³	< 4.0	< 4.0	< 4.0
ETHYLBENZENE	0.05	MG/M ³	99	120	110
METHYL-t-BUTYL ETHER	0.25	MG/M ³	< 50	< 50	< 50
METHYLENE CHLORIDE	0.20	MG/M ³	< 40	< 40	< 40
1,1,2,2-TETRACHLOROETHANE	0.05	MG/M ³	< 10	< 10	< 10
TETRACHLOROETHENE	0.05	MG/M ³	160	190	180
TOLUENE	0.05	MG/M ³	2000 A	2800 A	2400 A
1,1,1-TRICHLOROETHANE	0.10	MG/M ³	2700 A	3500 A	3100 A
1,1,2-TRICHLOROETHANE	0.02	MG/M ³	5.2	6.7	7.0
TRICHLOROETHENE	0.03	MG/M ³	8600 A	13000 A	11000 A
TRICHLOROFLUOROMETHANE	0.02	MG/M ³	< 4.0	< 4.0	< 4.0
VINYL CHLORIDE	0.05	MG/M ³	< 10	< 10	< 10
TOTAL XYLENES	0.05	MG/M ³	290	350	360
TRICHLOROTRIFLUOROETHANE	0.20	MG/M ³	< 40	< 40	< 40

SURROGATE:

BROMOCHLOROMETHANE (%)		95	84	93
SURROGATE LIMITS	(73 - 117)			
TRIFLUOROTOLUENE (%)		88	82	86
SURROGATE LIMITS	(69 - 117)			

CHEMIST NOTES: SAMPLE ID # 01 HAD VERY LITTLE SAMPLE TO WORK WITH
 A = SAMPLES ANALYZED USING ALTERNATE METHOD 8240 TO INCREASE LINEAR RANGE

American Environmental Network, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : PURGEABLE HALOCARBONS / AROMATICS (EPA 8010/8020)
 CLIENT : SPARTON TECHNOLOGIES AEN I.D.: 702366
 PROJECT # : 22797
 PROJECT NAME : SVE PILOT TEST

SAMPLE		DATE	DATE	DATE	DIL.
ID. #	CLIENT I.D.	SAMPLED	EXTRACTED	ANALYZED	FACTOR
04	ACUVAC EMISSION	2/27/97	NA	2/28/97	200
05	VR-1 FOURTH	2/27/97	NA	2/28/97	200
06	VR-1 DAY 2 INITIAL	2/28/97	NA	2/28/97	200
PARAMETER	DET. LIMIT	UNITS	04	05	06
BENZENE	0.05	MG/M ³	< 10	< 10	< 10
BROMODICHLORMETHANE	0.02	MG/M ³	< 4.0	< 4.0	< 4.0
BROMOFORM	0.05	MG/M ³	< 10	< 10	< 10
BROMOMETHANE	0.10	MG/M ³	< 20	< 20	< 20
CARBON TETRACHLORIDE	0.02	MG/M ³	< 4.0	< 4.0	< 4.0
CHLOROBENZENE	0.05	MG/M ³	< 10	< 10	< 10
CHLOROETHANE	0.05	MG/M ³	< 10	< 10	< 10
CHLOROFORM	0.05	MG/M ³	< 10	< 10	< 10
CHLOROMETHANE	0.10	MG/M ³	< 20	< 20	< 20
DIBROMOCHLOROMETHANE	0.02	MG/M ³	< 4.0	< 4.0	< 4.0
1,2-DIBROMOETHANE (EDB)	0.02	MG/M ³	< 4.0	12	< 4.0
1,2-DICHLOROENZENE	0.05	MG/M ³	< 10	< 10	< 10
1,3-DICHLOROENZENE	0.05	MG/M ³	< 10	< 10	< 10
1,4-DICHLOROENZENE	0.05	MG/M ³	< 10	< 10	< 10
1,1-DICHLOROETHANE	0.03	MG/M ³	< 6.0	< 6.0	< 6.0
1,2-DICHLOROETHANE (EDC)	0.05	MG/M ³	< 10	< 10	< 10
1,1-DICHLOROETHENE	0.02	MG/M ³	96	270	270
cis-1,2-DICHLOROETHENE	0.02	MG/M ³	< 4.0	< 4.0	< 4.0
trans-1,2-DICHLOROETHENE	0.10	MG/M ³	< 20	< 20	< 20
1,2-DICHLOROPROPANE	0.02	MG/M ³	< 4.0	< 4.0	< 4.0
cis-1,3-DICHLOROPROPENE	0.05	MG/M ³	< 10	< 10	< 10
trans-1,3-DICHLOROPROPENE	0.02	MG/M ³	< 4.0	< 4.0	< 4.0
ETHYLBENZENE	0.05	MG/M ³	< 10	100	100
METHYL-T-BUTYL ETHER	0.25	MG/M ³	< 50	< 50	< 50
METHYLENE CHLORIDE	0.20	MG/M ³	< 40	< 40	< 40
1,1,2,2-TETRACHLOROETHANE	0.05	MG/M ³	< 10	< 10	< 10
TETRACHLOROETHENE	0.05	MG/M ³	< 10	160	160
TOLUENE	0.05	MG/M ³	49	2100 A	2100 A
1,1,1-TRICHLOROETHANE	0.10	MG/M ³	< 20	2800 A	2700 A
1,1,2-TRICHLOROETHANE	0.02	MG/M ³	< 4.0	6.1	5.3
TRICHLOROETHENE	0.03	MG/M ³	440 E	9800 A	9800 A
TRICHLOROFLUOROMETHANE	0.02	MG/M ³	< 4.0	< 4.0	< 4.0
VINYL CHLORIDE	0.05	MG/M ³	< 10	< 10	< 10
TOTAL XYLENES	0.05	MG/M ³	< 10	310	320
TRICHLOROTRIFLUOROETHANE	0.20	MG/M ³	< 40	< 40	< 40

SURROGATE:

BROMOCHLOROMETHANE (%)		94	86	86
SURROGATE LIMITS	(73 - 117)			
TRIFLUOROTOLUENE (%)		83	83	85
SURROGATE LIMITS	(69 - 117)			

CHEMIST NOTES: SAMPLE ID # 04 HAD A SMALL HOLE IN THE BAG, INSUFFICIENT SAMPLE VOLUME FOR REANALYSIS
 A = SAMPLES ANALYZED USING ALTERNATE METHOD 8240 TO INCREASE LINEAR RANGE
 E = ESTIMATED VALUE BEYOND LINEAR RANGE

American Environmental Network, Inc.

GAS CHROMATOGRAPHY RESULTS
REAGENT BLANK

TEST	: PURGEABLE HALOCARBONS / AROMATICS (EPA 8010/8020)		
BLANK I.D.	: 022697	AEN I.D.	: 702365
CLIENT	: SPARTON TECHNOLOGIES	DATE EXTRACTED	: N/A
PROJECT #	: 22797	DATE ANALYZED	: 2/26/97
PROJECT NAME	: SVE PILOT TEST	SAMPLE MATRIX	: AIR

PARAMETER	UNITS	
BENZENE	MG/M ³	<0.05
BROMODICHLOROMETHANE	MG/M ³	<0.02
BROMOFORM	MG/M ³	<0.05
BROMOMETHANE	MG/M ³	<0.10
CARBON TETRACHLORIDE	MG/M ³	<0.02
CHLOROBENZENE	MG/M ³	<0.06
CHLOROETHANE	MG/M ³	<0.05
CHLOROFORM	MG/M ³	<0.05
CHLOROMETHANE	MG/M ³	<0.10
DIBROMOCHLOROMETHANE	MG/M ³	<0.02
1,2-DIBROMOETHANE (EDB)	MG/M ³	<0.02
1,2-DICHLOROBENZENE	MG/M ³	<0.05
1,3-DICHLOROBENZENE	MG/M ³	<0.05
1,4-DICHLOROBENZENE	MG/M ³	<0.05
1,1-DICHLOROETHANE	MG/M ³	<0.03
1,2-DICHLOROETHANE (EDC)	MG/M ³	<0.06
1,1-DICHLOROETHENE	MG/M ³	<0.02
cis-1,2-DICHLOROETHENE	MG/M ³	<0.02
trans-1,2-DICHLOROETHENE	MG/M ³	<0.10
1,2-DICHLOROPROPANE	MG/M ³	<0.02
cis-1,3-DICHLOROPROPENE	MG/M ³	<0.02
trans-1,3-DICHLOROPROPENE	MG/M ³	<0.02
ETHYLBENZENE	MG/M ³	<0.05
METHYL t-BUTYL ETHER	MG/M ³	<0.25
METHYLENE CHLORIDE	MG/M ³	<0.20
1,1,2,2-TETRACHLOROETHANE	MG/M ³	<0.05
TETRACHLOROETHENE	MG/M ³	<0.05
TOLUENE	MG/M ³	<0.05
1,1,1-TRICHLOROETHANE	MG/M ³	<0.10
1,1,2-TRICHLOROETHANE	MG/M ³	<0.02
TRICHLOROETHENE	MG/M ³	<0.03
TRICHLOROFLUOROMETHANE	MG/M ³	<0.02
VINYL CHLORIDE	MG/M ³	<0.05
TOTAL XYLENES	MG/M ³	<0.05
SURROGATE:		
BROMOCHLOROMETHANE (%)		102
SURROGATE LIMITS	(73 - 117)	
TRIFLUOROTOLUENE (%)		80
SURROGATE LIMITS	(69 - 117)	

CHEMIST NOTES:
N/A

American Environmental Network, Inc.

GC/MS RESULTS

TEST : VOLATILE ORGANICS EPA METHOD 8240
 CLIENT : SPARTON TECHNOLOGY, INC. AEN I.D. : 702365
 PROJECT # : 022797
 PROJECT NAME : SVE PILOT TEST

SAMPLE ID #	BATCH	MATRIX	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
RFA/GENT BLANK	022897	AQUEOUS	N/A	02/28/97	1
PARAMETER	DET. LIMIT				UNITS
Dichlorodifluoromethane	1.0	< 1.0			MG/M ³
Chloromethane	1.0	< 1.0			MG/M ³
Vinyl Chloride	1.0	< 1.0			MG/M ³
Bromomethane	1.0	< 1.0			MG/M ³
Chloroethane	1.0	< 1.0			MG/M ³
Trichlorofluoromethane	1.0	< 1.0			MG/M ³
Acetone	10	< 10			MG/M ³
1,1-Dichloroethane	1.0	< 1.0			MG/M ³
Iodomethane	1.0	< 1.0			MG/M ³
Methylene Chloride	1.0	< 1.0			MG/M ³
cis-1,2-Dichloroethane	1.0	< 1.0			MG/M ³
1,1-Dichloroethane	1.0	< 1.0			MG/M ³
trans-1,2-Dichloroethane	1.0	< 1.0			MG/M ³
2-Butanone	10	< 10			MG/M ³
Carbon Disulfide	1.0	< 1.0			MG/M ³
Chloroform	1.0	< 1.0			MG/M ³
1,2-Dichloroethane	1.0	< 1.0			MG/M ³
Vinyl Acetate	1.0	< 1.0			MG/M ³
1,1,1-Trichloroethane	1.0	< 1.0			MG/M ³
Carbon Tetrachloride	1.0	< 1.0			MG/M ³
Benzene	1.0	< 1.0			MG/M ³
1,2-Dichloropropane	1.0	< 1.0			MG/M ³
Trichloroethene	1.0	< 1.0			MG/M ³
Bromodichloromethane	1.0	< 1.0			MG/M ³
2-Chloroethyl Vinyl Ether	10	< 10			MG/M ³
cis-1,3-Dichloropropene	1.0	< 1.0			MG/M ³
trans-1,3-Dichloropropene	1.0	< 1.0			MG/M ³
1,1,2-Trichloroethane	1.0	< 1.0			MG/M ³
Toluene	1.0	< 1.0			MG/M ³
1,2-Dibromoethane	1.0	< 1.0			MG/M ³
4-Methyl-2-Pentanone	10	< 10			MG/M ³
2-Hexanone	10	< 10			MG/M ³
Dibromochloromethane	1.0	< 1.0			MG/M ³
Tetrachloroethane	1.0	< 1.0			MG/M ³
Chlorobenzene	1.0	< 1.0			MG/M ³
Ethylbenzene	1.0	< 1.0			MG/M ³
m&p Xylenes	1.0	< 1.0			MG/M ³
o-Xylene	1.0	< 1.0			MG/M ³
Styrene	1.0	< 1.0			MG/M ³
Bromoform	1.0	< 1.0			MG/M ³
1,1,2,2-Tetrachloroethane	1.0	< 1.0			MG/M ³
1,3-Dichlorobenzene	1.0	< 1.0			MG/M ³
1,4-Dichlorobenzene	1.0	< 1.0			MG/M ³
1,2-Dichlorobenzene	1.0	< 1.0			MG/M ³

American Environmental Network, Inc.

GC/MS RESULTS

TEST : VOLATILE ORGANICS EPA METHOD 8240
CLIENT : SPARTON TECHNOLOGY, INC. AEN I.D. : 702365
PROJECT # : 022797
PROJECT NAME : SVE PILOT TEST

SAMPLE ID #	BATCH	MATRIX	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
REAGENT BLANK	022097	AQUEOUS	N/A	02/28/97	1
PARAMETER	DET. LIMIT	UNITS			

SURROGATE % RECOVERY

1,2-Dichloroethane-d4	106
	(78 - 114)
Toluene-d8	104
	(88 - 110)
Bromofluorobenzene	108
	(86 - 118)

American Environmental Network, Inc.

GAS CHROMATOGRAPHY QUALITY CONTROL
MSMSD

TEST : PURGEABLE HALOCARBONS / AROMATICS (EPA 8010/8020)
 MSMSD # : 702360-01 AEN I.D. : 702365
 CLIENT : SPARTON TECHNOLOGIES DATE EXTRACTED : N/A
 PROJECT # : 22797 DATE ANALYZED : 2/26/97
 PROJECT NAME : SVE PILOT TEST SAMPLE MATRIX : AIR
 UNITS : MG/M³

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD	REC LIMITS	RPD LIMITS
BENZENE	<0.05	1.00	0.87	87	0.86	86	1	(82 - 128)	20
TOLUENE	<0.05	1.00	0.88	88	0.89	89	1	(87 - 128)	20
1,1-DICHLOROETHENE	<0.02	1.00	1.02	102	0.96	96	6	(40 - 120)	20
TRICHLOROETHENE	<0.03	1.00	1.13	113	1.18	118	4	(89 - 127)	20
CHLOROBENZENE	<0.05	1.00	0.89	89	0.90	90	1	(87 - 124)	20

CHEMIST NOTES:

N/A

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

PLEASE FILL THIS FORM IN COMPLETELY.

SHADED AREAS ARE FOR LAB USE ONLY



Analytical Technologies of New Mexico, Inc., Albuquerque, NM
San Diego • Phoenix • Seattle • Pensacola • Ft. Collins • Portland • Albuquerque • Anchorage

CHAIN OF CUSTODY
DATE: 2-27-97 PAGE 1 OF 1

ATLAB ID. 702365

PROJECT MANAGER: John M. Wakefield

COMPANY: Sparton Technology Inc

ADDRESS: 4621 Coors Rd. NW, Albuquerque, NM 87114

PHONE: 505-892-5360

FAX: 505-892-5360

BILL TO: "

COMPANY: " 4901 Rockaway Blvd

ADDRESS: Rio Rancho, NM 87124

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
VR-1 Initial	2-21-97	0734	Air	091
VR-1 Second	2-21-97	1148	Air	02
VR-1 Third	"	1345	Air	03
AcuVac Emission	"	1551	Air	04
VR-1 Fourth	"	1602	Air	05
VR-1 Day 2 Initial	2-25-97	0859	Air	06

ANALYSIS REQUEST	STATUS
Petroleum Hydrocarbons (418.1) TRPH	
(MOD.8015) Diesel/Direct/Inject	
(M8015) Gas/Purge & Trap	
Gasoline/BTEX & MTBE (M8015/8020)	
BTXE/MTBE (8020)	
BTEX & Chlorinated Aromatics (602/8020)	
BTEX/MTBE/EDC & EDB (8020/8010/Short)	
Chlorinated Hydrocarbons (601/8010)	
806/8020	X
504 EDB / DBCP	X
Polynuclear Aromatics (610/8310)	X
Volatile Organics (624/8240) GC/MS	X
Volatile Organics (8260) GC/MS	X
Pesticides/PCB (608/8080)	
Herbicides (615/8150)	
Base/Neutral/Acid Compounds GC/MS (625/8270)	
General Chemistry	
Priority Pollutant Metals (13)	
Target Analyte List Metals (23)	
RCRA Metals (8)	
RCRA Metals by TCLP (Method 1311)	

PROJECT INFORMATION

PROJ NO: G32797

PROJ NAME: SUE Pilot test

PO NO: Pe-Ang

SHIPPED VIA: Delivered

NO. CONTAINERS: 6

CUSTOMER SEALS: QN/NA

RECEIVED INTACT: YES

BLUE ICE/SPACE: 02

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) 24hr 48hr 72hr 1 WEEK (NORMAL) 2 WEEK

CERTIFICATION REQUIRED: NMM OTHER

METHANOL PRESERVATION

COMMENTS: VR-1 Initial Bag leaked ??
attempt to sample.
HCl concentration on AcuVac Emission
sample is it possible?

RELINQUISHED BY: [Signature] Time: 0900 Date: 2-28-97

RELINQUISHED BY: [Signature] Time: 0930 Date: 2-28-97

RECEIVED BY: [Signature] Time: 0900 Date: 2-28-97

RECEIVED BY: [Signature] Time: 0930 Date: 2-28-97

Company: STI

10/23/95 All in the Sun (1) 660 (619) 456 9141 • Phoenix (602) 496 4100 • Seattle (206) 728 8355 • Pensacola (904) 474 1001 • Portland (503) 683 0447 • Albuquerque (505) 344 3777 DISTRIBUTION White, Canary, All Pink ORIGINAL



Owner SPARTON Computed By DLC
 Plant COORS ROAD Unit _____ Date 5/21 19 97
 Project No. 026602.0100 File No. _____ Verified By _____
 Title SUE PILOT TEST Date _____ 19 _____
EMISSION CALCULATIONS Page _____ of _____

- INFLUENT SAMPLED @ 1345 HOURS ON 2/27/97
TOTAL VOC = 17,461.4 mg/m³
- EFFLUENT SAMPLED @ 1551 HOURS ON 2/27/97
TOTAL VOC = 585 mg/m³
- INFLUENT SAMPLED @ 1602 HOURS ON 2/27/97
TOTAL VOC = 15,548.1 mg/m³
- FLOW RATE MAINTAINED AT 65 cfm
 $(65 \text{ ft}^3/\text{min}) (0.02832 \frac{\text{m}^3}{\text{ft}^3}) (\frac{1440 \text{ min}}{\text{day}}) = 2650.752 \frac{\text{m}^3}{\text{day}}$

ASSUMING AN AVERAGE INFLUENT CONCENTRATION
 OF $(\frac{17,461.4 + 15,548.1}{2}) = 16,504.75 \text{ mg/m}^3$

THE VOC REMOVAL RATE WAS

$$\begin{aligned}
 & (16,504.75 \frac{\text{mg}}{\text{m}^3}) (\frac{1 \times 10^{-6} \text{ kg}}{\text{mg}}) (2650.752 \frac{\text{m}^3}{\text{day}}) = 43.75 \text{ kg/day} \\
 & \qquad \qquad \qquad \text{OR} \\
 & (43.75 \frac{\text{kg}}{\text{day}}) (\frac{2.20462 \text{ lb}}{\text{kg}}) = \underline{\underline{96.45 \text{ lb/day}}}
 \end{aligned}$$

THE VOC EMISSION RATE WAS 1.55 kg/day

OR 3.4 lb/day

DESTRUCTIVE EFFICIENCY WAS

$$(\frac{16,504.75 \text{ mg/m}^3 - 585 \text{ mg/m}^3}{16,504.75 \text{ mg/m}^3}) (100\%) = \underline{\underline{96.45\%}}$$

DO NOT WRITE IN THIS SPACE

PGN-172B



Environmental Health Department

Martin J. Chávez, Mayor

February 25, 1997

Mr. Richard D. Mico
Vice President and General Manager
Sparton Technology
4901 Rockaway Blvd.
Rio Rancho, NM 87124
Phone (505) 892-5300
Sent via facsimile to: (505) 892-5515 (2-25-97)

Jarvis D. Kotchian, Director
768-2600 (phone)
768-2617 (fax)

Re: Soil Vapor Extraction Pilot Test

Dear Mr. Mico:

This memo is in response to your request, received by our office on February 25, 1997, to allow two consecutive ten (10) hour pilot study tests. These tests will evaluate the feasibility of remediating solvent contaminated soils at your 9621 Coors Rd. NW facility. Based on Departmental policy you are required to notify the agency of any pilot studies that may potentially emit any regulated air pollutants. Your February 25, 1997 request will serve as notification.

In accordance with your description of the pilot study and its duration, the Department has determined that you do not have to apply for an Authority-to-Construct permit pursuant Part 42, Authority-to-Construct, or register this project as a source of air contaminants pursuant Part 41, Source Registration. However, the Department will require additional notification if it is determined by your staff that the project will exceed the proposed two day test periods.

In closing allow me to remind you of your potential regulatory responsibilities prior to extending the proposed pilot study into an actual continuous remediation project. If continuous remediation is pursued, please be aware that the Air Quality Control Regulations for Albuquerque / Bernalillo County may require the submission of an Authority-to-Construct application pursuant Part 42 for Departmental technical review. If this is the case, you will not be able to commence your project until you have received an actual Authority-to-Construct permit pursuant to this regulation from the Department. If you have any further questions please feel free to contact me at 768-1961 or Isreal Tavarez at 768-1965. Thank you very much for your cooperation.

Good for You. Albuquerque!

P.O. Box 1293, Albuquerque, New Mexico 87103
One Civic Plaza, Albuquerque, New Mexico 87102



FEB. -25' 97 (TUE) 17:46

ENV HEALTH WESTSIDE

P. 002 _____

~~Respectfully,~~
Angel Martinez Jr.

cc: Alana Eager, Manager, APCD
Curt Montman, Manager, ESD
Isreal Tavaraz, Permitting, AQS
file

SPARTON

SPARTON TECHNOLOGY

Via Facsimile

February 25, 1997

Mr. Angel Martinez
Air Pollution Control Division
Environmental Health Department
City of Albuquerque
PO Box 1293
Albuquerque, New Mexico 87103

Re: Soil Vapor Extraction Pilot Test.

Dear Mr. Martinez:

As discussed via telephone with John Wakefield on Monday, 2-24-97, Sparton Technology, Inc. is planning to conduct a pilot test in conjunction with NMED-GWQB on our recently installed vapor recovery wells. This test is to evaluate the feasibility of remediating solvent contaminated soil by a process called soil vapor extraction (SVE). Mr. Rob Pine of NMED-GWQB will be monitoring the pilot test.

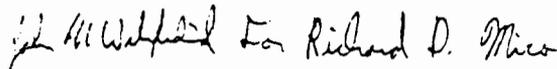
The 5 wells, designated VR-1 through 5 are located at our Coors Rd. Facility, (9621 Coors Rd. NW). An outside contractor, AcuVac, Inc. will have a trailer mounted SVE system at the site, see attached specification sheet for the operating performance of the SVE I-6. Project Engineer is Mr. Pierce Chandler of Black & Veatch, Inc. Testing will commence on Thursday (2-27-97) and end on Friday, (2-28-97). We anticipate that the equipment will run for approximately 10 hours each day. As listed on the SVE I-6 specification sheet the combustion efficiency with the 3 catalytic converters in series is 99.9% with <0.9 lbs. VOC/day. The equipment can produce a maximum of 120 cfm from a well and is one of the parameters that will be determined during this pilot test. AcuVac, Inc. has conducted approximately 10 SVE pilot tests within the City of Albuquerque and their low emission rates have been verified by City employees.

Attached is a faxed copy of preliminary analytical results for solvent vapor concentrations from each of these wells. This sampling was conducted on February 20, 1997 in conjunction with Mr. Rob Pine.

I understand that based on a telephone conversation that you had with John Wakefield on 2-24-96 you agreed to review this faxed request and try to respond expeditiously via facsimile prior to the commencement of Thursday's pilot test. We appreciate your willingness to give prompt attention to this matter.

If you have any questions please feel free to call Mr. Pierce Chandler at 214-770-1531 or John Wakefield at 892-5300.

Sincerely,
SPARTON TECHNOLOGY, INC.



Richard D. Mico
Vice President and General Manager

attachments:

cc: Mr. J. Appel
Mr. P. Chandler
Mr. R. Pine: NMED GWQB
Mr. J. Wakefield

ACUVAC SYSTEM - SVE I-6

OPERATING SPECIFICATIONS
300 Cubic Inch/4.9 Liter/6 Cylinder IC Engine

Electrical Requirements	None
Engine RPM	1,800 RPM to 2,500 RPM/site specific. Calculations below based on 2,200 RPM
Fuel Source	Well flow/contamination (or) natural gas (or) propane (or) combination well flow and alternate fuel
Fuel Consumption/Propane	¹ Maximum usage 4.8 gallons/hour Actual usage 3.0 gallons/hour
Fuel Consumption/Natural Gas	¹ Maximum usage 4.39 therms/hr Actual usage 2.74 therms/hr
Fuel Consumption/Well Flow	Site specific, 0 to 4.5 gal/hr projected
Fuel Consumption/BTUs	¹ Maximum usage 432,000 BTUs/hour Actual usage 274,000 BTUs/hour
Total Fresh Air/Fuel Flow	Maximum usage 160 cfm Actual usage 90 - 120 cfm
Well Flow	0 to 120/site specific
Fresh Air Flow	0 to 80/site specific
Combustion Efficiency with Catalytic Converters	² 87% ² 99.9% (less than .9 lbs VOC/day)
Vacuum/Well Manifold	0" to 15" HG/site specific Actual 0.25" to 3.00" HG
Noise Level	Less than 50 db at 20 feet
Ambient Temperature	-20°F to + 120°F

1. Maximum usage and actual usage differ because of the load factor on the engine. Actual information has been obtained from field data. Fuel usage stated for propane and natural gas assumes no BTU value from well flow.

2. This efficiency rating assumes the engine is maintained and tuned and the catalysis are in good working order.

AcuVac System SVE I-6 Specifications

Engine - Power Source/Thermal Oxidizer

Make: Ford internal combustion engine with power with power take-off
Model: CSG-649P Year: 1994
300 cubic inch displacement (4.9), 120 HP, 6 cylinders
Propane or natural gas co-fired

Catalytic Converter

Make: NAPA
Model: ICEN 703
100 cfm, temperature 600-1500°F
Anticipated life 4,000 hours; performance examination
recommended every 500 hours; three in series

Vacuum Pump

Make: Dresser-Roots Model: 33 RAI Universal
Engine driven, maximum flow 155 scfm,
Actual operating flow rates 20 - 70 scfm

*Air Injection Pump

Make: Dresser-Roots Model: 22 RAI Universal
Engine driven, maximum flow 55 scfm,
Actual operating flow rates 18 - 40 scfm
Heat Exchanger: Stainless Steel Fin Tube

System Dimensions

8.0' length, 4.0' width, 6.5' height
(with trailer 12' 6" L X 4' 9" W x 8' H; 2,900 lbs)
Tank size: 3.0' diameter, 5.0' height
Trailer: Custom made by Manufacturer

Stack

Height: 10'
Temperature: 700 - 850°F
Exhaust Pipe: 2 1/2"

Other

Flow Gauges: Dwyer (including flow sensors)
Instrumentation & Safety Shut-off; Murphy Gauges
Electrical: 12 volts, HD battery
Air Intake Filter: Ford Industrial
Valves: Heavy Duty Brass
Moisture Knockout Tank: Custom made by Manufacturer
Moisture Knockout Filter: Custom made by Manufacturer
Leveling Jacks: Custom made by Manufacturer
Vacuum Connection Hose to SVE Manifold (2.0 inch HD)

*Optional Equipment

AIR EMISSIONS INFORMATION

The following is a summary of information on NOx and CO emissions from a 4 and 6 cylinder IC engine identical to those installed in the AcuVac SVE System.

NOx and CO emissions are the product of incomplete combustion within the IC engine, the combustion temperature, the combustion chamber design and the air to fuel ratio. All of our tests indicate the FORD 4 and 6 cylinder industrial engines, with catalytic converters, will meet the NOx and CO emission standards for the State of California Air Quality Division. Those standards are as follows:

Oxides of Nitrogen	0.46 lbs/day
Carbon Monoxide	17.93 lbs/day

Summary of test results conducted on a FORD 6 cylinder IC engine in SVE service at the Naval Construction Battalion Center, Port Hueneme, CA by BTC Environmental, Inc. on 09/24/92 are as follows:

Oxides of Nitrogen	0.01 lbs/hr	0.24 lbs/day
Carbon Monoxide	0.01 lbs/hr	0.24 lbs/day

This is well below the emission standards for California which were enacted to assure maximum protection of air quality. It should also be noted that these regulations are enforced.

The SVE System that was tested had one catalytic converter. AcuVac SVE Systems are delivered with three catalytic converters. If leaded fuel is the contaminant, our preventative maintenance schedule indicates the catalytic converters must be changed more frequently.

There have been other tests conducted on similar Systems with almost identical analytical results. The IC engine system is designed to consume high concentrations of contaminants with minimum emissions.

If we can furnish additional information, please contact the Houston office.

INTRODUCTION

A. Reason for Tests: NMED Air Quality Permit No. 1040 requirement

B. New Source Performance Standards (NSPS) and NESHAPS: None

C. Process: The Soil Vapor Extraction System (SVE) is being used to remediate solvent-contaminated soil. Solvent vapors are drawn under vacuum (60 inches water) from a well and pumped into an IC engine fueled with natural gas and equipped with a catalytic converter.

D. Company Name: New Mexico State Highway Department

E. Facility: Artesia Maintenance Yard

F. Testing Firm: Kramer & Associates, Inc.
4501 Bogan NE, Suite A-1
Albuquerque, NM 87109
Gary R. Kramer (505 881-0243)

G. Individuals Present at Test:

1. NM Highway Dept. Consultant: Jack Kirby, DB Stephens & Assoc.
2. NMED Air Quality Bureau: Chris Vigil
3. AcuVac Remediation: James Sadler
2. Kramer & Associates, Inc.: Gary Kramer, Buster Wright, Rio Trujillo

H. Dates of Test: April 23 and 24, 1996

L. Operating Conditions: Engine: hours = 2953 Well: Flow = 50 CFM
RPM = 2100 Vacuum = 60" H₂O
Air Flow = 26 CFM

J. Control Equipment: Catalytic Converter

Table 1
DATA SUMMARY

Test No.	Units are lb/yr			Ave	Permit Std
VOC, Method 25A *	0.036	0.046	0.047	0.043	2.0
Benzene	0.0016	0.0014	0.0018	0.0016	0.020
EDC	<0.000016	<0.000016	<0.000018	<0.000016	0.000024
EDB	0.000022	0.000029	0.000041	0.000031	0.000040

* as Propane

B. Unit Operating Parameters: See Part I above

C. Control Equipment Operating Parameters: New Catalytic Converter installed prior to testing

GAS CHROMATOGRAPHY RESULTS

TEST : PURGEABLE HALOCARBONS / AROMATICS (EPA 8010/8020)
 CLIENT : SPARTON TECHNOLOGIES
 PROJECT # : 22097
 PROJECT NAME : VR-WELLS-1Q97

AEN I.D.: 702347

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL FACTOR
04	VR-2	AIR	2/20/97	NA	2/20/97	100
05	VR-1	AIR	2/20/97	NA	2/20/97	1000

PARAMETER	DET. LIMIT	UNITS	04	05
BENZENE	0.05	MG/M ³	< 5.0	< 50
BROMODICHLORMETHANE	0.02	MG/M ³	< 2.0	< 20
BROMOFORM	0.05	MG/M ³	8.9	< 50
BROMOMETHANE	0.10	MG/M ³	< 10	< 100
CARBON TETRACHLORIDE	0.02	MG/M ³	< 2.0	< 20
CHLORO BENZENE	0.05	MG/M ³	8.3	< 50
CHLOROETHANE	0.05	MG/M ³	< 5.0	< 50
CHLOROFORM	0.05	MG/M ³	< 5.0	< 50
CHLOROMETHANE	0.10	MG/M ³	< 10	< 100
DIBROMOCHLOROMETHANE	0.02	MG/M ³	2.9	25
1,2-DIBROMOETHANE (EDB)	0.02	MG/M ³	5.5	54
1,2-DICHLORO BENZENE	0.05	MG/M ³	< 5.0	< 50
1,3-DICHLORO BENZENE	0.05	MG/M ³	< 5.0	< 50
1,4-DICHLORO BENZENE	0.05	MG/M ³	< 5.0	< 50
1,1-DICHLOROETHANE	0.03	MG/M ³	< 3.0	< 30
1,2-DICHLOROETHANE (EDC)	0.05	MG/M ³	< 5.0	< 50
1,1-DICHLOROETHENE	0.02	MG/M ³	150 D(2000)	250
cis-1,2-DICHLOROETHENE	0.02	MG/M ³	< 2.0	< 20
trans-1,2-DICHLOROETHENE	0.10	MG/M ³	< 10	< 100
1,2-DICHLOROPROPANE	0.02	MG/M ³	< 2.0	< 20
cis-1,3-DICHLOROPROPENE	0.05	MG/M ³	< 5.0	< 50
trans-1,3-DICHLOROPROPENE	0.02	MG/M ³	< 2.0	< 20
ETHYLBENZENE	0.05	MG/M ³	< 5.0	350
METHYL-t-BUTYL ETHER	0.25	MG/M ³	< 25	< 250
METHYLENE CHLORIDE	0.20	MG/M ³	< 20	< 200
1,1,2,2-TETRACHLOROETHANE	0.05	MG/M ³	< 5.0	< 50
TETRACHLOROETHENE	0.05	MG/M ³	120	300
TOLUENE	0.05	MG/M ³	< 5.0	7500
1,1,1-TRICHLOROETHANE	0.10	MG/M ³	1200 D(2000)	1200 D(2000)
1,1,2-TRICHLOROETHANE	0.02	MG/M ³	2.2	26
TRICHLOROETHENE	0.03	MG/M ³	3600 D(2000)	7400 D(2000) E
TRICHLOROFUOROMETHANE	0.02	MG/M ³	< 2.0	< 20
VINYL CHLORIDE	0.05	MG/M ³	< 5.0	< 50
TOTAL XYLENES	0.05	MG/M ³	< 5.0	1100
TRICHLOROTRIFLUOROETHANE	0.20	MG/M ³	< 4.0	< 10

SURROGATE:

BROMOCHLOROMETHANE (70)		90	94
SURROGATE LIMITS	(73 - 117)		
TRIFLUOROTOLUENE (%)		89	92
SURROGATE LIMITS	(89 - 117)		

CHEMIST NOTES:

D(2000) = 2000X DILUTION ANALYZED ON 2/21/97 E = ESTIMATED VALUE, OVERRANGE FOR INSTRUMENTATION

GAS CHROMATOGRAPHY RESULTS

TEST : PURGEABLE HALOCARBONS / AROMATICS (EPA 8010/8020)
 CLIENT : SPARTON TECHNOLOGIES AEN I.D.: 702347
 PROJECT # : 22097
 PROJECT NAME : VERMILION 1997

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	VR-3	AIR	2/20/97	NA	2/20/97	20
02	VR-5	AIR	2/20/97	NA	2/20/97	50
03	VR-4	AIR	2/20/97	NA	2/20/97	50

PARAMETER	DET. LIMIT	UNITS	01	02	03	
BENZENE	0.05	MG/M ³	< 1.0	< 2.5	< 2.5	
BROMODICHLORMETHANE	0.02	MG/M ³	< 0.4	< 1.0	< 1.0	
BROMOFORM	0.05	MG/M ³	< 1.0	< 2.5	< 2.5	
BROMOMETHANE	0.10	MG/M ³	< 2.0	< 5.0	< 5.0	
CARBON TETRACHLORIDE	0.02	MG/M ³	0.5	< 1.0	< 1.0	
CHLOROBENZENE	0.05	MG/M ³	< 1.0	< 2.5	< 2.5	
CHLOROETHANE	0.05	MG/M ³	< 1.0	< 2.5	< 2.5	
CHLOROFORM	0.05	MG/M ³	< 1.0	< 2.5	< 2.5	
CHLOROMETHANE	0.10	MG/M ³	< 2.0	< 5.0	< 5.0	
DIBROMOCHLOROMETHANE	0.02	MG/M ³	0.6	< 1.0	< 1.0	
1,2-DIBROMOETHANE (EDB)	0.02	MG/M ³	1.1	< 1.0	< 1.0	
1,2-DICHLOROBENZENE	0.05	MG/M ³	< 1.0	< 2.5	< 2.5	
1,3-DICHLOROBENZENE	0.05	MG/M ³	< 1.0	< 2.5	< 2.5	
1,4-DICHLOROBENZENE	0.05	MG/M ³	< 1.0	< 2.5	< 2.5	
1,1-DICHLOROETHANE	0.03	MG/M ³	< 0.6	< 1.5	< 1.5	
1,2-DICHLOROETHANE (EDC)	0.05	MG/M ³	< 1.0	< 2.5	< 2.5	
1,1-DICHLOROETHENE	0.02	MG/M ³	87 E	130 E	94	
cis-1,2-DICHLOROETHENE	0.02	MG/M ³	< 0.4	< 1.0	< 1.0	
trans-1,2-DICHLOROETHENE	0.10	MG/M ³	< 2.0	< 5.0	< 5.0	
1,2-DICHLOROPROPANE	0.02	MG/M ³	< 0.4	< 1.0	< 1.0	
cis-1,3-DICHLOROPROPENE	0.05	MG/M ³	< 1.0	< 2.5	< 2.5	
trans-1,3-DICHLOROPROPENE	0.02	MG/M ³	< 0.4	< 1.0	< 1.0	
ETHYLBENZENE	0.05	MG/M ³	< 1.0	< 2.5	< 2.5	
METHYL-t-BUTYL ETHER	0.25	MG/M ³	< 5.0	< 13	< 13	
METHYLENE CHLORIDE	0.20	MG/M ³	< 4.0	< 10	< 10	
1,1,2,2-TETRACHLOROETHANE	0.05	MG/M ³	< 1.0	< 2.5	< 2.5	
TETRACHLOROETHENE	0.05	MG/M ³	27	26	22	
TOLUENE	0.05	MG/M ³	< 1.0	< 2.5	< 2.5	
1,1,1-TRICHLOROETHANE	0.10	MG/M ³	220 D(1000)	810 D(2000)	1600 D(2000)	
1,1,2-TRICHLOROETHANE	0.02	MG/M ³	0.5	< 1.0	< 1.0	
TRICHLOROETHENE	0.03	MG/M ³	870 D(1000)	2300 D(2000)	3800 D(2000)	
TRICHLOROFUOROMETHANE	0.02	MG/M ³	< 0.4	< 1.0	< 1.0	
VINYL CHLORIDE	0.05	MG/M ³	< 1.0	< 2.5	< 2.5	
TOTAL XYLENES	0.05	MG/M ³	< 1.0	< 2.5	< 2.5	
TRICHLOROTRIFLUOROETHANE	0.20	MG/M ³	< 4.0	< 10	< 10	
SURROGATE:						
BROMOCHLOROMETHANE (%)			96	88	89	
SURROGATE LIMITS	(73 - 117)					
TRIFLUOROTOLUENE (%)			93	88	89	
SURROGATE LIMITS	(69 - 117)					

CHEMIST NOTES:
 D(1000) = 1000X DILUTION ANALYZED ON 2/21/97, D(2000) = 2000X DILUTION ANALYZED 2/21/97
 E = ESTIMATED VALUE, OVERRANGE FOR INSTRUMENTATION

United States
Environmental Protection
Agency

Center for Environmental
Research Information
Cincinnati OH 45268

EPA 625 4-89.020
September 1989

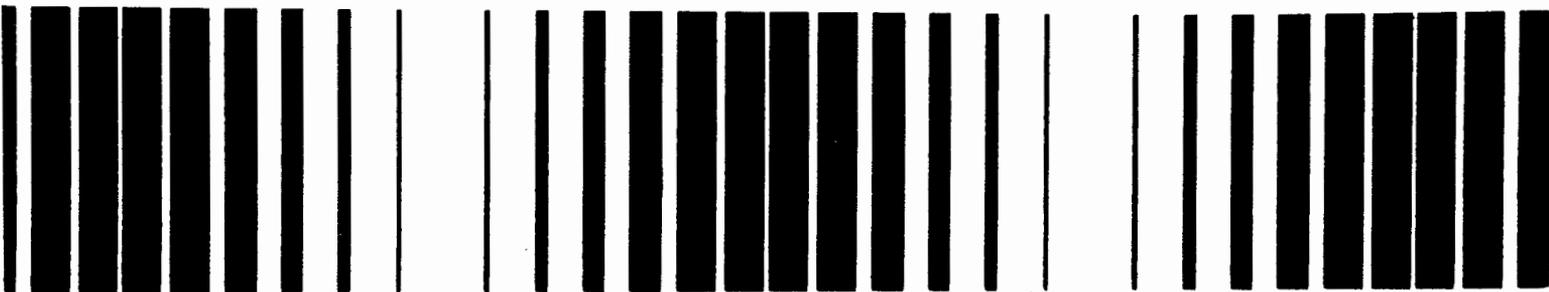
CHANDLER

Technology Transfer



Seminar Publication

Corrective Action: Technologies and Applications



tigative technique, particularly if correlated with a core-measured section or geophysical well log. The lack of "hard" stratigraphic data from a core, well log, etc., means that the interpretation of the "soft" seismic data is much more subjective. This may not be a problem in a small study area, but when the goal is subsurface stratigraphic interpretation over a large area, the results would probably be considered speculative until a well was drilled and logged or an outcrop measured, and this stratigraphic information was convincingly correlated with the seismic data. Once again, note the importance of mapping the site geology to determine field relations of the various strata present. Without this information, much of the interpretation of information gathered from seismic studies is necessarily speculative.

Figure 3a Cross-section of seismic refraction measuring technique (Zhody, 1974).

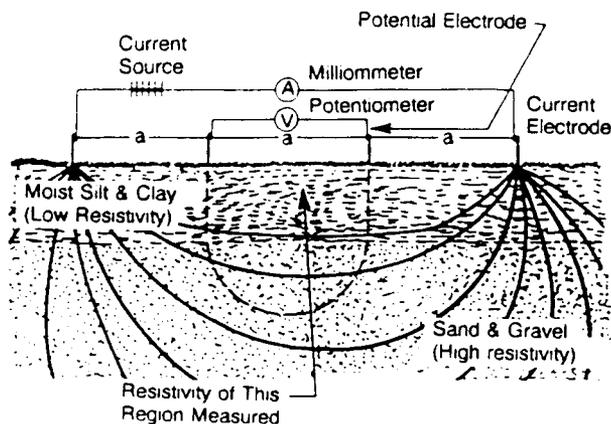
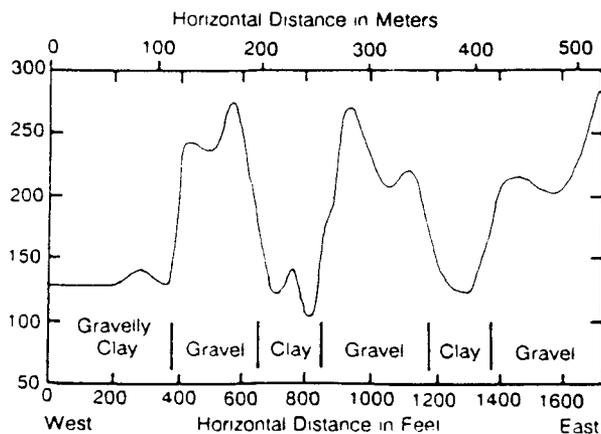


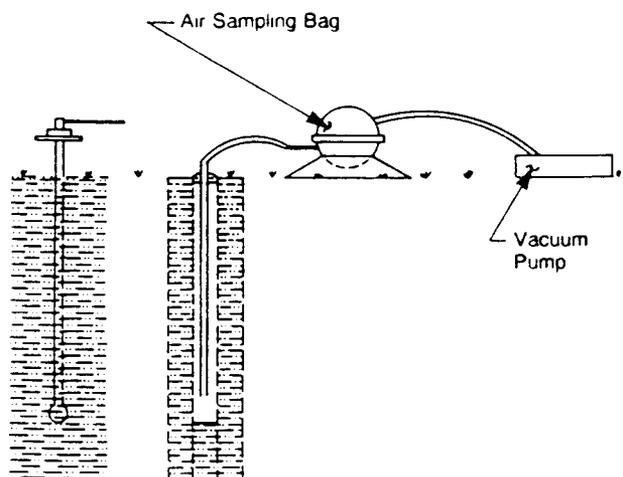
Figure 3b Log of seismic refraction results (Zhody, 1974).



Soil Gas Monitoring

VOCs on the "surface" of groundwater volatilize into the voids in the soil above the groundwater. Soil gas collection and sampling procedures have been developed that are simple and quick to implement (Lappala, 1984; Quinn, 1985; Nadeau, 1985). In one method as shown in Figure 4, a small diameter (1-in.) steel probe is inserted to a depth of 3 feet. A vacuum pump pulls the VOC that is present between the interspaces or voids of the soils into a sample tube. The sealed tube is taken to a laboratory for analysis by Gas Chromatography (GC). The sample train is decontaminated before use in the next probe hole by pumping ambient air through the system. A portable photoionization detector (PID) gas chromatograph can be used in the field prior to putting the sample into the collection tube. By first passing a sample through this device, a quick determination of the presence of VOCs can be made. If there is no reading, then no sample need be analyzed in the laboratory.

Figure 4. Soil vapor probe and sampling train (Nadeau, 1985).



As shown in Figures 5a, 5b, 5c and 5d, the soil gas sampling procedure can quickly produce isopleths of VOC concentrations over a large site and indicate possible source areas. While not exactly analogous to the VOC concentrations in groundwater, the results can be utilized to develop a borehole and monitoring well program with a minimum number of wells because of this prior knowledge of the site conditions. The soil gas sampling procedure is low cost, produces low site disturbance and can be used at sites with difficult access.

Detection limits of 0.0001 to 0.01 mg/P in soil samples and 0.1 to 1.0 mg/l in water samples have been reported. Lappala (1984) reported the results of repeated sampling on successive days at a

southwestern United States site using these soil gas sampling techniques. The results of successive days' samples showed no significant difference by Student's "t" Test. However, Karably (1987) reported significant variations in soil gas sample point readings (i.e., magnitude of VOC detected) over an extended time period caused by environmental variables. However, the general trend of contaminant levels and plume geometry were roughly the same. Soil gas concentrations were found to be affected by temperature and infiltrating groundwater.

A second factor affecting the repeatability of the soil gas sampling techniques was the length of time to draw the sample at each station. Karably (1987) reported that results of repeated sampling at the same station suggest that a specific volume of soil gas must be evacuated to obtain a representative sample, and that this volume would differ among hazardous sites. This required volume would need to be determined at each site as part of the sampling protocol. Results and effectiveness have been found to be sensitive to repeated spill incidents on the same site and to fluctuations of the groundwater table. Sites with tight, saturated clay layers or an expected contaminated layer below a clean layer of groundwater are not good applications for soil gas sampling (Lappala, 1984). A sampling probe length of 3 feet has been used on sites with groundwater down to 36 feet, while a length of 10 feet is needed for groundwater down to 100 feet. If the detected concentration decreases with depth, then the source of the VOC is a surface spill. If the concentration increases, this indicates that the VOC is on the surface of the groundwater. The sampling procedure has limited usefulness for deep groundwater (75 to 100 feet).

For air sampling of unknown contaminants, a multistage tube was developed to provide a quick profile of organic compounds (Turpin, 1984). Solid sorbent media require minimal processing to produce a suitable sample for injection into GC/MS analytical equipment, a rapid qualitative and quantitative device for characterization of unknown mixtures. This procedure reduces the number of air samples needed, improves turnaround time, and identifies a wide variety of chemicals in the screening process. The sample is collected in a two-stage tube consisting of Tenax-GC packing in the first tube and Chromosorb® 102 sorbent in the second. Some chemicals such as tricresyl phosphate, isopropyl alcohol, chlordane, Aroclor 1254, and naphthalene were not collectible by this tube configuration.

Use of Surrogates

During a preliminary investigation, much of the expense associated with analytical activities can be reduced by using surrogate or good indicator parameters. These are typically nonspecific.

Examples would be: total organic carbon, total organic halogens, specific conductance or, if dealing with gases, organic volatile measurements. It should be emphasized that these analyses measure a class or a group of compounds and may not directly quantify the specific compound or contaminants of concern. Care must be exercised when correlating these nonspecific measurements with the total movement of the contaminant.

Core Sampling

To make the most of monitoring well installations, it should be decided if continuous coring with core recovery should be performed during well drilling activities. The study of cores is the best way to examine rocks in the subsurface, and if there are unresolved questions about porosity, hydraulic conductivity, fracturing, etc., the detailed lithologic log produced from core logging will often provide answers. Cores give a more complete picture of the subsurface geology and contaminant location than do cuttings alone, and therefore, coring is preferred.

Monitoring Well Networks

Pumping tests or single well tests are probably the most utilized tool to determine the aquifer properties. There are a number of different type tests, but as with any other type of testing program, selecting the sampling point(s) is critical in order to obtain good results. An effective preliminary survey can produce significant cost savings by specifying the optimum locations for a minimum number of required wells. Before any site-specific groundwater sampling is done, soil and waste characterization should be completed.

When groundwater contaminant plumes are suspected of having significant depth as well as lateral distribution, a three-dimensional array of monitoring points is needed to identify and characterize such plumes. Thus, groundwater data must be obtained from a number of different locations and from a number of different depths at each location. As a result, either a large number of drillholes are required, each with separate instrumentation installed, or instruments must be combined and installed at multiple levels in each of a smaller number of drillholes.

Several downhole sampling devices have been developed to sample at discrete and multiple levels within the well. Discrete sampling can be utilized to identify the location for the well screening to assure extraction of the contaminant during pumping. The sampler can be lowered into a borehole to increasingly lower depths until the proper level is identified. The sampler is then removed and the well is developed for extraction. If the well were being developed as a monitoring well, then the sampler can

Figure 5. Comparison of TCE and TCA concentration distribution by groundwater and soil gas samples, southwestern U.S. study (Lappala, 1984).

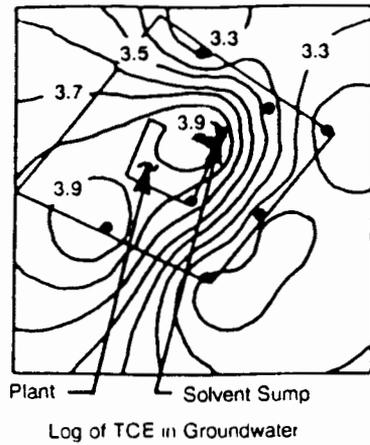


Figure 5a.

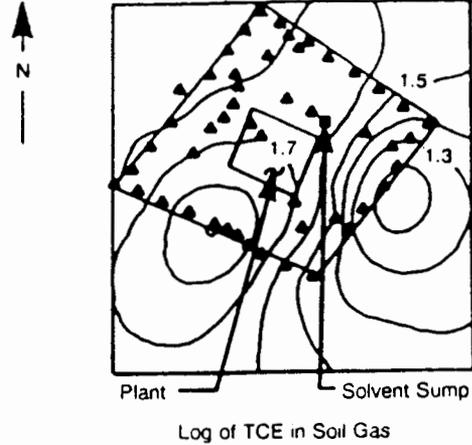


Figure 5b

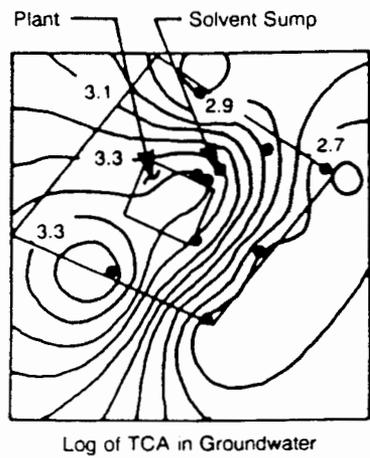


Figure 5c

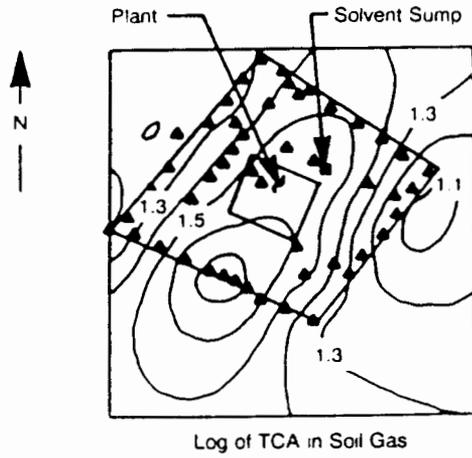
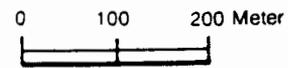


Figure 5d.



- Legend:
 ● Monitoring Well
 ▲ Soil Gas Probe
 ~ 3.1 Log of TCE or TCA Concentration in Groundwater
 ~ 3.1 Log of TCE or TCA Concentration in Soil Gas

be left in place. A multiple level sampler can be used to take many samples over the depth of the well without having to be moved if such sampling is required.

Conceptual Model

Upon completion of both the preliminary and detailed site investigation, a conceptual model can be prepared. A conceptual model is essentially a site model which includes all of the information that has been acquired for the site from both preliminary and detailed investigations, as well as other investigations not directly related to the site. The conceptual model can be anything from simple diagrams to detailed computer simulations, depending upon the complexity of the site. The model must be continually updated to include new information as it is developed.

Once the conceptual model is operating, it can be utilized to help develop a technically sound, cost-effective recovery and treatment system. Potential uses for a conceptual model include provision of continual updates of project developments, provision of a yardstick to measure what has been done and what needs to be done, and helping prioritize areas for Corrective Action. Ultimately, the principal use for a conceptual model is to help determine what Corrective Actions or alternatives are applicable to the site.

Laboratory and Bench-Scale Studies

Bench- or pilot-scale studies are necessary to demonstrate the ability of a technology to effectively treat a specific waste. Waste characteristics vary from site to site and because of this, the effect of a treatment technology with that particular waste may not be known, given the site-specific factors and conditions. Also, the proposed treatment technology may be new or unproven.

Thus, bench or pilot studies are necessary to avoid technology misapplication in the field. The loss of time in treatment or the requirement to provide additional treatment for the waste is very expensive. Therefore, the relatively small costs and time needed for these studies make them useful tools in treatment selection. Bench-scale treatability studies for demonstrated technologies can cost between \$10,000-\$50,000 and take up to 6 weeks. Demonstrated technologies are those for which the major design parameters and treatment efficiencies are well understood. Innovative (and some biological processes) will require substantially more time (4-16 weeks) and money (\$25,000->\$200,000). These are estimates, and actual time and costs are going to depend on what kind of technology is under consideration.

Pilot-scale studies for demonstrated technologies can cost from \$25,000 to more than \$100,000 and typically require 2-12 weeks. For innovative technologies, the cost for pilot testing can start at \$100,000 and exceed \$1,000,000 and require 3 to 12 months.

Aside from size considerations, the primary difference between bench-scale and pilot-scale work is that bench-scale tests are conducted in the laboratory; pilot-scale testing is usually carried out on the site. Pilot tests are subject to a whole range of problems, such as siting, health and safety, obtaining clearances, installation and operation. However, the data obtained from pilot-scale tests are much more appropriate and useful because they reflect what is actually occurring in the field.

The choice of the kind of testing (bench or pilot-scale) to be performed is going to hinge on the balance between the level of certainty that the technology is going to work (and be effective for the site) against the risk of failure if the technology does not work for the unique mix of contaminants and contaminated media (air, water, soils, sediments) found at that site. The risks of failure include the cost and time needed to perform another test or to implement another technology if the first one selected fails. Obviously, pilot-scale studies may not be needed if there is a high level of certainty that the particular technology will work (i.e., there is a low risk of failure). Pilot-scale studies also may be unnecessary if there is going to be very little cost or time penalty for identifying a new treatment system, given failure of the first. On the other hand, if there is a low level of certainty that the technology is appropriate and there is a very high risk of failure, one needs to carefully consider that it may be more prudent to spend the time and money for bench-scale testing. Pilot-scale testing, without prior bench-scale testing, should be employed only when there is a moderate level of certainty that the technology is going to be effective and there is only a moderate risk of failure.

References

Johnson Division-Universal Oil Products Company, Groundwater and Wells, St. Paul, Minnesota, 1972, p. 177.

Johnson, W. and P. Johnson. "Pitfalls of Geophysics in Characterizing Underground Hazardous Waste," In: Management of Uncontrolled Hazardous Waste Sites Proceedings, Hazardous Materials Control Research Institute, Washington, D.C., p. 227-232, 1986.

Karably, L. and K. Babcock. Effects of Environmental Variables on Soil Gas Surveys In: Superfund '87, The 8th National Conference

Proceedings, Hazardous Materials Control Research Institute, Washington, D.C., 1987.

Lappala, E. and G. Thompson. Detection of Groundwater Contamination by Shallow Soil Gas Sampling in the Vadose Zone and Applications. In: Management of Uncontrolled Hazardous Waste Sites Proceedings, Hazardous Materials Control Research Institute, Washington, D.C., 1984.

Nadeau, R., J. Lafornera, G. Klinger and T. Stone. Measuring Soil Vapors for Defining Subsurface Contaminated Plumes. Management of Uncontrolled Hazardous Waste Sites Proceedings, Hazardous Materials Control Research Institute, Washington, D.C., 1985.

Quinn, K., S. Wittmann and R. Lee. Use of Soil Gas Sampling Techniques for Assessment of Groundwater Contamination. In: Management of Uncontrolled Hazardous Waste Site Proceedings, Hazardous Materials Control Research Institute, Washington, D.C., 1985.

Turpin, R., K. Vora, J. Singh, A. Eissler, and D. Stranbergh. "On-Site Air Monitoring Classification by the Use of a Two-Stage Collection Tube," Management of Uncontrolled Hazardous Waste Sites Proceedings, Hazardous Materials Control Research Institute, Washington, D.C., 1984.

Zohdy, A., G. Eaton, and D. Mabey. Application of Surface Geophysics to Groundwater Investigation, Techniques of Water Resource Investigation, Book II Chapter D1, U.S. Government Printing Office, Washington, D.C., 1974, p.14.