REPORT OF GEOTECHNICAL SERVICES

ENVIRONMENTAL SITE CHARACTERIZATION

BULK PLANT 0046

BINGEN, WASHINGTON

FOR UNOCAL

GeoEngineers

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REPORT OF GEOTECHNICAL SERVICES
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BULK PLANT 0046
BINGEN, WASHINGTON
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INTRODUCTION AND SCOPE

The results of our environmental assessment at the site of Unocal Bulk Plant 0046 are presented in this report. The bulk plant is located at 217 East Stuben Street east of downtown Bingen, Washington. The site location is shown relative to surrounding features in the Vicinity Map, Figure 1. A generalized site plan of the facility is shown on the Site Plan, Figure 2.

The purpose of our services is to explore the site for the presence of subsurface petroleum-related contamination. The scope of services completed for this study is listed below:

1. Drill eight borings at the site and obtain soil samples from each boring. Also obtain soil samples from one hand-excavated pit in the easternmost storm water detention pond.
2. Screen each soil sample in the field using visual, water sheen and headspace vapor screening methods.
3. Install ground water monitor wells with locking flush-grade surface monuments in four of the borings.
4. Develop the well screens by hand bailing with a PVC bailer.
5. Determine the monitor well casing elevations to an accuracy of 0.01 feet using an engineer's level and an assumed site datum.
6. Measure the air space in each well casing for hydrocarbon vapors using a Bacharach TLV Sniffer.
7. Measure water table depths for all of the wells and sample each well for the potential presence of free (floating) hydrocarbons.
8. Obtain ground water samples from the monitor wells for laboratory analysis.

9. Test selected soil samples from each boring for total petroleum hydrocarbons (TPH) by EPA Method 418.1, and for benzene, ethylbenzene, toluene and xylenes (BETX) by EPA Method 8020.
10. Test ground water samples from each monitor well for TPH by EPA Method 418.1, and for benzene, ethylbenzene, toluene and xylenes (BETX) by EPA Method 602.
11. Evaluate the field and laboratory data with regard to existing regulatory concerns.

SITE CONDITIONS

GENERAL

Bulk Plant 0046 was constructed in 1924. The land use prior to 1924 is unknown. Presently, the facilities at the site include five 20,000-gallon vertical steel above-grade storage tanks, a loading rack and unloading platform, associated piping, pumps and reservoirs, a septic tank, an oil storage warehouse, a garage, an office building, and two detention ponds. In addition, an underground storage tank and fuel dispenser service pump operated by the bulk plant is located at the east end of the property. Discussions with the bulk plant operator indicate that a 1,000-gallon steel underground storage tank was located near the product dispenser about 15 years ago. The tank and dispenser are presently operational and subsurface conditions in the vicinity of this tank were not explored in this or previous studies by GeoEngineers.

In a report dated June 28, 1989, GeoEngineers, Inc. discussed the results of soil sampling during the removal of a 5,000-gallon gasoline underground storage tank (UST) located near the warehouse. Samples were obtained from the limits of the excavation and near the north wall of the warehouse and tested for total petroleum hydrocarbons (TPH). TPH concentrations of 7,920 ppm and 9,200 ppm were found in samples obtained from the south wall of the excavation and near the warehouse, respectively. These concentrations exceed current Washington State Department of Ecology (Ecology) cleanup guidelines. Our observations indicated that this contamination may extend beneath the warehouse.

A 550-gallon steel heating oil UST was also removed in 1989. This excavation was not monitored by GeoEngineers, Inc. (see Figure 2).

SUBSURFACE SOIL CONDITIONS

Subsurface soil conditions beneath the bulk plant site were explored by drilling eight borings (B-1 through B-4 and MW-1 through MW-4) to depths between 8 and 25 feet at the locations indicated in Figure 2. Details of the field exploration program and the boring logs are presented in Appendix A. In addition to the drilled explorations, a shallow hand-dug test pit was dug in the detention pond located in the southeast corner of the site to investigate possible shallow petroleum contamination.

The borings encountered native brown gravel with silt extending from the ground surface to a depth of approximately 10 feet. Large cobbles and boulders and possibly bedrock were encountered below the gravel. Three to seven feet of brown silt was encountered above the brown gravel in B-1, B-2, and B-3.

GROUND WATER CONDITIONS

Ground water conditions at the site were explored by installing monitor wells in four of the borings. Construction details for the monitor wells are included in Appendix A. We measured the water table depth and elevation in the monitor wells on May 17, 1990.

Ground water was encountered between 6 and 14 feet below the ground surface, usually within the cobble and boulder soil unit. Ground water elevations based on measurements made on May 17 are shown in Figure 2. The ground water elevations were irregular and did not show a consistent flow direction. Local topography suggests ground water flow is probably southward, toward the Columbia River.

SUBSURFACE CONTAMINATION

Potential subsurface contamination at the site from petroleum products was evaluated by:

1. Physical examination of soil samples and noting the presence of petroleum odor during drilling.

2. Conducting field screening on soil samples using visual, water sheen and headspace vapor screening methods. These methods are described in Appendix A.
3. Measuring the air space in the monitor well casings for hydrocarbon vapors using a Bacharach TLV Sniffer on May 17, 1990.
4. Sampling the water table interface in each monitor well for the potential presence of free (floating) hydrocarbons on May 17, 1990.
5. Testing soil and ground water samples for petroleum hydrocarbons and related compounds.

The soil and ground water analytical data are summarized in Tables 1 and 2, respectively. The laboratory reports for soil and water samples are included in Appendix B.

Field screening revealed evidence of slight subsurface petroleum contamination of soil. Moderate petroleum-like odors were detected during drilling at a depth of 20 feet in boring MW-3; petroleum-like odors were not detected during drilling of the other borings. Headspace vapor concentrations of soil samples obtained from the borings were all less than 100 ppm. Most soil samples exhibited only slight sheen. Petroleum sheens were not detected on soil samples obtained from B-4 and MW-4. Field screening results are presented in the monitor well logs and are summarized in Table 1.

Free (floating) hydrocarbons were not present in any of the monitor wells. Concentrations of combustible hydrocarbon vapors in the well casings ranged from less than 100 to 180 ppm. These measurements are within the range of normal background conditions for monitor well casings in non-contaminated soil. Hydrocarbon vapor measurements are presented in Table 2.

The soil samples resulted in low concentrations of total petroleum hydrocarbons (TPH) in the vicinities of B-4, MW-1, MW-3, and MW-4 (6 to 11 ppm at depths above 5 feet). Low concentrations of ethylbenzene, toluene and xylenes were found in soil samples obtained from B-4 and MW-1 at depths of 2.5 and 5.0 feet, respectively. The shallow soil samples obtained from the detention pond at the southeast corner of the site contained low

concentrations of TPH (15 to 18 ppm). Results from laboratory testing of soil samples are presented in Appendix B and summarized in Table 1.

Laboratory analysis of ground water samples detected low concentrations of TPH in MW-1 and MW-4 (1.6 and 0.8 ppm, respectively). TPH was not detected in water samples from MW-2 and MW-3. Benzene was not detected in any water sample. Low concentrations of ethylbenzene, toluene and xylenes were detected in MW-1. Results from analytical testing of ground water are presented in Appendix B and summarized in Table 2.

CONCLUSIONS

The current Ecology cleanup guidelines for petroleum-related contamination in soil are 200 ppm TPH, 660 ppb (0.66 ppm) benzene, 143 ppm toluene and 14 ppm ethylbenzene. Concentrations of TPH and BETX from boreholes at this site were all less than current Ecology soil cleanup guidelines. However, as noted in our report dated June 28, 1989, two soil samples obtained from the underground storage excavation of a 5,000-gallon steel UST had TPH concentrations in excess of the cleanup guidelines. Field observations indicate that the soil contamination in excess of Ecology guidelines probably originated from the warehouse.

Concentrations of petroleum-related compounds in ground water do not exceed current drinking water standards in the four monitor wells. BETX was detected in small concentrations in ground water obtained from MW-1. Ecology does not have cleanup standards for petroleum in ground water at the present time. MW-1 is located near the loading racks and a storm drain that receives surface water from the unloading platform.

RECOMMENDATIONS

Our field observations indicate that residual soil contamination exists near the north wall of the warehouse and may extend under the building. Residual soil contamination in this area is not expected to extend deeper than 5 feet. Based on the results of chemical analyses of ground water samples obtained from our monitor wells, the ground water has not been impacted significantly by this residual contamination. However, we recommend that the residual soil contamination near the warehouse be excavated

and transported to a landfill for legal disposal. This excavation may necessitate demolition of part or all of the warehouse.

We understand that Unocal intends to remove the onsite underground storage tank, product lines, and dispenser. Soil samples should be collected and analyzed for the presence of petroleum products during tank removal activities.

Approximately 4 cubic yards of soil cuttings from the borings have TPH and BETX concentrations below Ecology cleanup guidelines. We recommend that this soil may be used on site as fill or for other purposes.

LIMITATIONS

We have prepared this report for use by Unocal. This report may be made available to prospective buyers of the property and to regulatory agencies. The report is not intended for use by others and the information contained herein is not applicable to other sites.

Our interpretations of subsurface conditions are based on data from widely spaced boreholes at the site. It is possible that areas with undetected contamination exist beneath portions of the site that were not explored by drilling.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in this area at the time the report was prepared. No other conditions, express or implied, should be understood.

- o O o -

Please call if you have questions concerning our report.

Respectfully submitted,
GeoEngineers, Inc.

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Geological Engineer/Hydrogeologist

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Principal

JAM:SEW:NCV:ldc
Five copies submitted

TABLE 1
SUMMARY OF SOIL CONTAMINATION DATA

Monitor Well Number	Sample I.D.	Depth (feet)	Field Screening Results		TPH (b) (ppm)	B	E	T	X(c)
			Headspace Vapors (ppm)	Sheen		Benzene (ppb)	Ethylbenzene (ppb)	Toluene (ppb)	Xylenes (ppb)
B-1	MW-1A	3.0	<100	SS	ND	ND	ND	2	1
B-2	MW-2B	3.0	<100	SS	ND	ND	ND	ND	ND
B-3	MW-3	7.5	<100	SS	ND	ND	ND	2	3
B-4	MW-5A	2.5	<100	NS	6	ND	1	4	6
MW-1	MW-4B	5.0	<100	SS	11	ND	ND	3	1
MW-2	MW-7A	3.0	<100	SS	ND	ND	ND	ND	ND
MW-3	MW-8A	3.0	<100	NS	6	ND	ND	ND	ND
MW-4	MW-9A	5.0	<100	NS	10	ND	ND	ND	ND
RP-1(a)	R-2	0.5	--	SS	18	ND	ND	ND	ND
RP-1(a)	R-1	1.5	--	SS	15	ND	ND	ND	ND

Notes:
"--" indicates "not analyzed"
"ND" indicates "not detected"
"NS" indicates "no sheen"
"SS" indicates "slight sheen"
"ppm" indicates "parts per million"
"TPH" indicates "total petroleum hydrocarbons"
(a) Samples obtained from hand excavated hole.
(b) TPH detection limit was 5 ppm. Analytical Method 418.1.
(c) BETX detection limit was 1 ppb. Analytical Method 8020.

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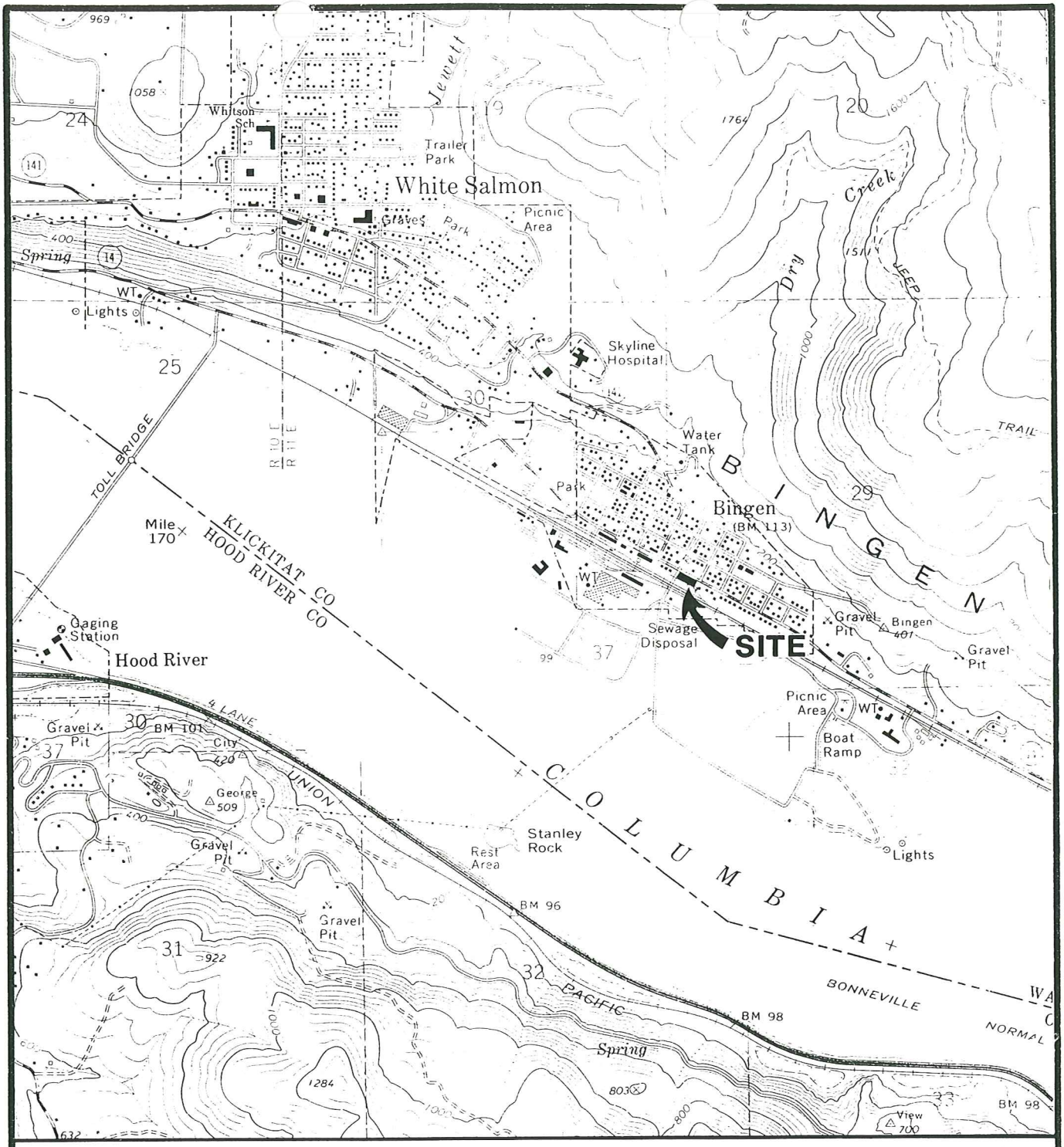
TABLE 2
SUMMARY OF GROUND WATER CHEMISTRY DATA

			B	E	T	X(c)
Monitor Well Number	Hydrocarbon Vapors (ppm)(a)	TPH (ppm)(b)	Benzene (ppb)	Ethylbenzene (ppb)	Toluene (ppb)	Xylenes (ppb)
MW-1	<100	1.6	ND	7	3	6
MW-2	180	ND	ND	ND	ND	ND
MW-3	130	ND	ND	ND	ND	ND
MW-4	<100	0.8	ND	ND	ND	ND

Notes:
"ND" indicates "not detected"
"ppb" indicates "parts per billion"
"ppm" indicates "parts per million"
Analytical methods are described in Appendix A.
Laboratory analysis reports are included as Appendix B.
(a) Measurements were obtained in monitor well within 1 ft. of water surface on May 17, 1990 using a Bacharach TLV Sniffer calibrated to hexane (110 ppm hexane = 1% LEL hexane).
(b) "TPH" indicates "total petroleum hydrocarbons"; laboratory detection limit was 0.5 ppm. Analytical Method 418.1.
(c) BETX detection limit was 1 ppb. Analytical Method 602.



REFERENCE: USGS 7.5' TOPOGRAPHIC MAP, "WHITE SALMON, WA".

0 2000 4000

SCALE IN FEET

N

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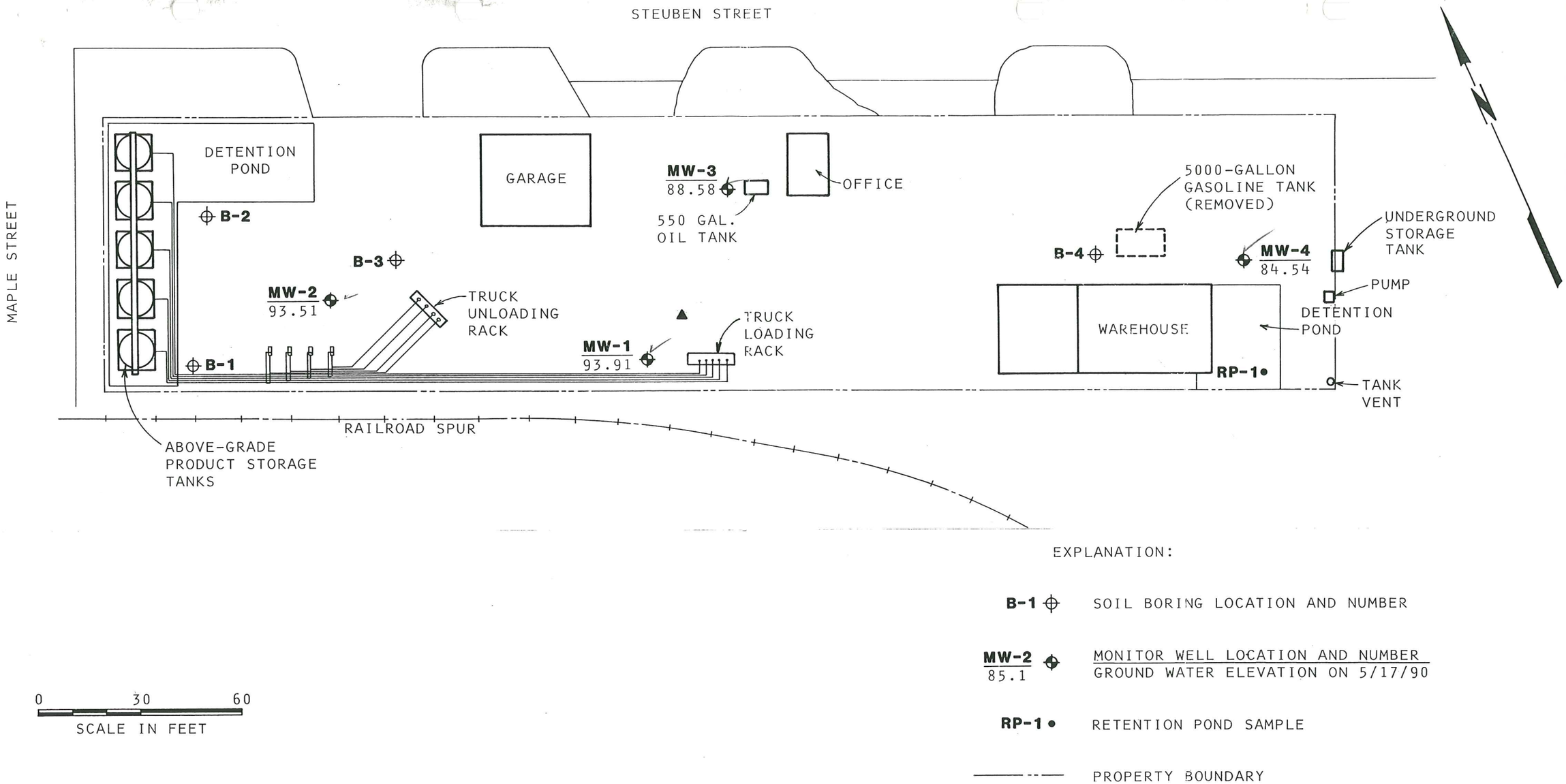
VICINITY MAP

FIGURE 1



0 30 60

SCALE IN FEET

EXPLANATION:

B-1 ⊕	SOIL BORING LOCATION AND NUMBER
MW-2 / 85.1 ⊕	MONITOR WELL LOCATION AND NUMBER / GROUND WATER ELEVATION ON 5/17/90
RP-1 •	RETENTION POND SAMPLE
——— -·- ———	PROPERTY BOUNDARY
▲	BENCHMARK ON NORTHWEST CORNER OF CONCRETE PAD OF LOADING RACK.

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SITE PLAN

FIGURE 2

LK 7/23/90

APPENDIX A

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A P P E N D I X A

FIELD EXPLORATIONS

DRILLING AND SOIL SAMPLING PROGRAM

Subsurface conditions at Bulk Plant 0046 were explored by drilling eight borings at the locations indicated in Figure 2. The borings were drilled initially (B-1 through B-4 and MW-1) using truck-mounted hollow-stem auger drilling equipment owned and operated by R & R Drilling, Inc. of Puyallup, Washington. MW-2 through MW-4 were drilled with air rotary methods due to drilling refusal encountered at approximately 10 feet with the hollow-stem auger. The borings were drilled on April 25, 26 and 27, 1990, to depths ranging between 8 and 25 feet. The drilling and soil sampling equipment was cleaned with a hot-water pressure washer between each boring.

A representative from our staff determined the boring locations, examined and classified the soils encountered, and prepared a detailed log of each boring. Soils encountered were classified visually in general accordance with ASTM D-2488-83, which is described in Figure A-1. An explanation of the boring log symbols is presented in Figure A-2. The boring logs are given in Figures A-3 through A-6.

Soil samples were obtained from each boring using a Dames & Moore split-barrel sampler (2.4-inch ID). The sampler was driven 18 inches by a 300-pound weight falling a vertical distance of approximately 30 inches. The number of blows needed to advance the sampler the final 12 inches is indicated to the left of the corresponding sample notations on the boring logs.

One soil sample was selected from each boring for chemical analysis. Samples that were tested are denoted in our boring logs with a "CA". Chain-of-custody procedures were followed in transporting the soil samples to the laboratory.

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FIELD SCREENING OF SOIL SAMPLES

A GeoEngineers representative conducted field screening on soil samples obtained from the exploratory borings. Field screening results are used as a general guideline to delineate areas of potential petroleum-related contamination in soils. In addition, screening results are used to aid in the selection of soil samples for chemical analysis. The field screening methods employed included: (1) visual examination, (2) sheen testing and (3) headspace vapor testing using a Bacharach TLV Sniffer calibrated to hexane.

Visual screening consisted of inspecting the soil for the presence of stains indicative of fuel-related contamination. Visual screening is generally more effective in detecting the presence of heavier petroleum hydrocarbons such as motor oil or when hydrocarbon concentrations are high. Sheen screening and headspace vapor screening are more sensitive methods which have been effective in detecting residual fuel hydrocarbons at levels less than regulatory cleanup guidelines. The results of the field screening are presented on the boring logs.

Sheen testing involves placing soil in water and observing the water surface for signs of sheen. Sheens observed at the site were classified as follows:

NS - No Sheen	No visible sheen on the water surface.
SS - Slight Sheen	Light colorless sheen, spread is irregular, not rapid; film dissipates rapidly.
MS - Moderate Sheen	Light to heavy film, may have some color or iridescence, globular to stringy; spread is rapid; irregular to flowing.
HS - Heavy Sheen	Heavy colorful film with iridescence; spread is rapid, and sheen flows off the sample; entire water surface may be covered with sheen.

Headspace vapor screening involves placing a soil sample in a plastic sample bag. Air is captured in the bag and the bag is shaken to expose the soil to the air trapped in the bag. The probe of a Bacharach TLV Sniffer is used to puncture the bag, the instrument withdraws the air from the bag, and the TLV Sniffer records the concentrations of combustible vapor in the air removed from the sample headspace. The TLV Sniffer records concentrations in parts per million (ppm) and is calibrated to hexane. The TLV Sniffer is designed to quantify combustible gas concentrations in the range between 100 and 10,000 ppm.

Field screening results are site and boring specific. The results vary with temperature, soil type, type of contaminant and soil moisture content.

MONITOR WELL CONSTRUCTION

Two-inch-diameter, Schedule 40 PVC pipe was installed in four borings at the completion of drilling. The lower portion of the PVC pipe is machine slotted (0.02-inch slot width) to allow entry of water, floating hydrocarbons and hydrocarbon vapors into the well casings. Medium sand was placed in the borehole annulus surrounding the slotted portion of the wells. A bentonite seal was placed above the sand pack to prevent surface water infiltration. The well casings were protected within flush-grade, locking surface monuments set in concrete. Monitor well construction is indicated in Figures A-3 through A-6.

The monitor well screens were developed by removing water from the wells with a PVC bailer. We determined the elevations of the well casings to the nearest 0.01 foot with an engineer's level on May 17, 1990. An elevation datum of 100.00 feet was assumed on the southwest corner of the concrete pad below the loading rack as shown on Figure 2. Elevations referenced to this datum are included on the monitor well logs.

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GROUND WATER SAMPLING PROGRAM

Ground water samples were obtained from the monitor wells by GeoEngineers on May 17 and June 12, 1990. The water samples were collected with a PVC bailer after at least three well volumes of water were removed from each well casing.

The water samples were transferred to septum vials and liter bottles in the field and kept cool during transport to the testing laboratory. Chain-of-custody procedures were observed during transport of the samples to the laboratory.

GROUND WATER ELEVATIONS

The depth to the ground water table relative to the monitor well casing rims was measured on May 17, 1990. The site measurements were made using a weighted fiberglass tape and water-finding paste. Ground water elevations were calculated by subtracting the water table depth from the casing rim elevations. Water table positions measured on May 17, 1990 are shown on the monitor well logs and in Figure 2.

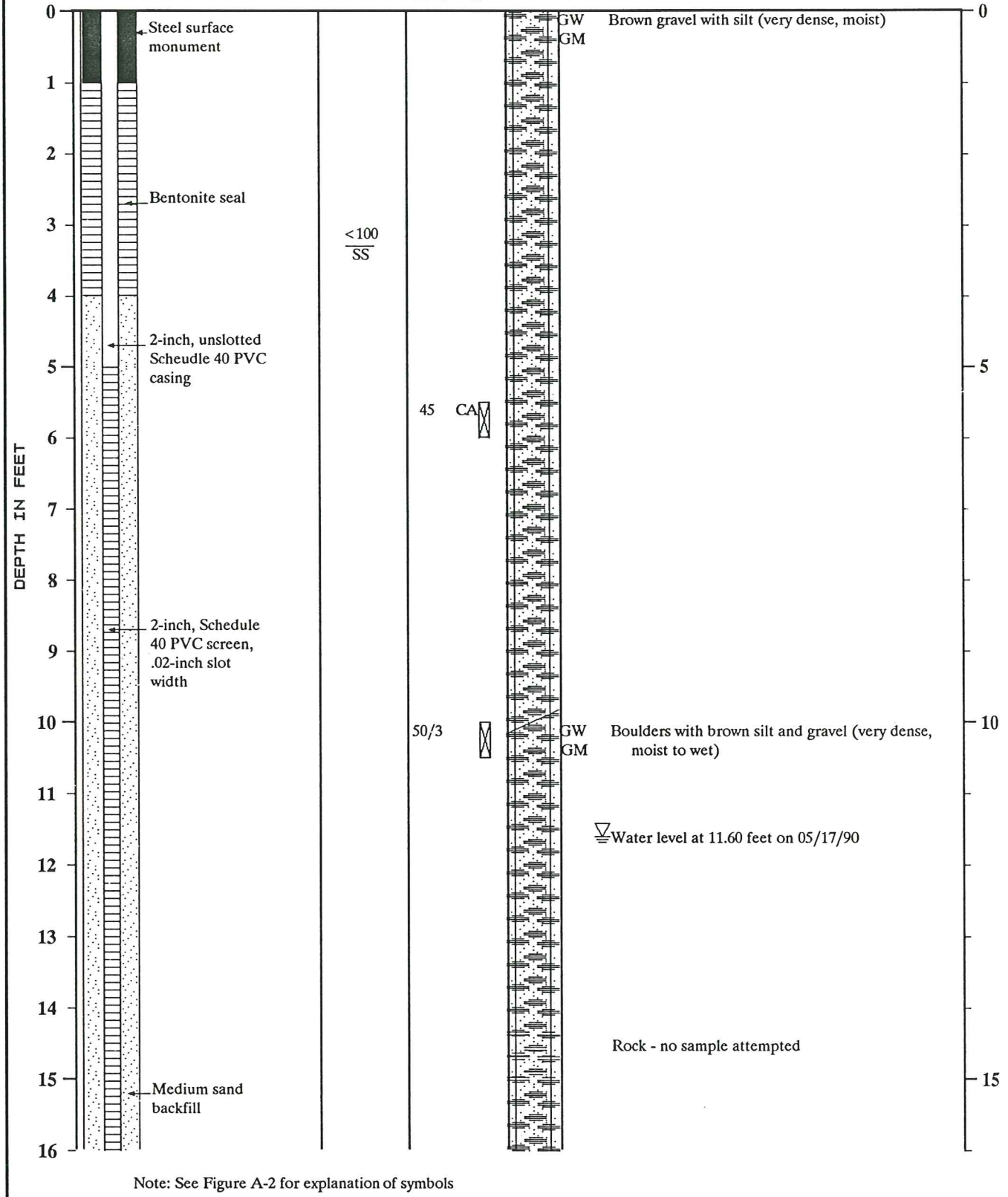
HYDROCARBON VAPOR CONCENTRATIONS

Hydrocarbon vapor concentrations were measured in each monitor well casing on May 17, 1990 using a Bacharach TLV Sniffer calibrated to hexane. The measurements were obtained by lowering a vinyl tube connected to the TLV to within approximately 1 foot of the water surface. The measurements obtained are reported in Table 2.

CHEMICAL ANALYTICAL PROGRAM

Eight soil and four ground water samples were analyzed by Pacific Environmental Laboratories, Inc of Beaverton, Oregon. The soil samples were analyzed for total petroleum hydrocarbons (TPH) using EPA Method 418.1 and for benzene, ethylbenzene, toluene, and xylenes (BETX) by EPA Method 8020. Ground water samples were analyzed for TPH by EPA Method 418.1 and for BETX by EPA Method 602. Laboratory reports are presented in Appendix B.

MONITOR WELL NO. MW-3



Note: See Figure A-2 for explanation of symbols

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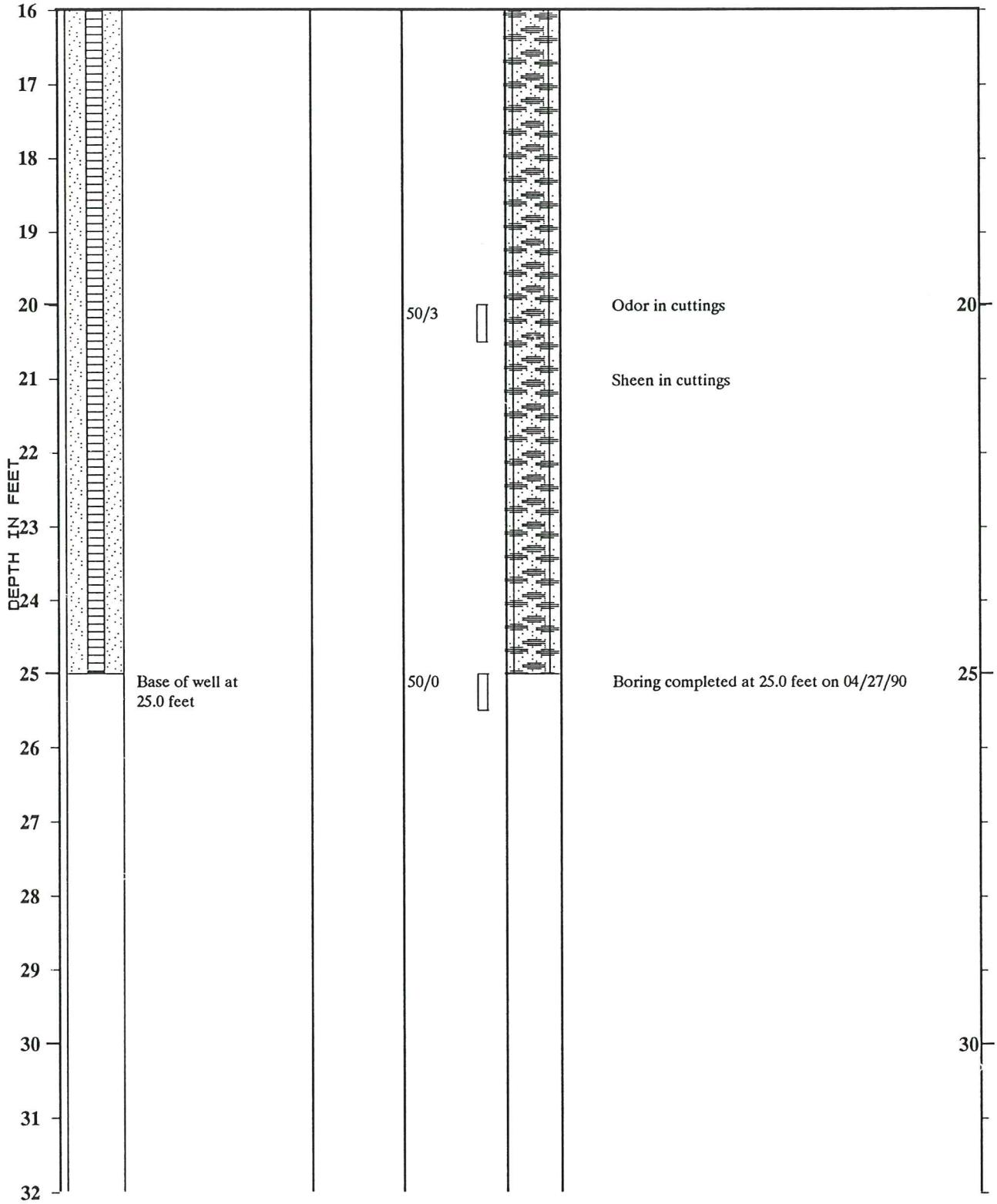
Log of Monitor Well

Figure A-5

:SEW:NCV:PLG 8/20/90

0161-181-P04

MONITOR WELL NO. MW-3
(Continued)



Note: See Figure A-2 for explanation of symbols

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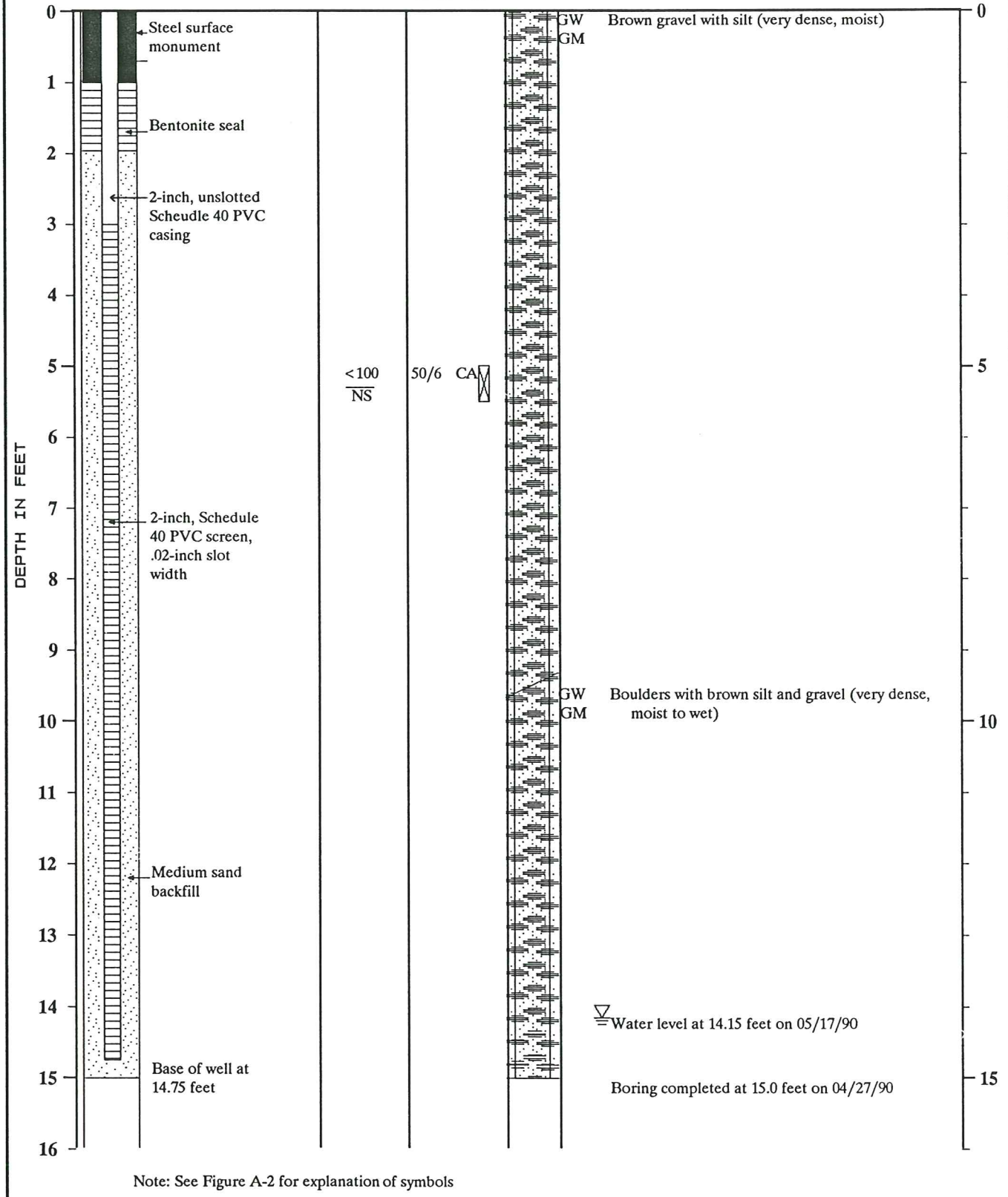
Log of Monitor Well

Figure A-5

:SEW:NCV:PLG 8/20/90

0161-181-P04

MONITOR WELL NO. MW-4



Note: See Figure A-2 for explanation of symbols

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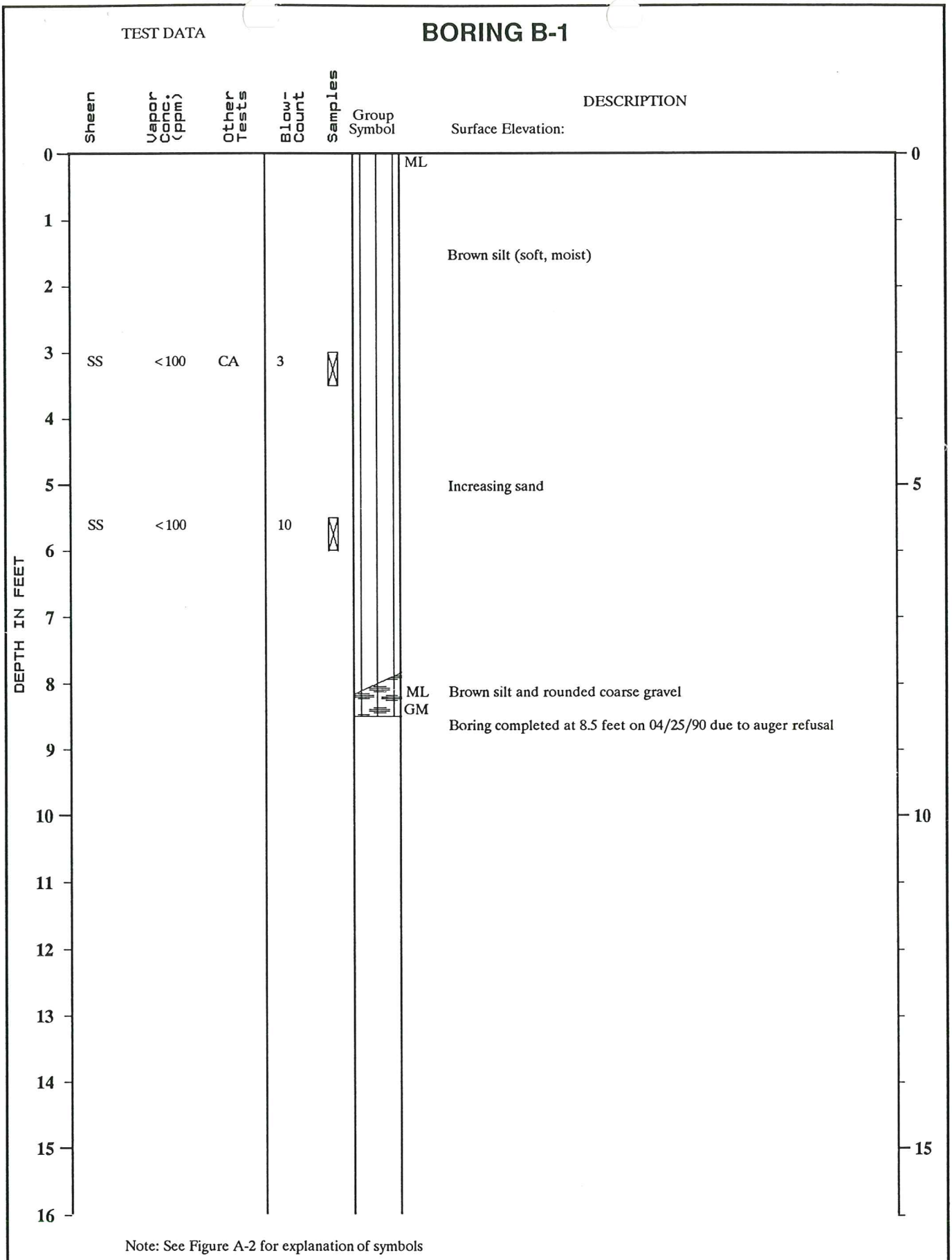
Log of Monitor Well

Figure A-6

:SEW:NCV:PLG 8/20/90

0161-181-P04

BORING B-1



Note: See Figure A-2 for explanation of symbols

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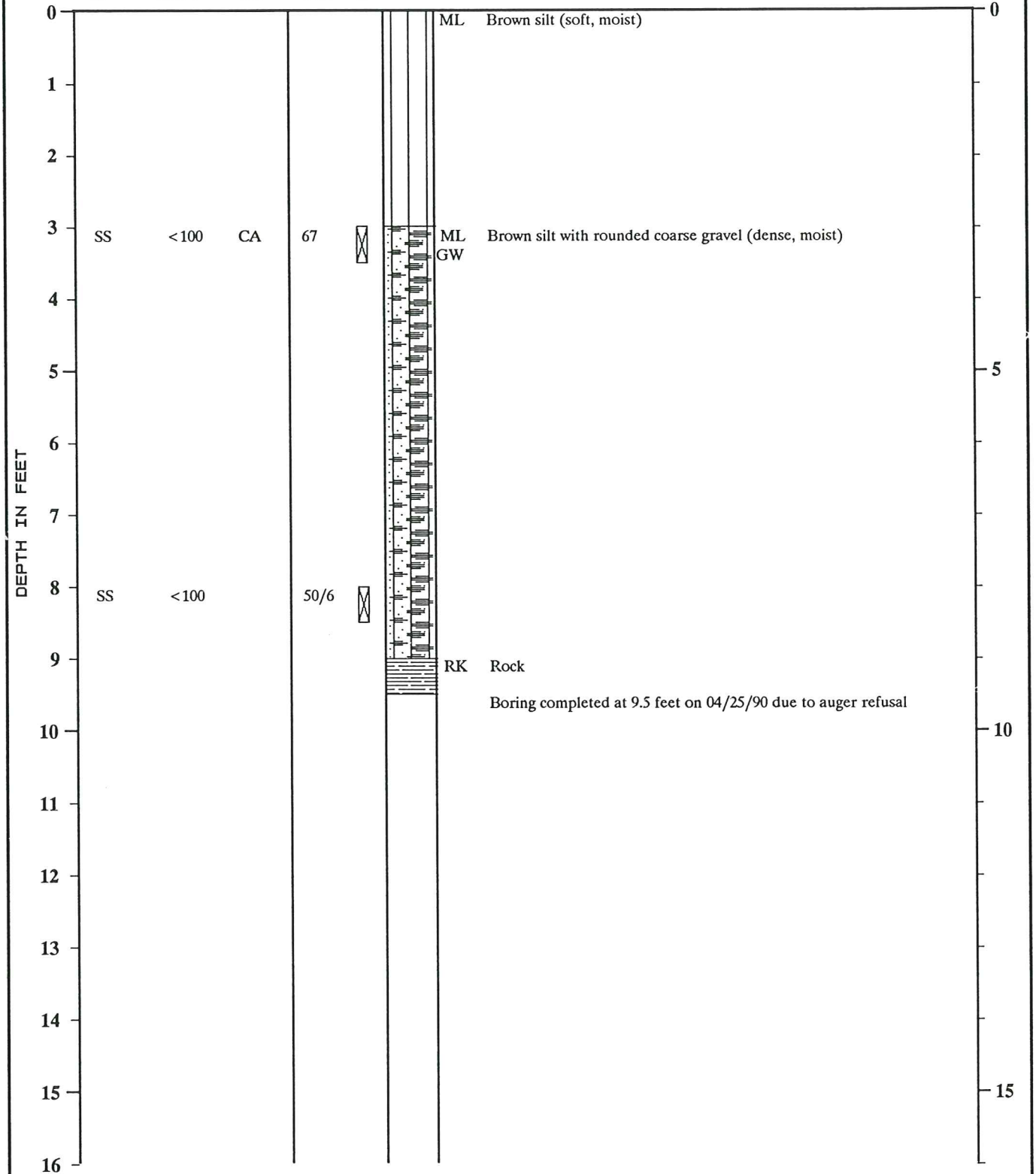
Log of Boring

Figure A-7

:SEW:NCV:PLG 8/20/90

3161-181-P04

BORING B-2



Note: See Figure A-2 for explanation of symbols

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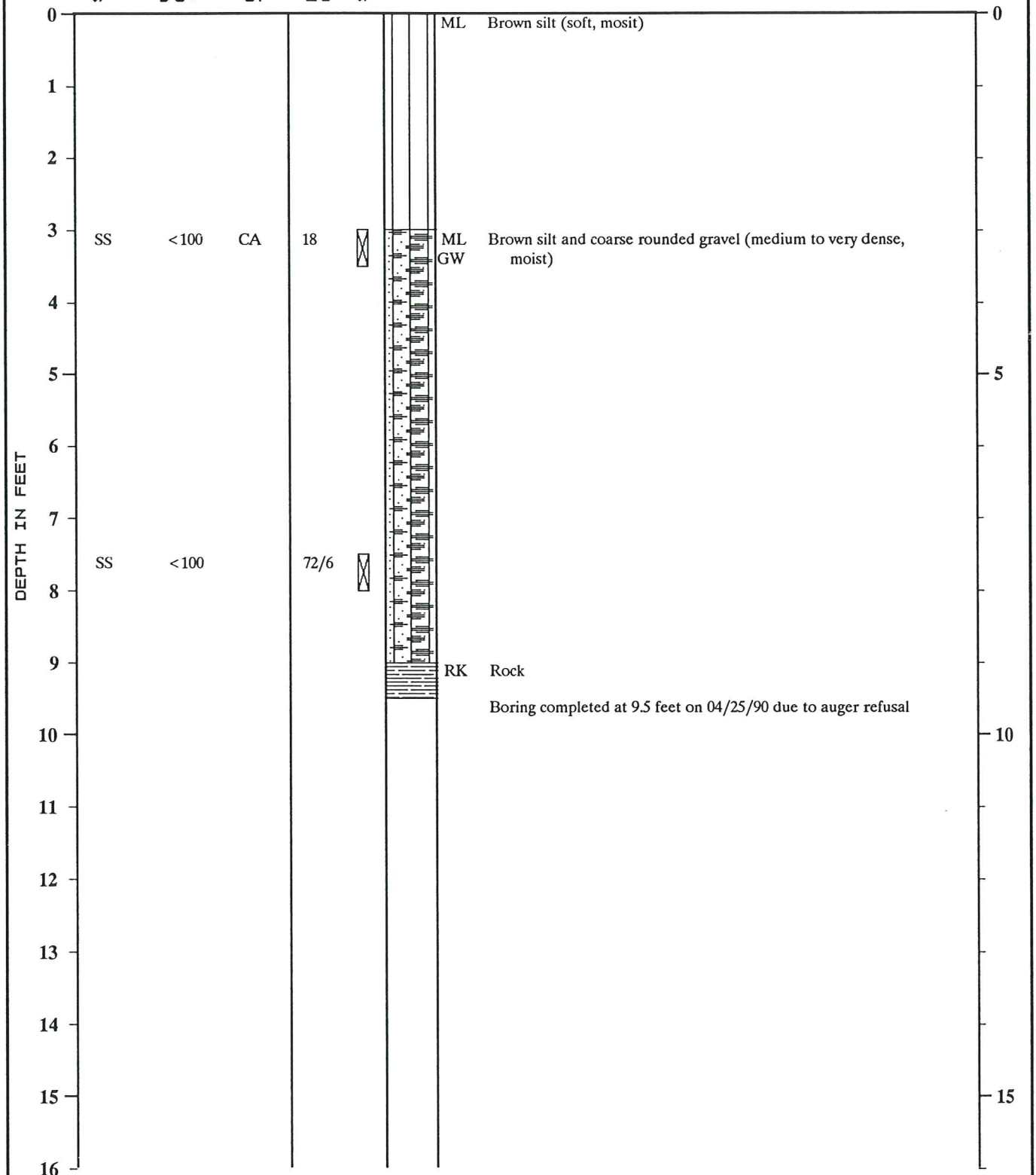
Log of Boring

Figure A-8

:SEW:NCV:PLG 8/20/90

0161-181-P04

BORING B-3



Note: See Figure A-2 for explanation of symbols

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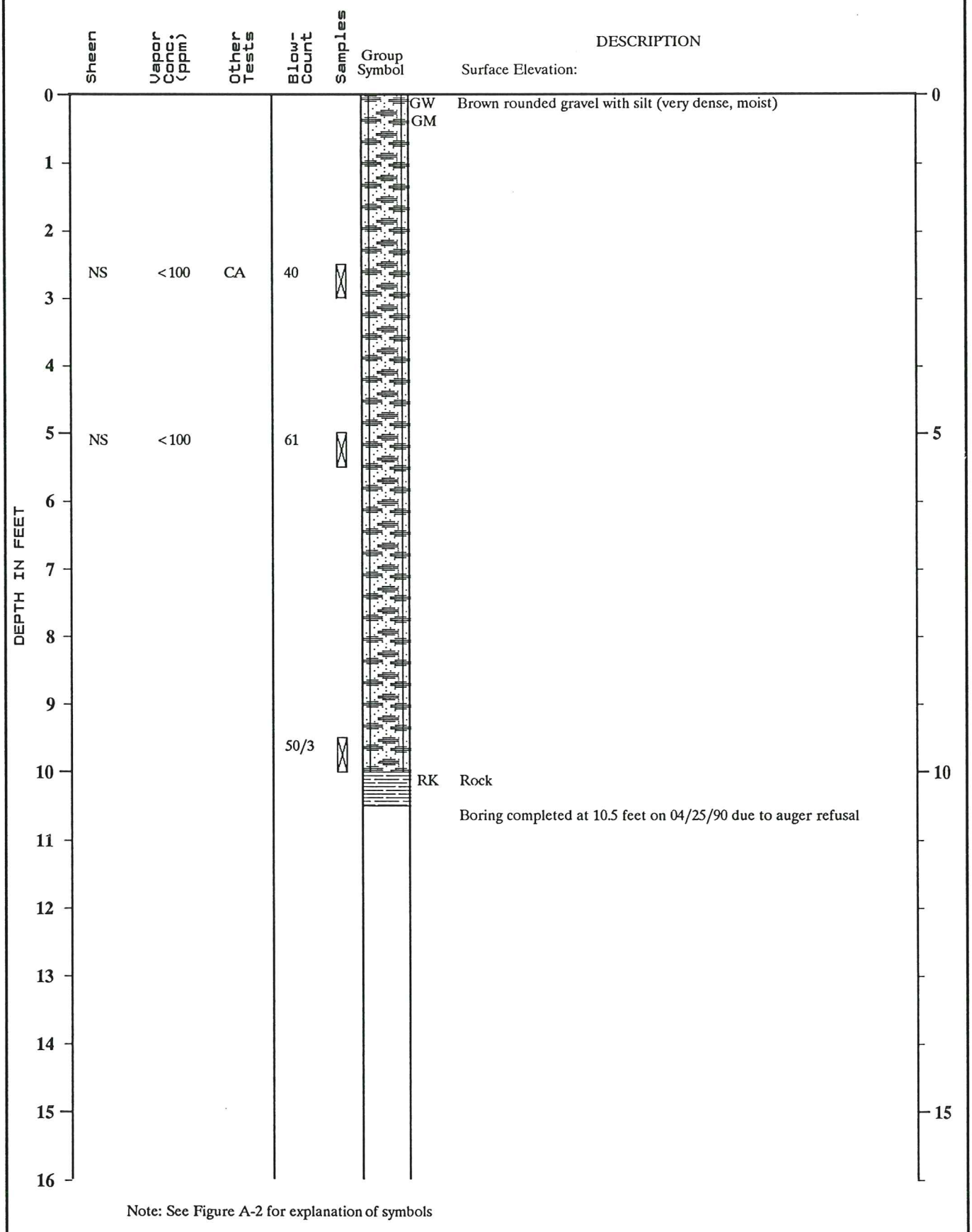
Log of Boring

Figure A-9

:SEW:NCV:PLG 8/20/90

0161-181-P04

BORING B-4



Note: See Figure A-2 for explanation of symbols

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Log of Boring

Figure A-10

0161-181-P04 :SEW:NCV:PLG 8/20/90

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVEL MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND MORE THAN 50% OF COARSE FRACTION PASSES NO. 4 SIEVE	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS MORE THAN 50% PASSES NO. 200 SIEVE	SILT AND CLAY LIQUID LIMIT LESS THAN 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY LIQUID LIMIT 50 OR MORE	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-83.
2. Soil classification using laboratory tests is based on ASTM D2487-83.
3. Descriptions of soil density or consistency are based on interpretation of blowcount data, visual appearance of soils, and/or test data.

SOIL MOISTURE MODIFIERS:

Dry - Absence of moisture, dusty, dry to the touch

Moist - Damp, but no visible water

Wet - Visible free water or saturated, usually soil is obtained from below water table

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SOIL CLASSIFICATION SYSTEM

FIGURE A-1

GEI 85-88

LABORATORY TESTS:

CA Chemical Analysis

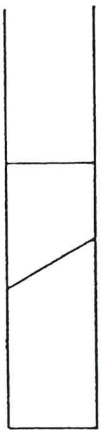
FIELD SCREENING TESTS:

Headspace vapor concentration data given in parts per million

Sheen classification system:

NS No Visible Sheen
SS Slight Sheen
MS Moderate Sheen
HS Heavy Sheen
NT Not Tested

SOIL GRAPH:



SM Soil Group Symbol (See Note 2)

Distinct Contact Between Soil Strata

Gradual or Approximate Location of Change Between Soil Strata

Water Level

Bottom of Boring

BLOW-COUNT/SAMPLE DATA:

Blows required to drive a 2.4-inch I.D. split-barrel sampler 12 inches or other indicated distances using a 300-pound hammer falling 30 inches.

22 — Location of relatively undisturbed sample

12 — Location of disturbed sample

17 — Location of sampling attempt with no recovery

Blows required to drive a 1.5-inch I.D. (SPT) split-barrel sampler 12 inches or other indicated distances using 140-pound hammer falling 30 inches.

10 — Location of sample obtained in general accordance with Standard Penetration Test (ASTM D-1586) procedures

26 — Location of SPT sampling attempt with no recovery

Location of grab sample

"P" indicates sampler pushed with weight of hammer or against weight of drill rig.

NOTES:

1. The reader must refer to the discussion in the report text, the Key to Boring Log Symbols and the exploration logs for a proper understanding of subsurface conditions.

2. Soil classification system is summarized in Figure A-1.

GEI 86-88 Rev. 6/90

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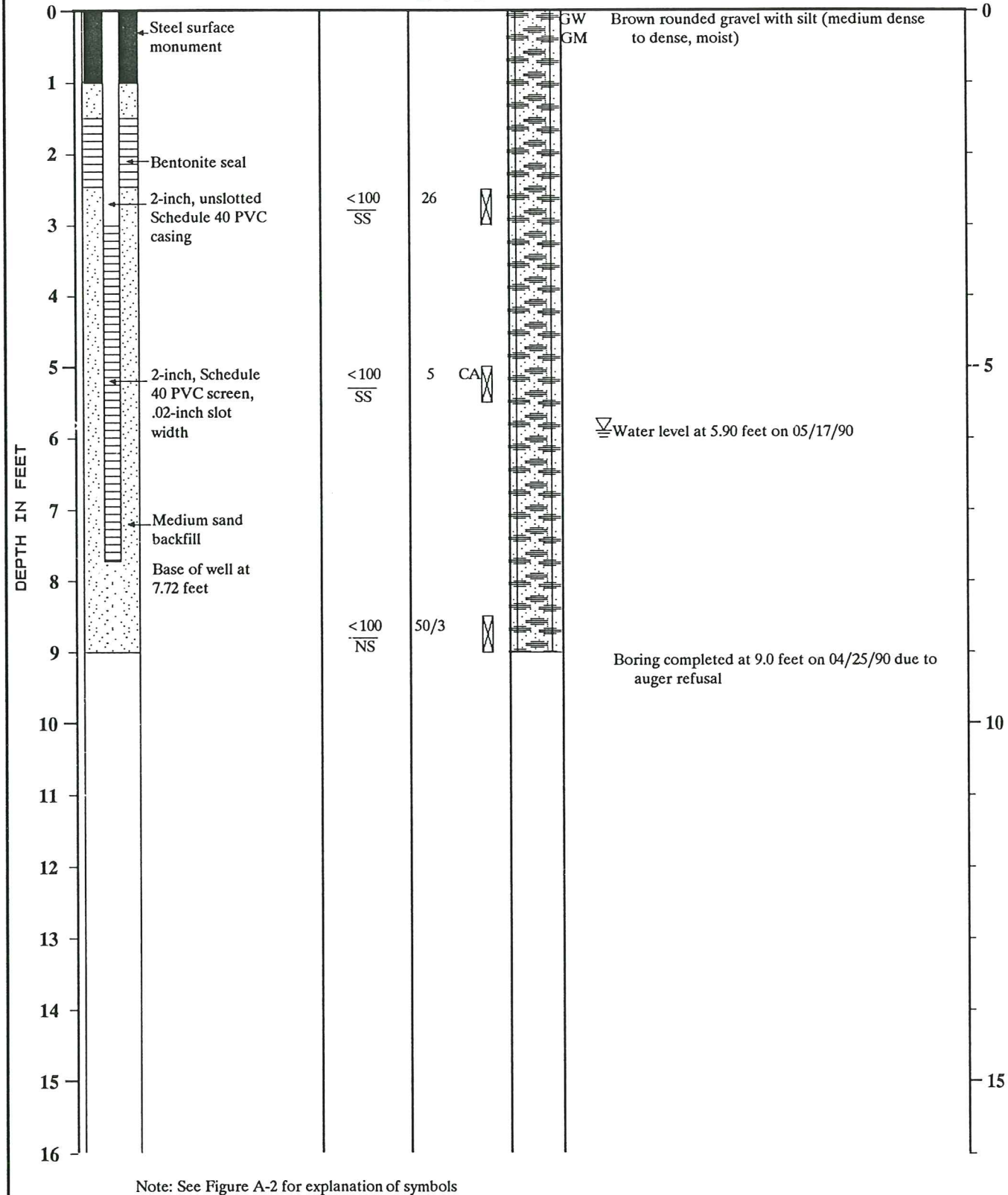
KEY TO BORING LOG SYMBOLS

FIGURE A-2

MONITOR WELL NO. MW-1



Note: See Figure A-2 for explanation of symbols

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Log of Monitor Well

Figure A-3

:SEW:NCV:PLG 8/20/90

-P04

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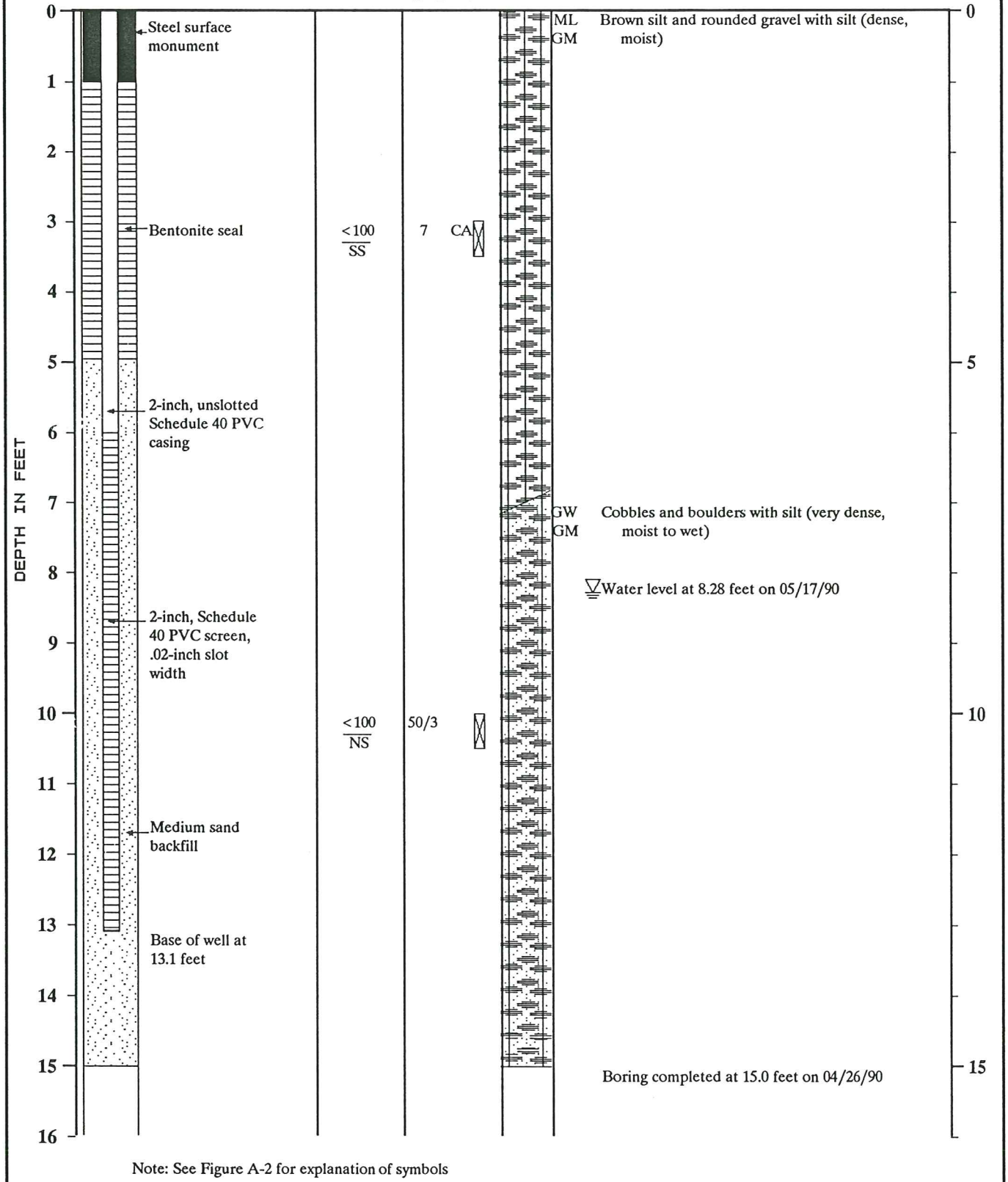
MONITOR WELL NO. MW-2



Note: See Figure A-2 for explanation of symbols

GeoEngineers

Log of Monitor Well

Figure A-4

:SEW:NCV:PLG 8/20/90

4-P04

01

APPENDIX B

PACIFIC environmental laboratory INC.

9405 S.W. Nimbus Ave. Beaverton, OR 97005 (503) 644-0660
FAX # (503) 644-2202

May 7, 1990

GeoEngineers
10170 S.W. Nimbus Ave., H-01
Portland, OR 97223

Attn: Nick Varnum

Re: JOB 161-181-P04
PEL #90-1147

Enclosed is the lab report for your samples which were received on April 27, 1990.

I. Sample Description

Ten Soil Samples

The samples were received under a chain of custody.

The samples were received in containers consistent with EPA protocol.

II. Quality Control

No project specific QC was requested. In-house QC data is available upon request.

III. Analytical Results

Test methods may include minor modifications of published methods such as detection limits or parameter lists. Solid and waste samples are reported on an "as received" basis unless otherwise noted.

Compounds not detected are listed under results as ND.

Sincerely,

Philip Nerenberg
Philip Nerenberg
President

Robert Jones
Robert Jones
Chemist

GeoEngineers
MAY 9 1990
Routing
File

PACIFIC ENVIRONMENTAL LABORATORY INC.

PEL REPORT NUMBER: 90-1147
CLIENT: GeoEngineers
JOB REFERENCE: 161-181-P04
DATE: May 7, 1990
ITEMS: Ten Soil Samples

METHOD: Total Petroleum Hydrocarbons per EPA 418.1
Results in mg/kg (ppm)

Sample I.D.	TPH
MW-1A	ND
MW-2B	ND
MW-3	ND
MW-4B	11
MW-5A	6
R-1	18
R-2	15
MW-7A	ND
MW-8A	6
MW-9A	10
Lab Blank	ND
Detection Limit	5

PACIFIC environmental laboratory INC

PEL REPORT NUMBER: 90-1147
CLIENT: GeoEngineers
JOB REFERENCE: 161-181-P04
DATE: May 7, 1990
ITEMS: Ten Soil Samples

METHOD: BTEX per EPA 8020
Results in ug/kg (ppb)

Sample I.D.	Benzene	Toluene	Ethyl Benzene	Xylene	Detection Limit
MW-1A	ND	2	ND	1	1
MW-2B	ND	ND	ND	ND	1
MW-3	ND	2	ND	3	1
MW-4B	ND	3	ND	1	1
MW-5A	ND	4	1	6	1
R-1	ND	ND	ND	ND	1
R-2	ND	ND	ND	ND	1
MW-7A	ND	ND	ND	ND	1
MW-8A	ND	ND	ND	ND	1
MW-9A	ND	ND	ND	ND	1
Lab Blank	ND	ND	ND	ND	1

Surrogate Recoveries (%)

Sample I.D.	4-Bromofluorobenzene
MW-1A	91
MW-2B	83
MW-3	71
MW-4B	66
MW-5A	71
R-1	63
R-2	63
MW-7A	83
MW-8A	92
MW-9A	87

PACIFIC environmental laboratory INC.

9405 S.W. Nimbus Ave. Beaverton, OR 97005 (503) 644-0660
FAX # (503) 644-2202

June 19, 1990

GeoEngineers
10170 SW Nimbus Ave., H-01
Portland, OR 97223

Attn: Nick Varnum

Re: JOB #161-181-P04
PEL #90-1583

Enclosed is the lab report for your sample which was received on June 12, 1990.

I. Sample Description

One Water Sample

The sample was received under a chain of custody.

The sample was received in a container consistent with EPA protocol.

II. Quality Control

No project specific QC was requested. In-house QC data is available upon request.

III. Analytical Results

Test methods may include minor modifications of published methods such as detection limits or parameter lists. Solid and waste samples are reported on an "as received" basis unless otherwise noted.

Compounds not detected are listed under results as ND.

Sincerely,

Philip Nerenberg
President

Joe Ingram
Chemist

GeoEngineers
JUN 21 1990
Routing
File

PACIFIC ENVIRONMENTAL LABORATORY INC

PEL REPORT NUMBER: 90-1583
CLIENT: GeoEngineers
JOB REFERENCE: 161-181-P04
DATE: June 19, 1990
ITEM: One Water Sample

METHOD: BTEX per EPA 602
Results in ug/L (ppb)

Sample I.D.	Benzene	Toluene	Ethyl Benzene	Xylene	Detection Limit
MW-4	ND	ND	ND	ND	1
Lab Blank	ND	ND	ND	ND	1

Surrogate Recoveries(%)

Sample I.D.	4-Bromofluorobenzene
MW-4	90

PACIFIC environmental laboratory INC.

9405 S.W. Nimbus Ave. Beaverton, OR 97005 (503) 644-0660
FAX # (503) 644-2202

May 30, 1990

GeoEngineers
10170 SW Nimbus Ave., H-01
Portland, OR 97223

Attn: Nick Varnum

Re: JOB #161-181-P04
PEL #90-1356

Enclosed is the lab report for your samples which were received on May 18, 1990.

I. Sample Description

Four Water Samples

The samples were received under a chain of custody.

The samples were received in containers consistent with EPA protocol.

II. Quality Control

No project specific QC was requested. In-house QC data is available upon request.

III. Analytical Results

Test methods may include minor modifications of published methods such as detection limits or parameter lists. Solid and waste samples are reported on an "as received" basis unless otherwise noted.

Compounds not detected are listed under results as ND.

Sincerely,

Philip Nerenberg
President

Joe Ingram
Chemist

GeoEngineers
JUN 4 1990
Routing
File

PACIFIC environmental laboratory INC.

PEL REPORT NUMBER: 90-1356
CLIENT: GeoEngineers
JOB REFERENCE: 161-181-P04
DATE: May 30, 1990
ITEMS: Four Water Samples

METHOD: Total Petroleum Hydrocarbons per EPA 418.1
Results in mg/L (ppm)

Sample I.D.	TPH
MW-1	1.6
MW-2	ND
MW-3	ND
MW-4	0.8
Lab Blank	ND
Detection Limit	0.5

METHOD: BTEX per EPA 602
Results in ug/L (ppb)

Sample I.D.	Benzene	Toluene	Ethyl Benzene	Xylene	Detection Limit
MW-1	ND	3	7	6	1
MW-2	ND	ND	ND	ND	1
MW-3	ND	ND	ND	ND	1
Lab Blank	ND	ND	ND	ND	1

Surrogate Recoveries (%)

Sample I.D.	4-Bromofluorobenzene
MW-1	107
MW-2	94
MW-3	91

PACIFIC ANALYTICAL LABORATORY inc

9405 S.W. Nimbus Ave. Beaverton, OR 97005 (503) 644-0860

GeoEngineers

CHAIN OF CUSTODY RECORD

RUSH YES ☐ NO ☒

Proj No.	Project Name
161-181-P04	UNOCAL Bellevue, WA
P.O. Number	Sampler: Nick VanMouk

Sta. No.	Date	Time	Comp.	Grab	Station Location	No. of Containers	BTEX 602/8020	BTEX, VPH 3810 Modified	Gasoline 8015 Modified	TPH (IR) 418.1	Oil & Grease 413.1	EP TOX Cd,Cr,Pb only	EP TOX Metals (8)	PCB's 608/8080	Chlor. Solv. 601/8010	Flashpoint 1010
MW-1A	4/25			2.5			X			X						
MW-2B	4/25			5.0			X			X						
MW-3	4/25			7.5			X			X						
MW-4B	4/25			5.0			X			X						
MW-5A	4/25			2.5			X			X						
B-1	4/27			0.5			X			X						
B-2	4/27			1.5			X			X						
MW-7A	4/26			3.0			X			X						
MW-8A	4/27			5.0			X			X						
MW-9A	4/27			5.0			X			X						

ALL SAMPLES WILL BE DISPOSED OF 30 DAYS AFTER RECEIPT

Relinquished by: (Signature)	Date Time	Received by: (Signature)	Relinquished by: (Signature)	Date Time	Received by: (Signature)
Relinquished by: (Signature)	Date Time 4/27/90 4:40	Received by: (Signature)	Relinquished by: (Signature)	Date Time	Received by: (Signature)
Relinquished by: (Signature)	Date Time 4/27/90	Received for Laboratory by: (Signature) Marnetta Lindland		Remarks PEI # 90-1147	

4C

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ANALYTICAL LABORATORY inc

9405 S.W. Nimbus Ave. Beaverton, OR 97005 (503) 644-0660

GeoEngineers

CHAIN OF CUSTODY RECORD

RUSH YES ☐ NO ☒

Proj No.	Project Name
101-181-R4	Woodside Bridge
P.O. Number	Sampler
	Nick Vanvoorhis

	Sta. No.	Date	Time	Comp.	Grab	Station Location	No. of Containers	BTEX 602/8020	BTEX, VPH 3810 Modified	Gasoline 8015 Modified	TPH (IR) 418.1	Oil & Grease 413.1	EP TOX Cd,Cr,Pb only	EP TOX Metals (8)	PCB's 608/8080	Chlor. Solv. 601/8010	Flashpoint 1010
1	MW-1	5/17					3	X			X						
2	MW-2	5/17					3	X			X						
3	MW-3	5/17					3	X			X						
4	MW-4	5/17					1				X						

ALL SAMPLES WILL BE DISPOSED OF PROPERLY AFTER 60 DAYS

Relinquished by: (Signature)	Date Time	Received by: (Signature)	Relinquished by: (Signature)	Date Time	Received by: (Signature)
Relinquished by: (Signature)	Date Time	Received by: (Signature)	Relinquished by: (Signature)	Date Time	Received by: (Signature)
Nick Vanvoorhis	5/18/90 1604				
Relinquished by: (Signature)	Date Time	Received for Laboratory by: (Signature)	Remarks		
	5/18/90 4:05	Marnetta Lindland	PE1# 90-1356		

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