Western Steel Casting

VCP NW1055

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August 17, 2001

Mr. Bob Alexander
Western Steel Casting
145 South Horton Street
Seattle, WA 98134

Re: Limited Subsurface Investigation
Western Steel Casting
145 South Horton Street
Seattle, Washington
7606

Dear Mr. Alexander:

This letter report presents the results of our Limited Subsurface Investigation at the referenced property located in Seattle. The project work scope was completed in accordance with our proposal dated June 25, 2001. The property consists of the Western Steel Casting (WSC) foundry and warehouse. The purpose of the current subsurface investigation was to evaluate an area of contamination identified during a previous Hart Crowser investigation of the WSC property conducted in May 2001. The focused area is located in the vicinity of a former oil house and an abandoned underground storage tank (UST).

The following sections summarize the results of the limited subsurface investigation. Supporting tables and figures are presented at the end of the report text. Field methods and boring logs are presented in Appendix A, and laboratory analytical certificates are presented in Appendix B.

SUMMARY OF FINDINGS AND CONCLUSIONS

Soil and groundwater containing concentrations of diesel-range total petroleum hydrocarbons (TPH) exceeding the Adopted Model Toxics Control Act (MTCA) Method A cleanup levels were identified in three Strataprobe borings conducted by Hart Crowser in May 2001. The borings were located on the south and west side of the WSC office (borings

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P-1, P-9, and P-11 as shown on Figure 2). The diesel-impacted soil appeared to be limited to the upper 8 feet. The lateral extent of contamination was not determined at that time.

On July 6, 2001, Hart Crowser advanced ten Strataprobe borings (P-100 through P-109) surrounding the area of TPH-affected soil and groundwater identified in May. Concentrations of diesel-range TPH in exceedence of Method A cleanup levels for soil and groundwater were detected in four soil borings (P-100, P-102, P-103, and P-108). Based on the soil boring advanced to date and the soil samples analyzed, the estimated lateral extent of soil containing greater than 2,000 milligrams per kilogram (mg/kg) diesel-range TPH is shown on Figure 3. The northern extent of contamination beneath Horton Street was not determined. Samples collected from borings P-103 and P-108 between 8.5 and 9.0 feet contained no detectable TPH. Samples collected between 0 and 3.0 feet did not contain odors or staining indicative of petroleum contamination. Therefore, the vertical extent of contamination appears to be limited to the 3.0 and 8.5 foot depth range within the area outlined on Figure 3. Free phase petroleum product has not been observed in any of the borings.

Groundwater samples were collected and analyzed from three monitoring wells (P-104, P-106, and P-108). Sample P-108 contained 1.0 milligrams per liter (mg/L) diesel-range TPH. A laboratory duplicate contained 1.7 mg/L diesel-range TPH. The adopted Method A cleanup level for diesel-range TPH is 0.5 mg/L. Samples P-104 and P-106 contained no detectable TPH. Based on the presence of TPH in downgradient well P-108, groundwater containing diesel-range TPH exceeding Method A cleanup levels is likely migrating off site to the north toward Horton Street.

We understand that an abandoned UST was partially uncovered by Global Environmental on approximately July 19, 2001. An excavation conducted inside the foundry immediately west of boring P-100 encountered the top of a UST approximately 4 feet below the floor slab. Soil overlying the tank contained a petroleum odor. The UST contained oily sludge and was estimated by Global to be approximately 1,500 gallons in capacity. This UST appears to be associated to a UST fill port located on the north side of the WCS office. The UST also appears to be the likely source of diesel contamination at the property. A 12-inch-diameter water pipe is located immediately above the tank. Due to the water pipe and limited access inside the building, it was determined that it removing the UST would be impractical. The excavation was backfilled with the suspect TPH soils previously excavated from above the tank.

Recommendations

The UST should be removed or closed in-place in accordance with Ecology UST regulations. The UST should be inerted and cleaned prior to closure. A sample of the UST contents should be collected, analyzed, and evaluated by a marine-chemist. If the presence of diesel-range TPH in soil and groundwater nearby appears to be related to the UST, notification of a release should be reported to the Washington State Department of Ecology.

Remedial measures regarding the diesel-affected soils surrounding the office area should be evaluated. Since most of the petroleum-contaminated soil (PCS) appears to be beneath the office building or adjacent to bag house foundations, a hot spot removal of PCS does not appear practical at this time. *In situ* remedial options include natural attenuation, biosparging, and injection of oxygen release compounds (ORCs). In all cases, future monitoring of the existing wells would be required.

PROJECT BACKGROUND

The WSC site is located on South Horton Street at Occidental Avenue in Seattle's industrial district (Figure 1). The WSC facility spans two parcels separated by vacated Occidental Avenue. The combined square footage of the two parcels is approximately 60,000 square feet. The main WSC foundry is located on the east parcel. Foundry activities include melting of scrap steel in an electric-arc furnace, and molding and finishing of castings used for heavy duty industrial purposes such as rock crushers. The west parcel contains a warehouse used for storage and preparation of molds.

Site History

The property and surrounding area existed as tideflats until filling occurred in the area surrounding First Avenue South in about 1912 to 1914. The source of the fill material was likely from the straightening of the Duwamish Waterway channel or from downtown Seattle regrades. The existing foundry building at 145 South Horton Street was constructed in 1917. Western Steel Casting began operating at the site in 1930. Sanborn fire insurance maps indicate that the building layout was similar to the present configuration. However, an oil house is shown in the 1969 Sanborn on the west side of the foundry, approximately 50 south of the office (Figure 2). Mr. Alexander was not familiar with the oil house, but surmised that oil burners may have been used for ladle preheating. The existing office building was constructed in the 1937 and has been heated electrically.

The warehouse adjacent to the west of the foundry was constructed in 1914 and contained the Cumberland Coal Company until at least 1939. By 1950, the warehouse was occupied by Hemphill & McKillop for coal storage, and later for storage of industrial supplies. In 1969, the warehouse contained Western Foundry Sand. According to Bob Alexander, WSC purchased the property in 1972. WSC operations in the building have included a maintenance shop and areas for shipping, storage, and mold manufacturing.

May 2001 Subsurface Assessment

In May 2001, Hart Crowser conducted a limited subsurface investigation for the WCS facility. Eleven Strataprobe borings (P-1 through P-11) were conducted on May 5, 2001, at locations throughout the facility as shown on Figure 2. The borings were advanced to depths ranging from 8 to 11 feet below grade. Groundwater was encountered between depths of 5 and 6.5 feet below grade. Grab groundwater samples were collected from five of the borings (P-1, P-4, P-8, P-9, and P-11). Borings P-9 and P-11 were added to the field investigation when a petroleum-sheen was observed on the P-1 water sample. Borings P-9 and P-11 are presumed downgradient relative to P-1.

Grab groundwater samples collected from P-9 and P-11 contained 8.5 and 15 mg/L diesel-range TPH, respectively. These concentrations exceeded the adopted Model Toxics Control Act (MTCA) Method A cleanup level of 0.5 mg/L for diesel-range TPH. The TPH concentrations may have been biased high due to some sample turbidity. No groundwater monitoring wells were installed during the May assessment. Groundwater collected from P-1 had a visible sheen and odor; however, it did not contain detectable concentrations of TPH. Groundwater samples collected and analyzed from borings P-4 and P-8 did not contain detectable TPH.

A soil sample collected from P-11 between 4 to 8 feet below grade contained 3,800 mg/kg diesel-range TPH, exceeding Ecology's adopted Method A cleanup level of 2,000 mg/kg. The sample (P11-S3) collected between 8 to 11 feet did not contain detectable TPH. Therefore, the diesel-impacted soil appeared to be limited to the upper 8 feet. The lateral extent of contamination was not determined at that time.

Petroleum hydrocarbons were not detected in any of the other soil or groundwater samples submitted for analysis.

JULY 2001 PHASE II ASSESSMENT

To further define the extent of TPH-impacted soil and groundwater identified in May 2001, Hart Crowser advanced ten subsurface Strataprobe explorations (P-100 through P-109) on July 6, 2001, at the locations identified on Figure 3. The Strataprobe borings were advanced to a depth of 9.0 feet below grade. Boring P-100 encountered refusal at 4 feet below grade. Boring P-100A was advanced 6 feet to the east of P-100. Boring P-102 encountered refusal at 6 feet below grade. Boring P-102A was advanced 4 feet north of P-102. Groundwater samples were collected from miniature pre-packed monitoring wells installed in borings P-104, P-106, and P-108. The wells were screened at depths of between 5 to 10 feet below grade.

Subsurface Conditions

Soil encountered in the Strataprobe borings was typically 6 to 8 feet of silty, gravelly, fine to medium Sand overlying native sandy Silt and silty Sand. Silt and clay layers were commonly encountered near the native-fill material interface. Perched groundwater was encountered at depths of ranging from 5.5 to 6.5 feet below ground surface. The property and surrounding neighborhood are generally flat. The industrial area is bounded by Beacon Hill to the east, the Duwamish Waterway to the west, and Elliott Bay to the northwest. Based on past Hart Crowser experience in the surrounding area, the inferred direction of groundwater flow is to the northwest.

Sampling and Chemical Analysis

Soil samples from the borings were field monitored for odors, visual staining, and organic vapors using an HNU photo-ionization detector (PID). The PID measures organic vapors indicative of potential petroleum contaminants. Eighteen soil samples were selected from the Strataprobe soil borings for chemical analysis based on field observations, PID readings, and soil conditions. In general, the soil samples submitted for chemical analysis exhibited petroleum odors, or in the absence of odors, were nearest to the inferred water table elevation at the time of drilling. The samples were stored in a locked Hart Crowser refrigerator and submitted to ESN Northwest Laboratory (Bellevue, Washington) on July 9, 2001. Based on the finding of the May 2001 assessment, the samples were submitted for analysis of diesel-, and oil-range TPH by Ecology Method WTPH-D-extended.

Soil sample chemical analysis results are summarized in Table 1, and groundwater sample chemical analysis results are summarized in Table 2. Results for soil and grab groundwater

samples collected in May 2001 from borings P-1, P-9, and P-11 are also presented in Tables 1 and 2.

Soil Sample Analyses Results

Diesel-range TPH was detected in ten of the eighteen soil samples at concentrations ranging from 71 to 15,000 mg/kg. The highest concentration was detected in sample P-100A S-2, collected at 3 to 6 feet below grade adjacent to the abandoned UST. Other elevated concentrations were detected in boring P-103 (5,000 mg/kg at 3 to 6 feet, and 11,000 mg/kg at 7 to 8 feet), and P-108 (7,600 mg/kg at 3 to 6 feet, and 2,200 mg/kg at 6 to 7 feet). Soil beneath 8.5 feet exhibited no odors in both borings. Samples collected from the 8.5- to 9-foot-depth range in these borings did not contain detectable TPH.

Soil samples containing concentrations of diesel-range TPH exceeding the adopted Method A cleanup level of 2,000 mg/kg were identified in borings P-100A, P-103, and P-108.

Groundwater Sample Analyses Results

Groundwater samples were collected from the three miniature monitoring wells (P-104, P-106, and P-108). Groundwater sample P-108 contained 1.0 mg/L diesel-range TPH. A laboratory duplicate of P-108 contained 1.7 mg/L diesel-range TPH. The inconsistent concentrations for the P-108 samples may be due to a varying amount of sheen on the water sample. Samples collected from P-104 and P-106 were non-detect for TPH.

Data Quality Evaluation

Hart Crowser reviewed laboratory results for the chemical samples analyzed to verify that the data met acceptable quality assurance/quality control (QA/QC) criteria. The criteria included the following parameters:

- Holding Times;
- Method Blanks;
- Surrogate Recoveries;
- Laboratory Duplicate Relative Percent Difference (RPD);
- Detection Limits; and
- Chain of Custody.

The laboratory established control limits for the given parameters were met. The samples were received by the laboratory intact, in a sealed cooler containing blue ice. No data were qualified or rejected based on this evaluation for this project.

The chemistry laboratory analytical report for the samples collected in July 2001 are presented in Appendix B.

LIMITATIONS

Work for this project was performed, and this draft letter report prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of Western Steel Casting, for specific application to the subject property. This report is not meant to represent a legal opinion. No other warranty, express or implied, is made.

Any questions regarding our work and this letter report, the presentation of the information and the interpretation of the data are welcome and should be referred the undersigned.

Sincerely,

HART CROWSER, INC.

ROB ROBERTS
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cer@hartcrowser.com

JULIE K.W. WUKELIC
Principal
jkw@hartcrowser.com

Attachments:
Table 1 - Chemical Analysis Results for Soil Samples
Table 2 - Chemical Analysis Results for Groundwater Samples
Figure 1 - Vicinity Map
Figure 2 - Site and Exploration Plan (May 2001)
Figure 3 - TPH-D Results in Soil
Figure 4 - TPH-D Results in Groundwater
Appendix A - Field Methods and Boring Logs
Appendix B - Laboratory Reports, ESN Northwest

Table 1 - Chemical Analysis Results for Soil Samples

	Adopted Method A Cleanup Level	P1-S2	P1-S3	P11-S2	P11-S3	P100A-S2	P100A-S3	P101-S3	P102A-S2
TPH in mg/kg									
Kerosene/Jet fuel		20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Diesel/Fuel oil	2,000	20 U	300	**3800**	20 U	**15000**	**9700**	20 U	860
Heavy oil	2,000	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U

	Adopted Method A Cleanup Level	P102A-S3	P103-S3	P103-S3A	P103-S3B	P104-S2	P105-S3	P106-S2	P106-S3
TPH in mg/kg									
Kerosene/Jet fuel		20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Diesel/Fuel oil	2,000	2000	**5000**	**11000**	20 U	20 U	20 U	300	20 U
Heavy oil	2,000	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U

	Adopted Method A Cleanup Level	P107-S2	P107-S3	P108-S2	P108-S3A	P108-S3B	P109-S2
TPH in mg/kg							
Kerosene/Jet fuel		20 U	20 U	20 U	20 U	20 U	20 U
Diesel/Fuel oil	2,000	71	20 U	**7600**	**2200**	20 U	20 U
Heavy oil	2,000	50 U	50 U	50 U	50 U	50 U	50 U

Notes:
U = Not detected at indicated detection limit.
Samples analyzed by ESN Laboratory (Bellevue, Washington).
Method A exceedences are **bolded**.

Depths of Grand water Sample

Table 2 - Chemical Analysis Results for Groundwater Samples

	Adopted Method A Cleanup Level	P1-S4*	P9-S3*	P11-S4*	P104-S4	P106-S4	P108-S4
TPH in mg/L							
Kerosene/Jet fuel		0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Diesel/Fuel oil	0.50	0.20 U	**8.5**	**15**	0.20 U	0.20 U	**1.0 (a)**
Heavy oil	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U

Notes:
U = Not detected at indicated detection limit.
TPH and volatiles analysis performed by ESN Laboratory (Bellevue, Washington).
Dissolved metals analyzed by Sound Analytical Services (Fife, Washington).
(a) Laboratory duplicate for sample P108-S4 was 1.7 mg/L.
Method A Exceedences are **bolded**.
* Grab groundwater samples from soil borings.

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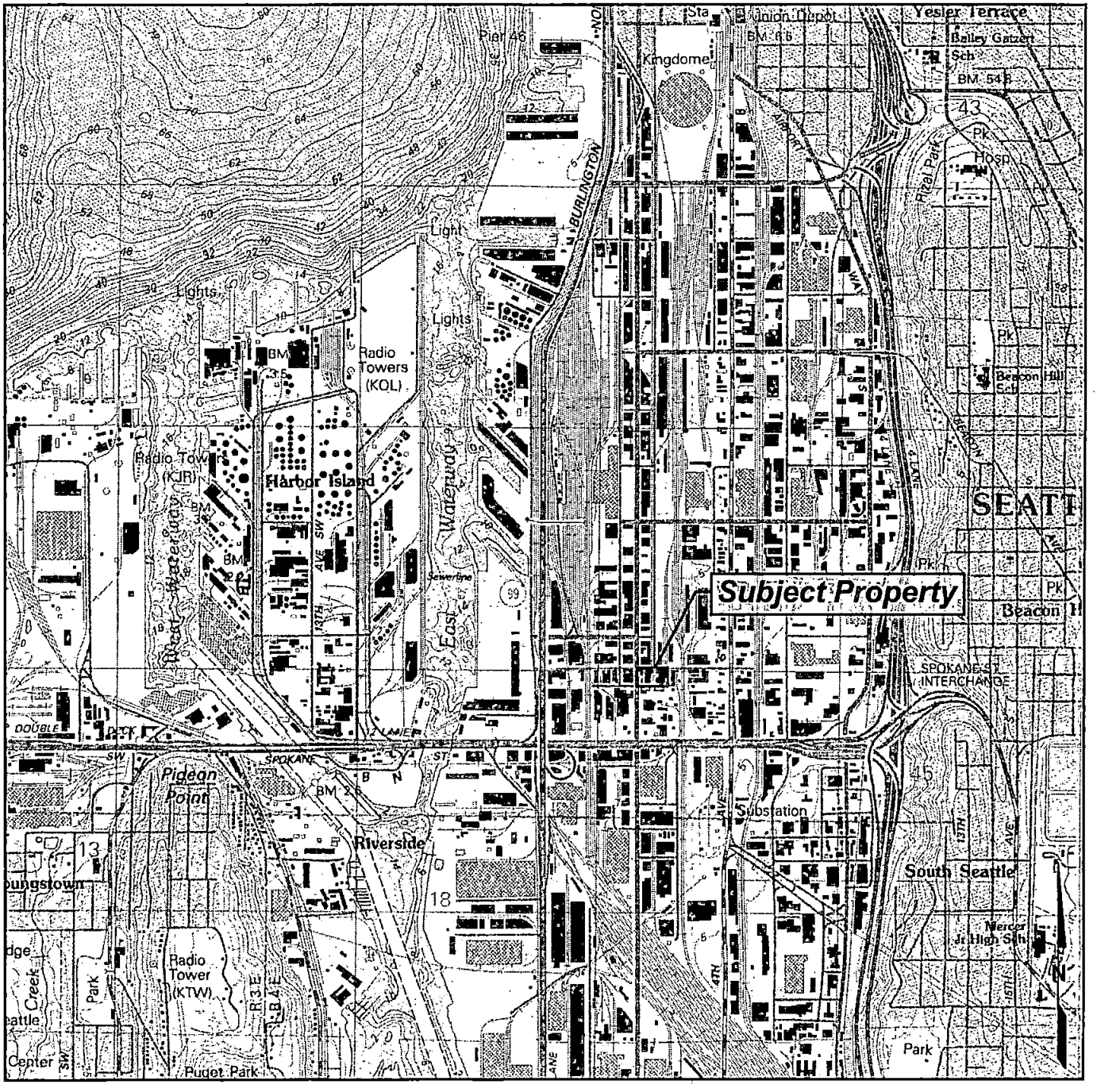
Vicinity Map



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Note: Base map prepared from 7.5x15 minute quadrangle map of Seattle South, dated 1983.

0 2000 4000

Approximate Scale in Feet

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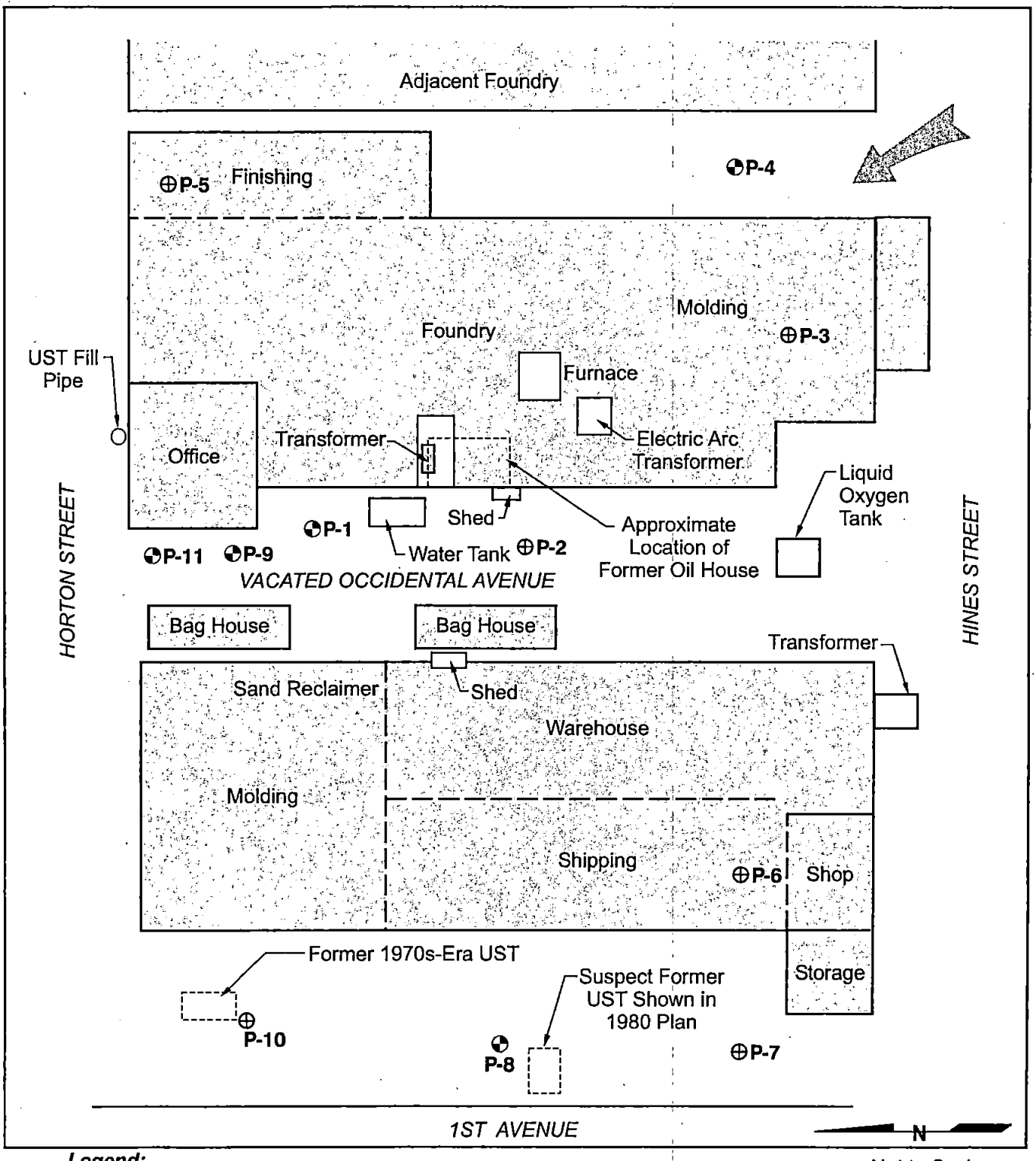
Figure 1

Site and Exploration Plan
May 2001



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Not to Scale

Legend:

⊕P-2 Strataprobe Boring Location and Number (May 2001)

◔P-8 Strataprobe Boring Location and Number with Grab Groundwater Sample (May 2001)

Inferred Groundwater Flow Direction

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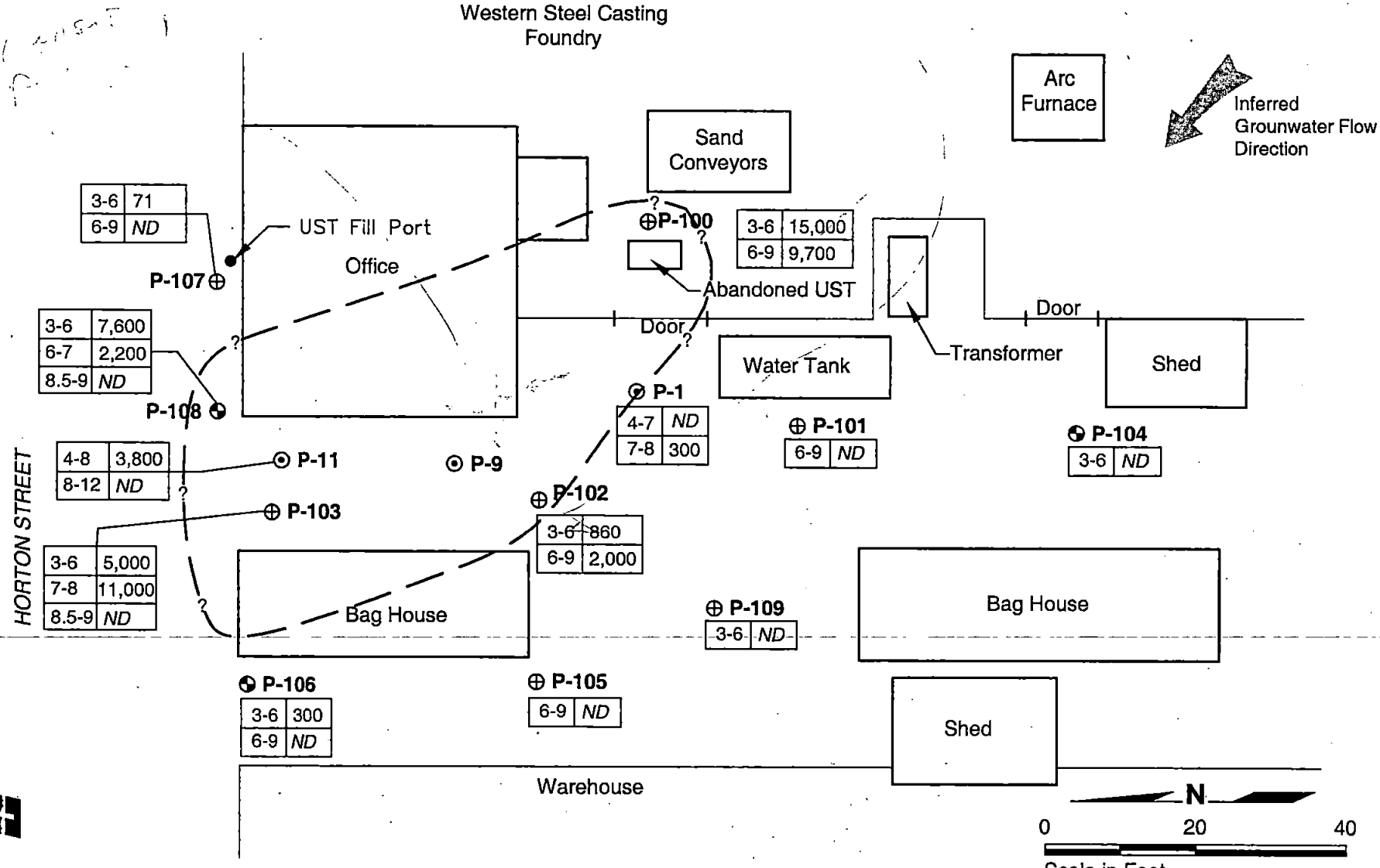
Figure 2

TPH-D Results in Soil



Exploration Location and Number

- **P-108** Strataprobe Boring and Miniature Monitoring Well (July 2001)
- **P-103** Strataprobe Soil Boring (July 2001)
- **P-11** Strataprobe Soil Boring (May 2001)
- —— —— Estimated Area of Soil Exceeding 2,000 mg/kg of Diesel

3-6	15,000
6-9	9,700

Sample Depth Interval in Feet

Concentration of Diesel-Range TPH in mg/kg

ND Analyte not Detected

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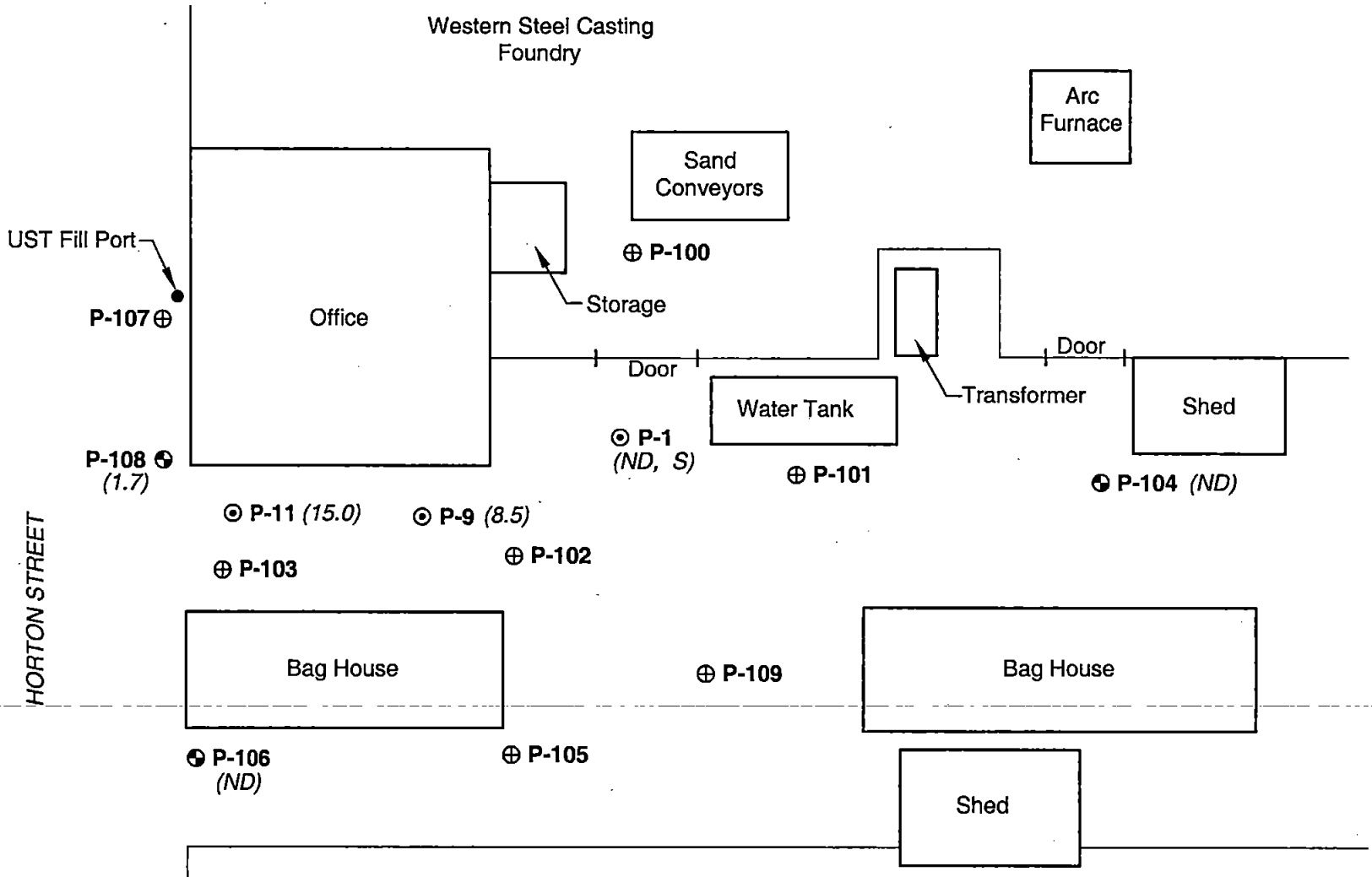
Figure 3

TPH-D Results in Groundwater



Exploration Location and Number

- **P-108** Strataprobe Boring and Miniature Monitoring Well (July 2001)
- **P-103** Strataprobe Soil Boring (July 2001)
- **P-11** Strataprobe Soil Boring and Grab Groundwater Sample (May 2001)
- *(8.5)* Diesel-Range TPH concentration in mg/L
- *(ND)* Diesel-Range TPH not detected
- *(S)* Petroleum Sheen observed on sampling equipment

N

0 20 40

Scale in Feet

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Figure 4

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APPENDIX A
FIELD METHODS AND BORING LOGS

APPENDIX A
FIELD METHODS AND BORING LOGS

Subsurface explorations, designated P-100 through P-109 were completed via the Strataprobe method to a maximum of 9 feet below grade. Figure 3 shows the locations of these explorations. Strataprobe exploration logs are presented on Figures A-2 through A-11 at the end of this appendix. The exploration logs show our interpretation of conditions encountered in the explorations. They indicate the depth where the soils change. In the field, we classified the samples taken from the explorations according to the methods presented on Figure A-1—Key to Explorations Logs. Figure A-1 also provides a legend explaining the symbols and abbreviations in the logs.

The following sections describe the specific exploration and sample collection methods used, and sample handling and transfer, and decontamination procedures used.

Strataprobe Explorations and Sampling

Under subcontract to Hart Crowser, ESN Drilling of Lacey, Washington, used a truck-mounted Strataprobe drilling rig to collect soil and groundwater samples on July 6, 2001. Strataprobe activities were continuously observed by a Hart Crowser field representative.

Soil samples from the site explorations were obtained at 3-foot-depth intervals using a Probe-Drive Sampler. Strataprobe samples were collected by driving a 1-inch-diameter, stainless steel split-spoon sampler using a hydraulic percussion hammer. Blow counts for the Standard Penetration Test (SPT) cannot be measured using the Strataprobe system; therefore, soil densities and consistencies, are not shown in the logs.

Miniature pre-packed monitoring wells were installed in borings P-104, P-106, and P-108. The wells were screened between 5 and 10 feet. The miniature wells are inserted into the Geoprobe hole. The wells are 3/4-inch-diameter flush thread PVC casing with 0.020 slot screens. The screens are packed with 10-20 mesh sand. The borings were backfilled with bentonite (0 to 3.5 feet below grade) and sealed with concrete and flush-mount monuments. Groundwater was collected using a peristaltic pump equipped with pre-cleaned PVC tubing.

Sample Handling and Transfer

Samples from the Strataprobe explorations were transferred to precleaned, labeled sample jars and bottles for laboratory analyses. Each container was wiped clean and capped with a Teflon-lined lid, then placed in an insulated ice chest with ice for transfer to Hart Crowser's refrigerated storage locker on July 6, 2001. The samples were transported to the ESN laboratory in Bellevue on July 9, 2001. Sample custody forms accompanied the samples to the laboratory. The samples were transported with blue ice and were received at the laboratory in good condition.

Decontamination

Boring equipment were cleaned prior to and between each exploration. The Strataprobe rods, stainless steel samplers, spoons, bowls, and other hand sampling equipment were brush-scrubbed using an Alconox detergent solution followed by successive rinses of tap and deionized water.

Attachments:

Figure A-1	Key to Exploration Logs
Figures A-2-through A-11	Strataprobe Log P-100 through Strataprobe Log P-109

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Key to Exploration Logs

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance.
Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL Density	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 – 4	Very soft	0 – 2	<0.125
Loose	4 – 10	Soft	2 – 4	0.125 – 0.25
Medium dense	10 – 30	Medium stiff	4 – 8	0.25 – 0.5
Dense	30 – 50	Stiff	8 – 15	0.5 – 1.0
Very dense	>50	Very stiff	15 – 30	1.0 – 2.0
		Hard	>30	>2.0

Moisture

Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptible moisture, probably above optimum

Minor Constituents

	Estimated Percentage
Not identified in description	0 – 5
Slightly (clayey, silty, etc.)	5 – 12
Clayey, silty, sandy, gravelly	12 – 30
Very (clayey, silty, etc.)	30 – 50

Legends

Sampling Test Symbols

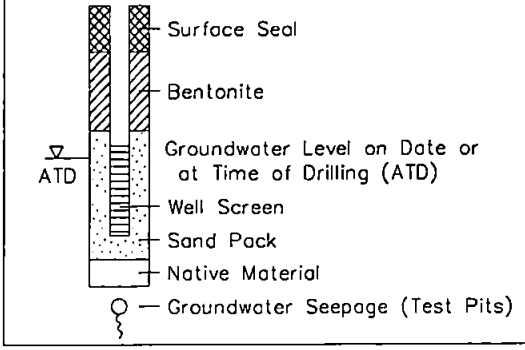
BORING SAMPLES

- Split Spoon
- Shelby Tube
- Cuttings
- Core Run
- * No Sample Recovery
- P Tube Pushed, Not Driven

TEST PIT SAMPLES

- Grab (Jar)
- Bag
- Shelby Tube

Groundwater Observations



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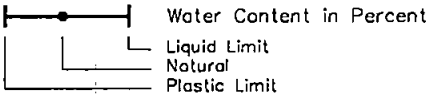
Test Symbols

GS	Grain Size Classification
CN	Consolidation
UU	Unconsolidated Undrained Triaxial
CU	Consolidated Undrained Triaxial
CD	Consolidated Drained Triaxial
QU	Unconfined Compression
DS	Direct Shear
K	Permeability
PP	Pocket Penetrometer Approximate Compressive Strength in TSF
TV	Torvane Approximate Shear Strength in TSF
CBR	California Bearing Ratio
MD	Moisture Density Relationship
AL	Atterberg Limits



PID	Photoionization Detector Reading
CA	Chemical Analysis
DT	*In Situ* Density Test

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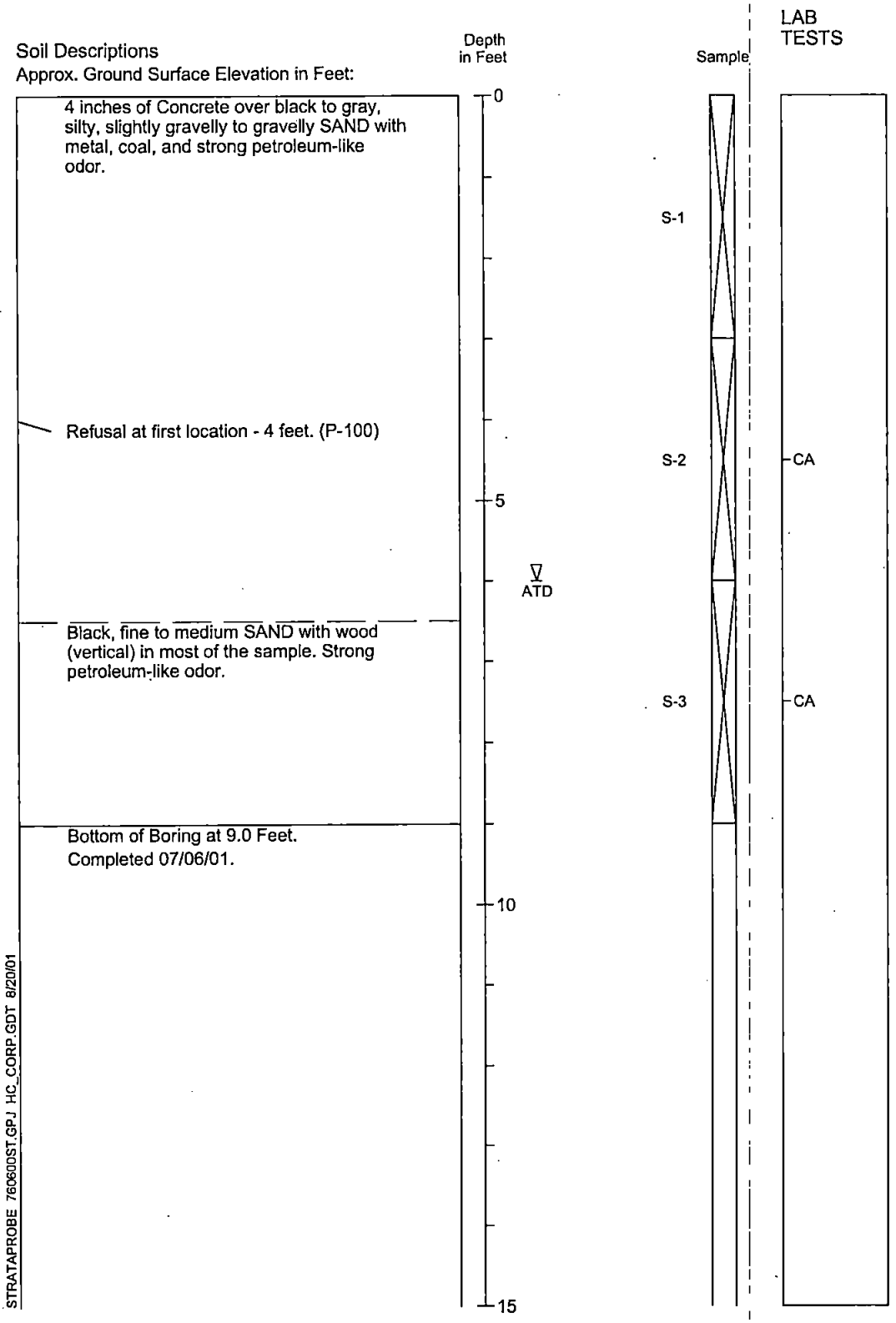
Figure A-1 7/01

Strataprobe Boring Log P-100/P-100A



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-2

Strataprobe Boring Log P-101

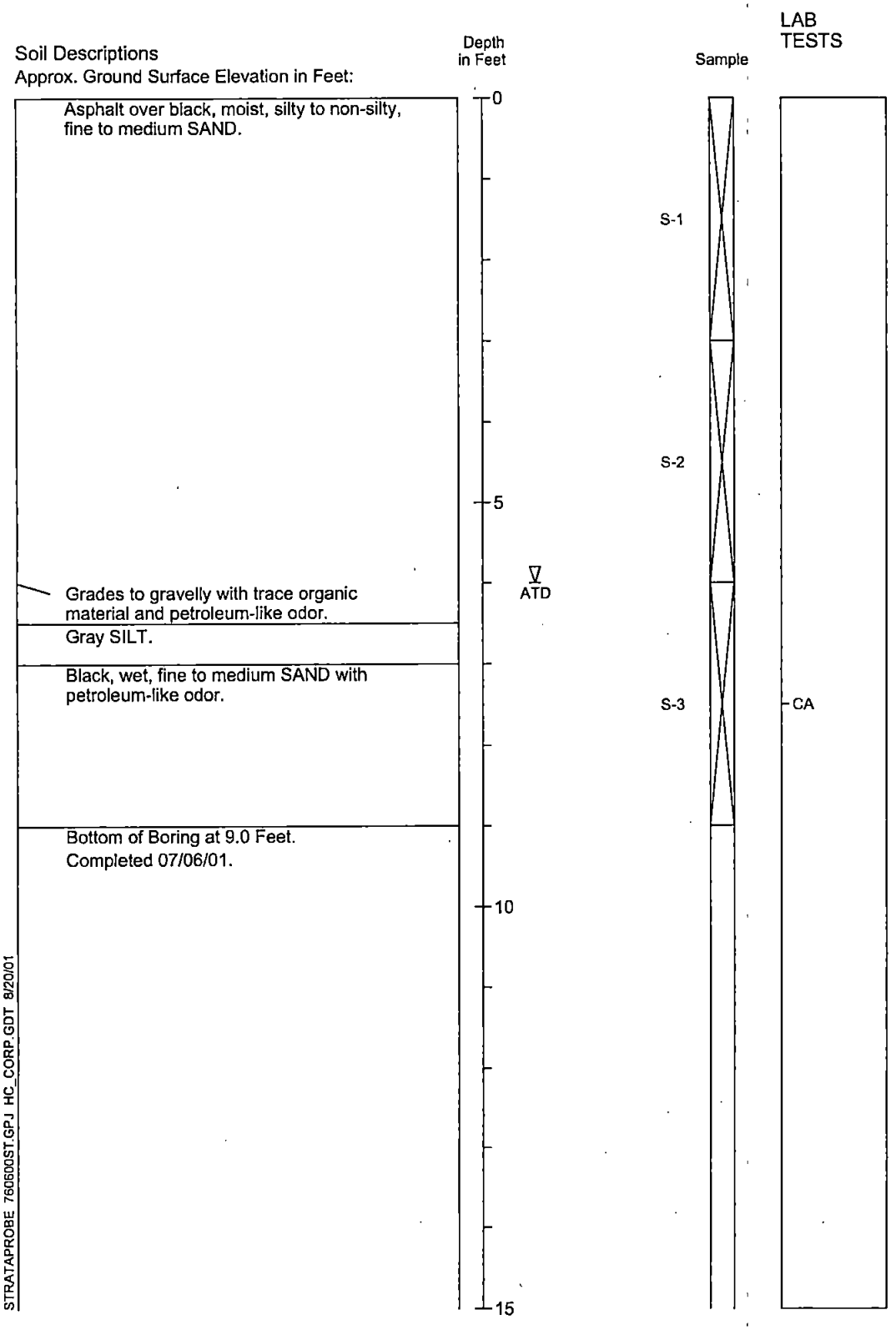

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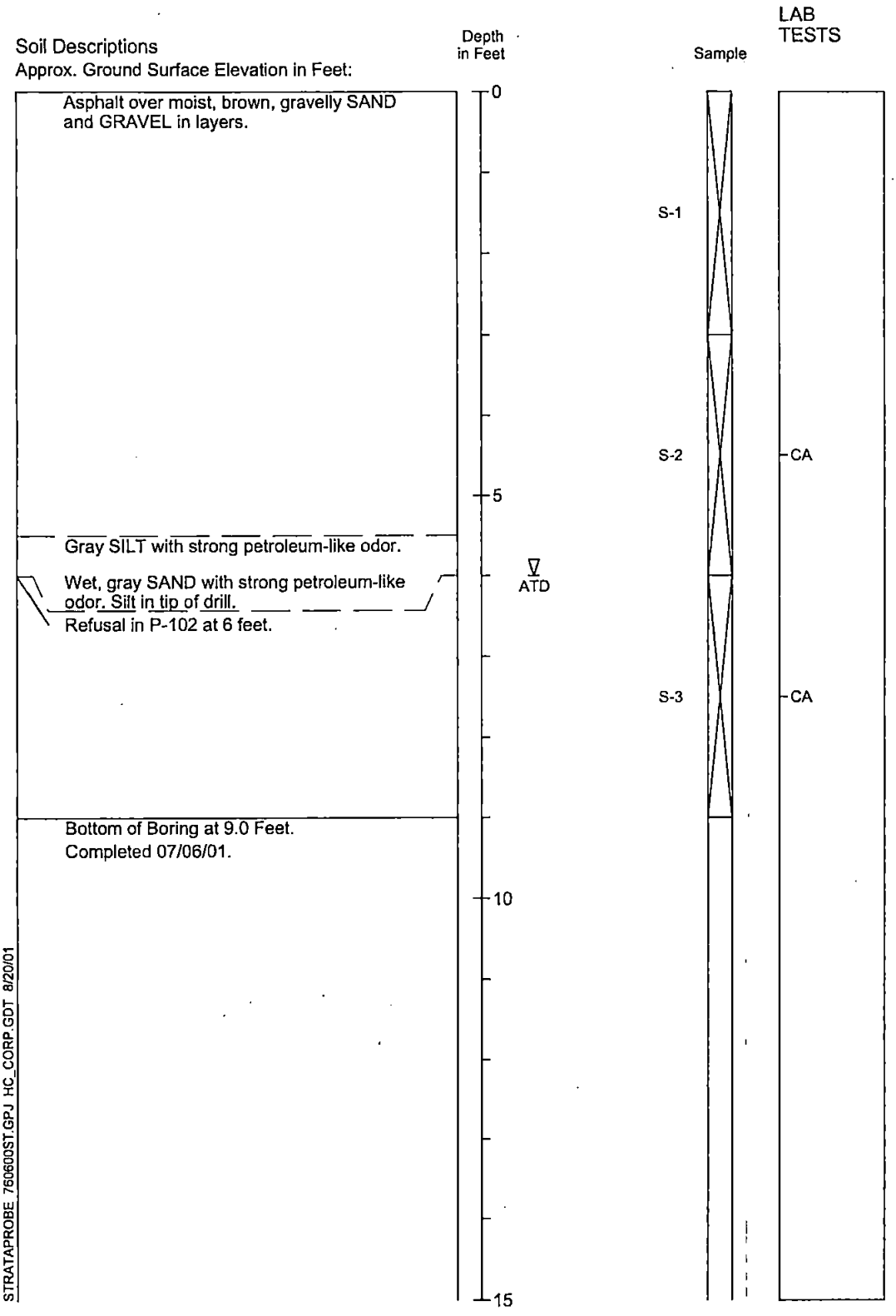
Figure A-3

Strataprobe Boring Log P-102/P-102A



STRATAPROBE 760600ST.GPJ HC_CORP.GDT 8/20/01

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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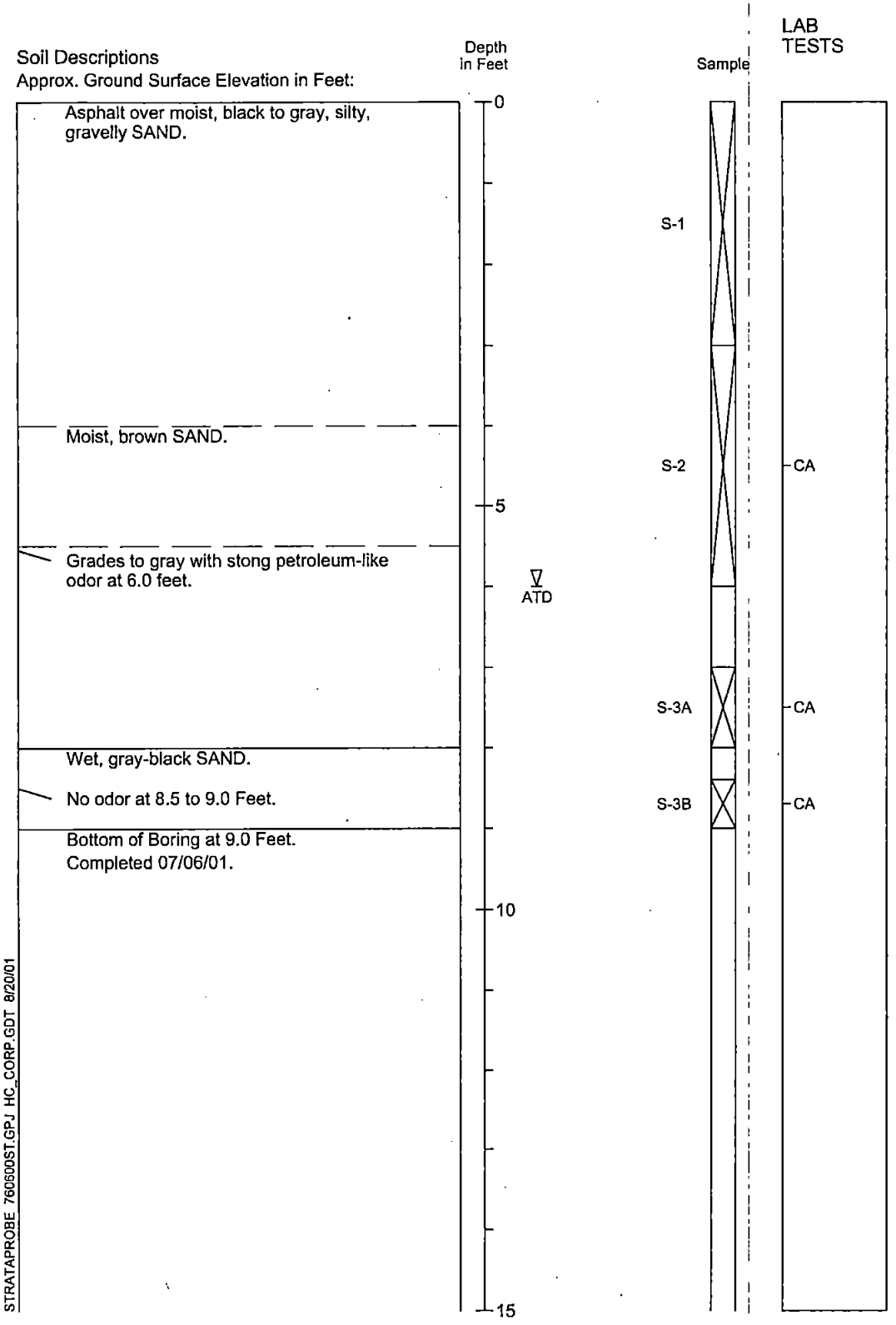
Figure A-4

Strataprobe Boring Log P-103



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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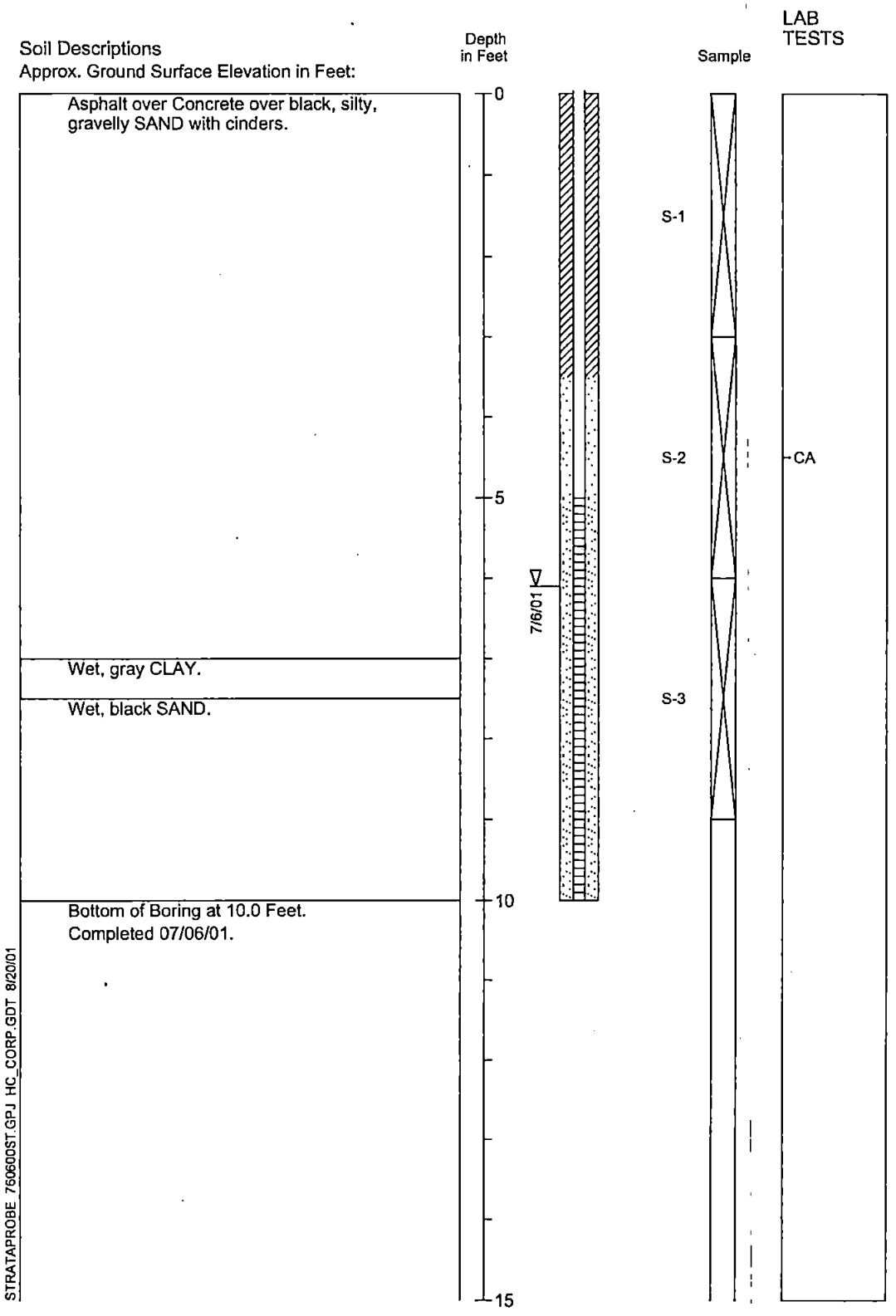
Figure A-5

Strataprobe Boring Log P-104



STRATAPROBE 7606GOST.GPJ HC_CORP.GDT 8/20/01

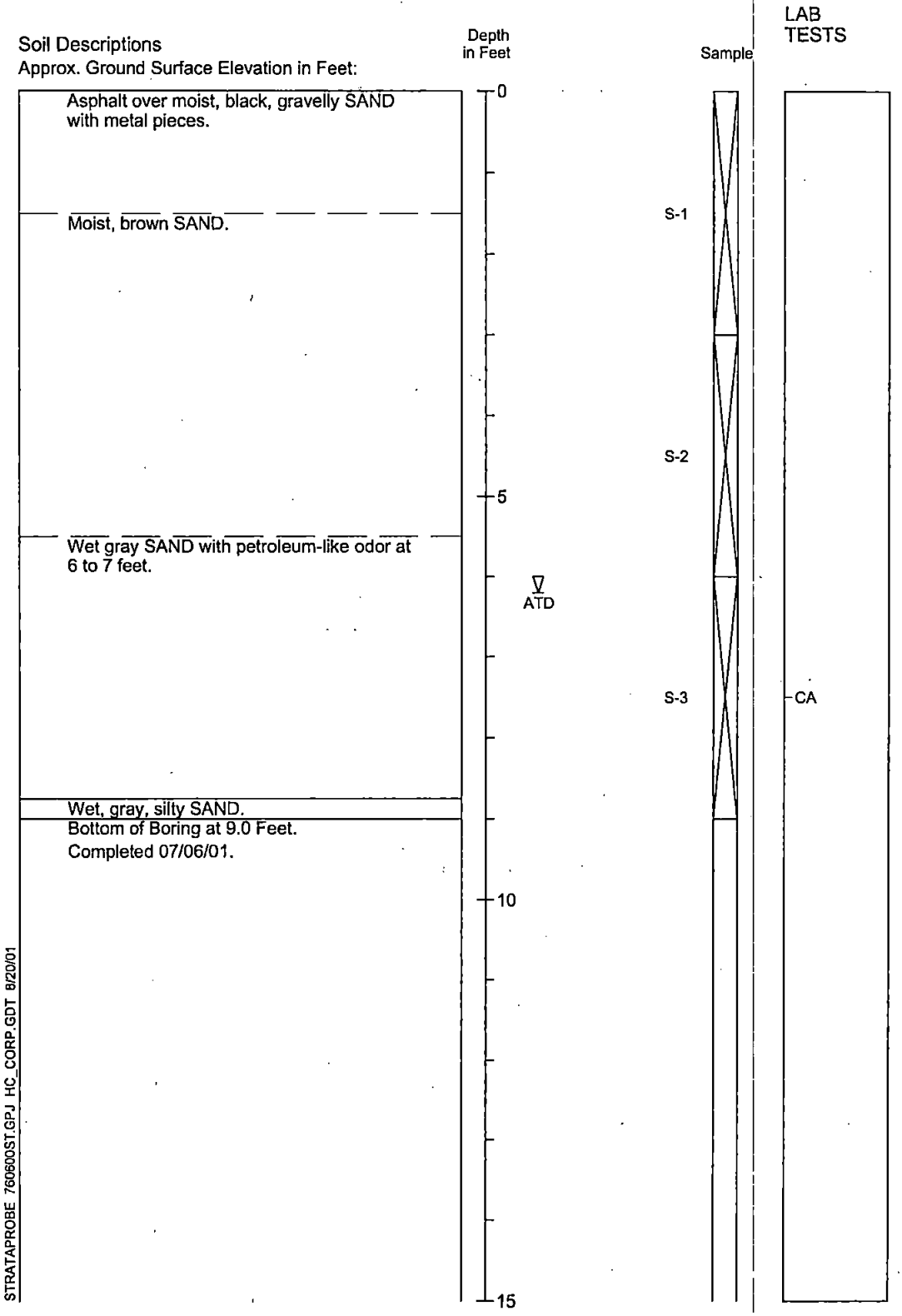
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

7606 07/01

Figure A-6

Strataprobe Boring Log P-105



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

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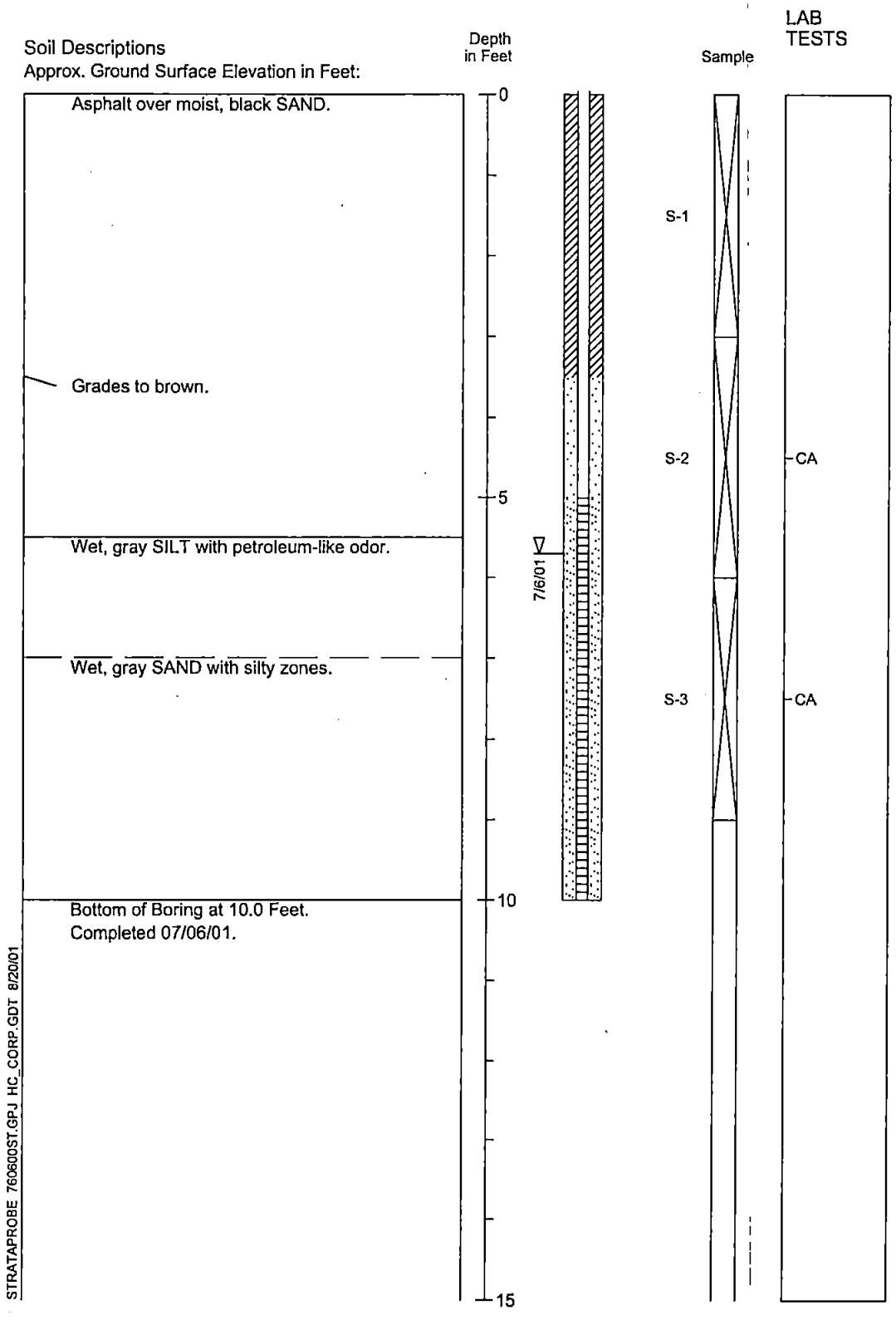
Figure A-7

Strataprobe Boring Log P-106



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

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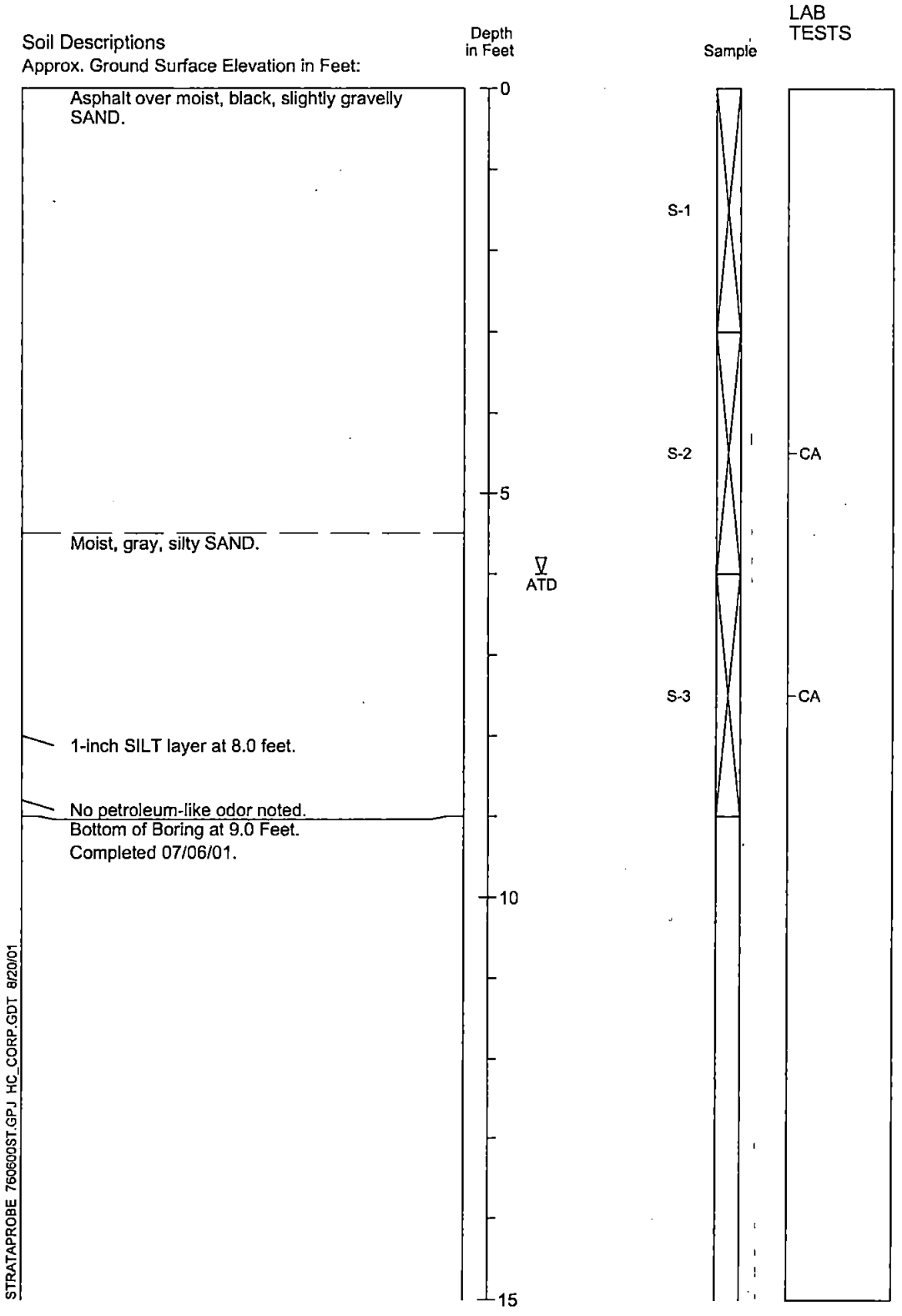
Figure A-8

Strataprobe Boring Log P-107



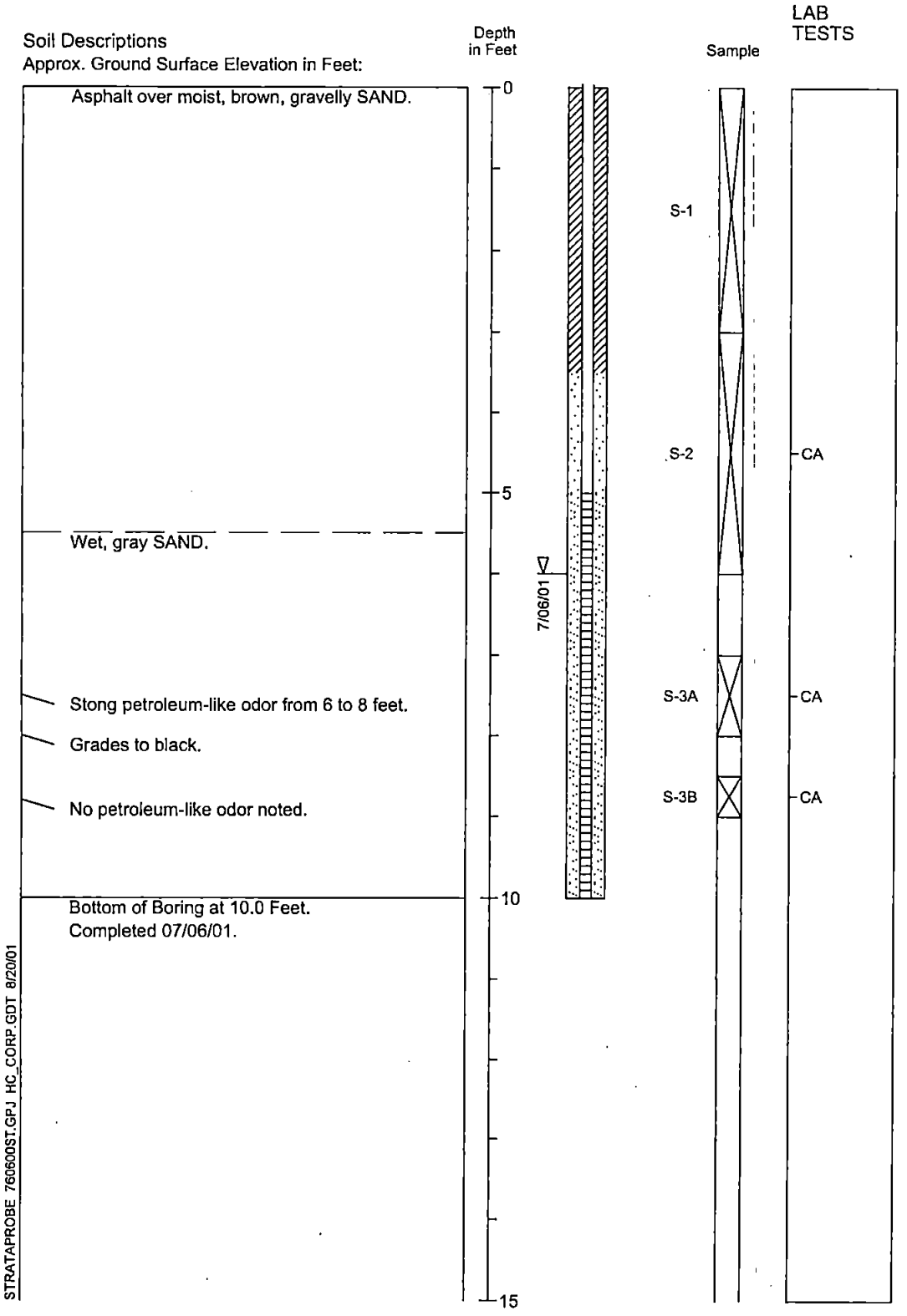
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

7606 *07/01*

Figure A-9

Strataprobe Boring Log P-108



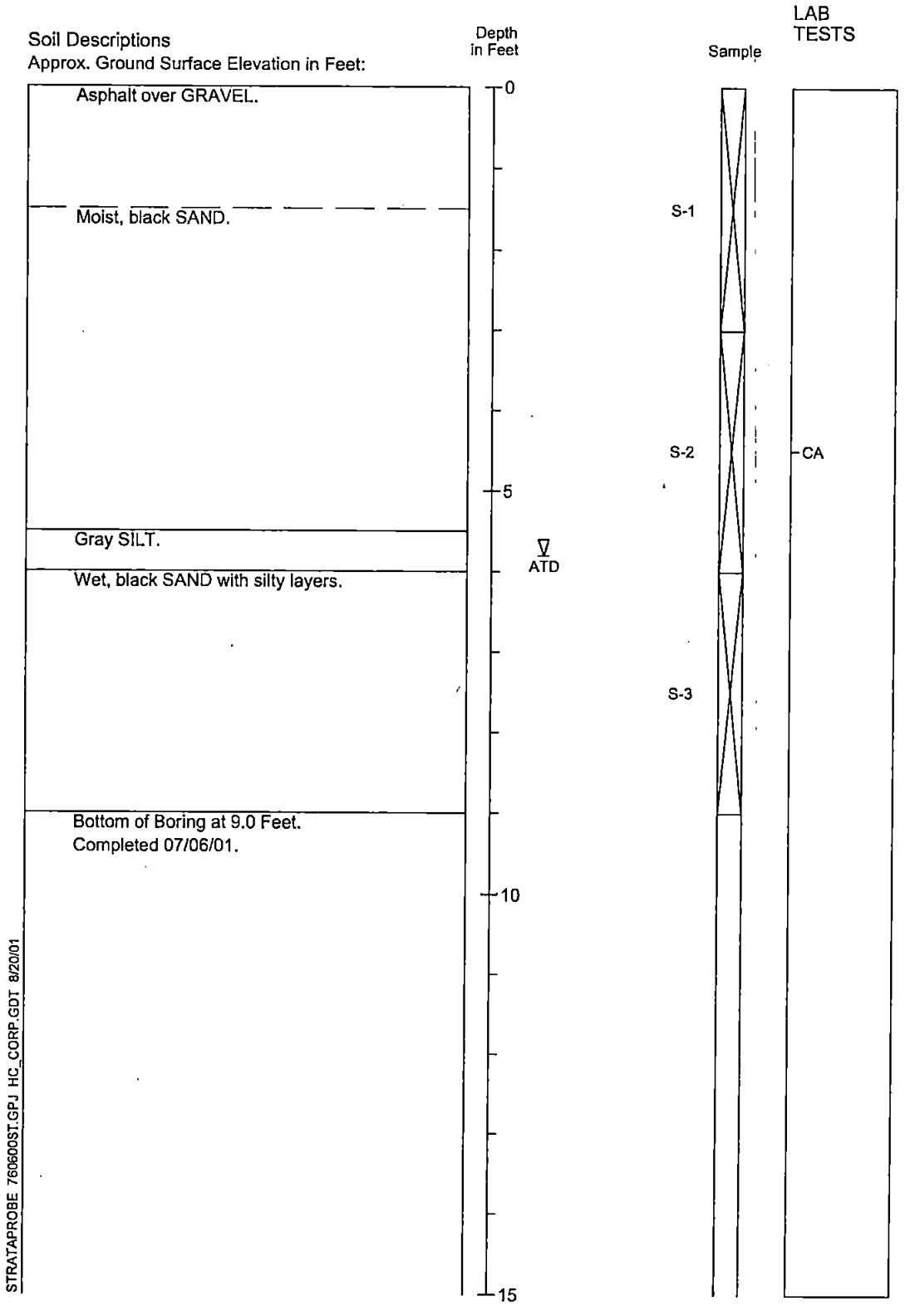
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

7606 *07/01*

Figure A-10

Strataprobe Boring Log P-109



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

7606 07/01

Figure A-11

APPENDIX B
LABORATORY REPORTS
ESN NORTHWEST

ESN NORTHWEST
Environmental Services Network

July 18, 2001

Rob Roberts
Hart Crowser
1910 Fairview Ave. E
Seattle, WA 98102-3699

Dear Mr. Roberts:

Please find enclosed the analytical data report for the Western Steel Casting Project in Seattle, Washington. Soil and water samples were analyzed for Diesel and Oil by NWTPH-Dx/Dx Extended on July 10 & 11, 2001.

The results of these analyses are summarized in the attached tables. All soil values are reported on a dry weight basis. Applicable detection limits and QA/QC data are included. An invoice for this work has been sent to your accounting department.

ESN Northwest appreciates the opportunity to have provided analytical services to Hart Crowser for this project. It was a pleasure working with you, and we are looking forward to the next opportunity to work together.

Sincerely,

Michael A Korosec

Michael A. Korosec
President

677 Woodland Square Lp. SE, Suite D ◘ Lacey, Washington 98503 ◘ 360.459.4670 ◘ FAX 360.459.3432
Web Site: *www.ESN-USA.com* E-Mail: *esnnw@aol.com*

ESN SEATTLE CHEMISTRY LABORATORY
(425) 957-9872, fax (425) 957-9904

ESN Job Number:	S10709-2
Client:	HART CROWSER
Client Job Name:	WESTERN STEEL CASTING
Client Job Number:	7606

Analytical Results

NWTPH-Dx, mg/kg		MTH BLK	P100A-S2	P100A-S3	P101-S3	P102A-S2
Matrix	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	07/11/01	07/11/01	07/11/01	07/11/01	07/11/01
Date analyzed	Limits	07/11/01	07/11/01	07/11/01	07/11/01	07/11/01
Kerosene/Jet fuel	20	nd	nd	nd	nd	nd
Diesel/Fuel oil	20	nd	15,000	9,700	nd	860
Heavy oil	50	nd	nd	nd	nd	nd
Surrogate recoveries:						
Fluorobiphenyl		117%	C	C	98%	107%
o-Terphenyl		129%	C	110%	107%	102%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
na - not analyzed
C - coelution with sample peaks
M - matrix interference
J - estimated value
Results reported on dry-weight basis
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 35%

ESN SEATTLE CHEMISTRY LABORATORY
(425) 957-9872, fax (425) 957-9904

ESN Job Number:	S10709-2
Client:	HART CROWSER
Client Job Name:	WESTERN STEEL CASTING
Client Job Number:	7606

Analytical Results		DUPL	RPD			
NWTPH-Dx, mg/kg		**P102A-S2**	**P102A-S2**	**P102A-S3**	**P103-S2**	**P103-S3A**
Matrix	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	07/11/01	07/11/01	07/11/01	07/11/01	07/11/01
Date analyzed	Limits	07/11/01	07/11/01	07/11/01	07/11/01	07/11/01
Kerosene/Jet fuel	20	nd		nd	nd	nd
Diesel/Fuel oil	20	800	7%	2,000	5,000	11,000
Heavy oil	50	nd		nd	nd	nd
Surrogate recoveries:						
Fluorobiphenyl		107%		116%	C	C
o-Terphenyl		106%		99%	105%	C

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
na - not analyzed
C - coelution with sample peaks
M - matrix interference
J - estimated value
Results reported on dry-weight basis
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 35%

ESN SEATTLE CHEMISTRY LABORATORY
(425) 957-9872, fax (425) 957-9904

ESN Job Number:	S10709-2
Client:	HART CROWSER
Client Job Name:	WESTERN STEEL CASTING
Client Job Number:	7606

Analytical Results

NWTPH-Dx, mg/kg		P103-S3B	P104-S2	P105-S3	DUPL P105-S3	P106-S2
Matrix	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	07/11/01	07/11/01	07/11/01	07/11/01	07/11/01
Date analyzed	Limits	07/11/01	07/11/01	07/11/01	07/11/01	07/11/01
Kerosene/Jet fuel	20	nd	nd	nd	nd	nd
Diesel/Fuel oil	20	nd	nd	nd	nd	300
Heavy oil	50	nd	nd	nd	nd	nd
Surrogate recoveries:						
Fluorobiphenyl		95%	95%	95%	102%	94%
o-Terphenyl		101%	103%	103%	107%	105%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
na - not analyzed
C - coelution with sample peaks
M - matrix interference
J - estimated value
Results reported on dry-weight basis
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 35%

ESN SEATTLE CHEMISTRY LABORATORY
(425) 957-9872, fax (425) 957-9904

ESN Job Number: S10709-2
Client: HART CROWSER
Client Job Name: WESTERN STEEL CASTING
Client Job Number: 7606

Analytical Results

NWTPH-Dx, mg/kg		P106-S3	P107-S2	P107-S3	P108-S2	P108-S3A
Matrix	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	07/11/01	07/11/01	07/11/01	07/11/01	07/11/01
Date analyzed	Limits	07/11/01	07/11/01	07/11/01	07/11/01	07/11/01
Kerosene/Jet fuel	20	nd	nd	nd	nd	nd
Diesel/Fuel oil	20	nd	71	nd	7,600	2,200
Heavy oil	50	nd	nd	nd	nd	nd
Surrogate recoveries:						
Fluorobiphenyl		96%	95%	98%	C	125%
o-Terphenyl		105%	105%	106%	C	106%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
na - not analyzed
C - coelution with sample peaks
M - matrix interference
J - estimated value
Results reported on dry-weight basis
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 35%

ESN SEATTLE CHEMISTRY LABORATORY
(425) 957-9872, fax (425) 957-9904

ESN Job Number:	S10709-2
Client:	HART CROWSER
Client Job Name:	WESTERN STEEL CASTING
Client Job Number:	7606

Analytical Results			DUPL	RPD		
NWTPH-Dx, mg/kg		**P108-S3A**	**P108-S3A**	**P108-S3B**	**P109-S2**
Matrix	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	07/11/01	07/11/01	07/11/01	07/11/01
Date analyzed	Limits	07/11/01	07/11/01	07/11/01	07/11/01
Kerosene/Jet fuel	20	nd		nd	nd
Diesel/Fuel oil	20	2,200	0%	nd	nd
Heavy oil	50	nd		nd	nd
Surrogate recoveries:					
Fluorobiphenyl		122%		100%	99%
o-Terphenyl		112%		109%	105%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
na - not analyzed
C - coelution with sample peaks
M - matrix interference
J - estimated value
Results reported on dry-weight basis
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 35%

ESN SEATTLE CHEMISTRY LABORATORY
(425) 957-9872, fax (425) 957-9904

ESN Job Number:	S10709-2
Client:	HART CROWSER
Client Job Name:	WESTERN STEEL CASTING
Client Job Number:	7606

Analytical Results

NWTPH-Dx, mg/l		MTH BLK	P104-S4	P106-S4	P108-S4	P108-S4 DUPL
Matrix	Water	Water	Water	Water	Water	Water
Date extracted	Reporting	07/10/01	07/10/01	07/10/01	07/10/01	07/10/01
Date analyzed	Limits	07/10/01	07/10/01	07/10/01	07/10/01	07/10/01
Kerosene/Jet fuel	0.20	nd	nd	nd	nd	nd
Diesel/Fuel oil	0.20	nd	nd	nd	1.0	1.7
Heavy oil	0.50	nd	nd	nd	nd	nd
Surrogate recoveries:						
Fluorobiphenyl		97%	95%	97%	101%	104%
o-Terphenyl		103%	105%	107%	110%	111%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
na - not analyzed
C - coelution with sample peaks
M - matrix interference
J - estimated value
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 35%

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES

510709-2

CHAIN-OF-CUSTODY RECORD

CLIENT: Hart Crowser

ADDRESS:

PHONE: 206-324-9530 FAX:

CLIENT PROJECT #: 7606 PROJECT MANAGER: R. Roberts

DATE: 7/6/01 PAGE 1 OF 3

PROJECT NAME: Western Steel Casting

LOCATION: 1st & Horton, Seattle

COLLECTOR: Fred Tuttle DATE OF COLLECTION 7/6/01

	Sample Number	Depth	Time	Sample Type	Container Type	VOA 8010/8021B	VOA 8021B BTEX	VOA 8260	SEMI VOL 8270	TPH-~~HCID~~ Dx	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (d & o)	PAH 8100	PCBs 8082	Pesticides 8081	TOTAL LEAD	pH								NOTES	Total Number of Containers	Laboratory Note Number
1.	P-100A S-1	0-3	0825	SOIL	GLASS																					SAMPLES KEPT IN	1	
2.	" S-2	3-6	0835							X																HC REFER #3	1	
3.	" S-3	6-9	0845							X																7/6→7/9	1	
4.	P-100 S-1	0-3	0820																								1	
5.	P-101 S-1	0-3	0925																								1	
6.	" S-2	3-6	0930																								1	
7.	" S-3	6-9	0935							X																	1	
8.	P-102 S-1	0-3	1105																								1	
9.	P-102A S-2	3-6	1125							X																	1	
10.	" S-3	6-9	1130							X																	1	
11.	P-103 S-1	0-3	1140																								1	
12.	P-103 S-2	3-6	1145							X																	1	
13.	P-103 S-3A	6-[illegible]	1150							X																	1	
14.	P-103 S-3B	8.5-9	1155							X																	1	
15.	P-104 S-1	0-3	0810																								1	
16.	" S-2	3-6	0815							X																	1	
17.	" S-3	6-9	0820																								1	
18.	P-104 S-4			WATER	LTR AMBER					X																	1	

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
[signature]	7/9/01 8:55	[signature]	7/9/01 10:00
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	18
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES: 72 Hr TAT

Turn Around Time:

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES

510709-2

CHAIN-OF-CUSTODY RECORD

CLIENT: HART C ROWSER

ADDRESS:

PHONE: 702-324-9530 FAX:

CLIENT PROJECT #: 7606 PROJECT MANAGER: R. ROBERTS

DATE: 7/6/01 PAGE 2 OF 3

PROJECT NAME: WESTERN STEEL CASTING

LOCATION: 1st & HANFORD, SEATTLE

COLLECTOR: FRED TUTTLE DATE OF COLLECTION 7/6/01

Sample Number	Depth	Time	Sample Type	Container Type	VOA 8010/8021B	VOA 8021B BTEX	VOA 8260	SEMI VOL 8270	TPH ~~HCID~~	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (d & o)	PAH 8100	PCBs 8082	Pesticides 8081	TOTAL LEAD	pH	NOTES	Total Number of Containers	Laboratory Note Number
1. P-105 S-1	0-3	1035	SOIL	GLASS															1	
2. " S-2	3-6	1040																	1	
3. " S-3	6-9	1045						X											1	
4. P-106 S-1	0-3	1240																	1	
5. " S-2	3-6	1245						X											1	
6. " S-3	6-9	1250						X											1	
7. P-107 S-1	0-3	1350																	1	
8. " S-2	3-6	1355						X											1	
9. " S-3	6-9	1400						X											1	
10. P-108 S-1	0-3	1330																	1	
11. " S-2	3-6	1335						X											1	
12. " S-3A	6.5-7	1340						X											1	
13. " S-3B	8.5-9	1340						X											1	
14. P-109 S-1	0-3	0945																	1	
15. " S-2	3-6	0950						X											1	
16. " S-3	6-9	0955																	1	
17. P-100A S-4	7'	0900	GRAB	LTR JAR															1	
18. P-106 S-4	5-10	1200	"	"				X											1	

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
[signature]	7/9/01 8:45	[signature]	7/9/01 1029
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE DISPOSAL INSTRUCTIONS

☐ TEG DISPOSAL @ $2.00 each ☐ Return ☐ Pickup

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	19
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

Turn Around Time: 72

Sample Custody Record

Samples Shipped to: ESN 7/9

HARTCROWSER

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle, Washington 98102-3699
Phone: 206-324-9530 FAX: 206-328-5581

JOB # 7606 LAB NUMBER

PROJECT NAME WESTERN STEEL CASTINGS

HART CROWSER CONTACT R. ROBERTS

SAMPLED BY: FRED TUTTLE

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	REQUESTED ANALYSIS: TPH-Dx	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
	P-108 5.4		7/6/01	1215	WATER	X	1	

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	7/9	SIGNATURE	7/9/1
PRINT NAME	TIME	PRINT NAME	TIME
COMPANY	6:55	COMPANY	1000

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE		SIGNATURE	
PRINT NAME	TIME	PRINT NAME	TIME
COMPANY		COMPANY	

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:
SAMPLE KEPT IN HC REFER R3 7/6 → 7/9.

1 TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. for Other Contract Requirements

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐ 48 HOURS ☐ STANDARD
☑ 72 HOURS OTHER

White and Yellow Copies to Lab Pink to Project Manager Lab to Return White Copy to Hart Crowser Gold to Sample Custodian