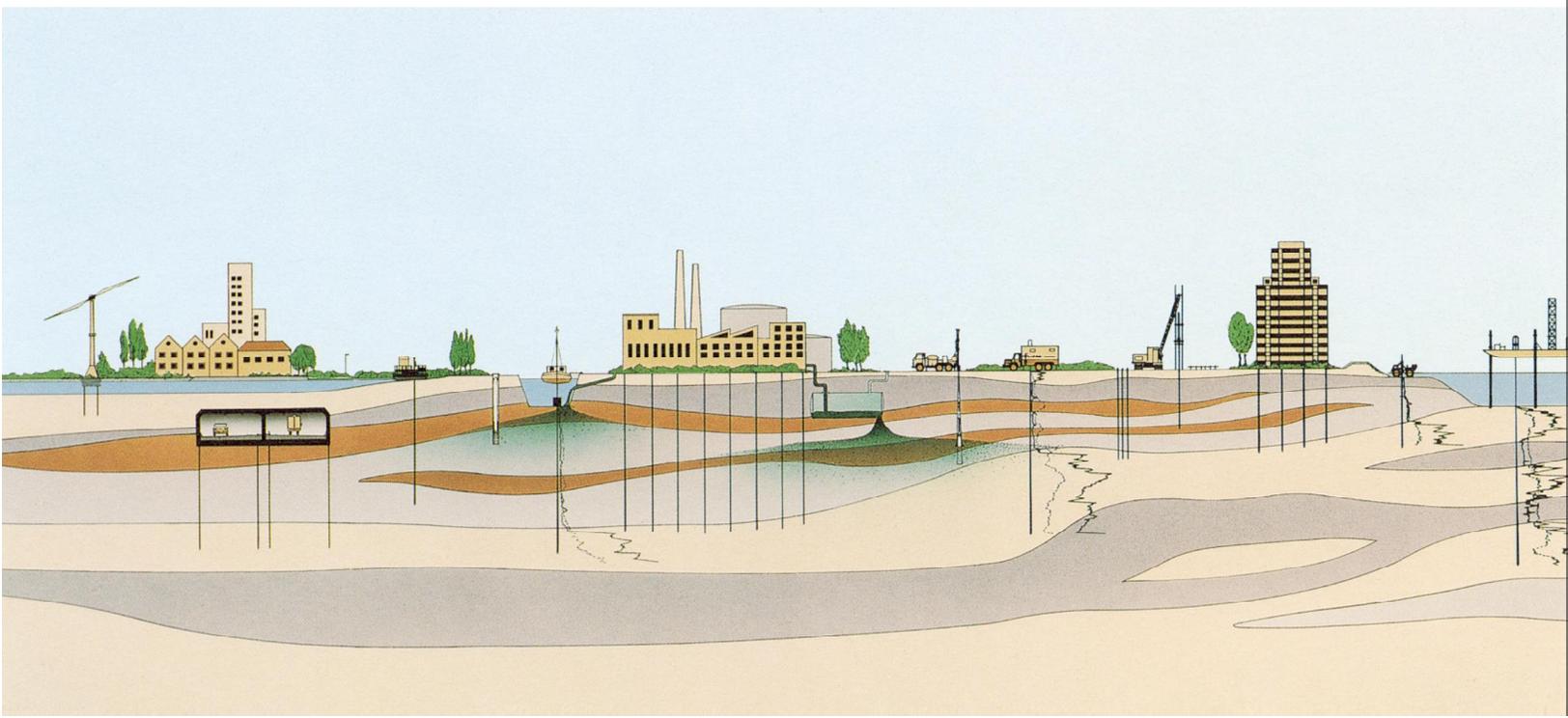


# GEOTECHNICAL INVESTIGATION RESULTS DPW FRIES AVENUE FORCE MAIN RELOCATION PORT OF LOS ANGELES

Prepared for:  
CITY OF LOS ANGELES HARBOR DEPARTMENT

June 1997





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June 12, 1997  
Project No. 96-42-1218

City of Los Angeles Harbor Department  
Harbor Department Administration Building  
425 South Palos Verdes Street  
San Pedro, California 90731

Attention: Mr. Todd Le

**Geotechnical Investigation Results  
DPW Fries Avenue Force Main Relocation  
Port of Los Angeles**

Deepening of the East Channel of the Los Angeles Inner Harbor for the Port of Los Angeles (POLA) Main Channel Deepening Program will require the relocation of the Department of Public Works (DPW) Fries Avenue force main. The enclosed report provides the factual results of geotechnical exploration and laboratory testing conducted for the alignment of the proposed DPW Fries Avenue force main relocation under the East Channel of the Los Angeles Harbor. The proposed alignment will cross under the East Channel between Berth 170 in the Shell Oil Terminal and Berths 221/222 in the Yusen Terminal. A draft report was previously provided for the DPW and POLA review.

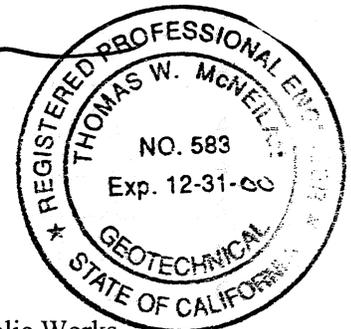
The work reported herein was authorized by Change Order No. 1, dated April 14, 1997, to Los Angeles Harbor Department Agreement No. 1948, dated March 26, 1997. The field exploration and other related activities described in this report were undertaken in conjunction with the field exploration for the Main Channel Deepening Program geotechnical and environmental studies and the associated investigation for the Department of Water and Power (DWP) proposed reclaimed water pipeline across the Los Angeles Inner Harbor Turning Basin.

On behalf of Fugro, we appreciate the opportunity to provide the enclosed report to the City of Los Angeles Harbor Department and Department of Public Works. Please call if we can answer any questions or provide additional information.

Sincerely,

FUGRO WEST, INC.

Thomas W. McNeilan, P.E., G.E.  
Vice President



TWM:av

c: Mr. Chris Zadoorian - City of Los Angeles Department of Public Works

Copies Submitted: (2) City of Los Angeles Harbor Department  
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## INTRODUCTION

### Background and Project Description

The City of Los Angeles Harbor Department (LAHD) is currently planning to deepen the navigation channels of the Port of Los Angeles (POLA) Inner Harbor. Execution of the Main Channel Deepening Program will require the relocation (sic. lowering) of the City of Los Angeles Department of Public Works (DPW) Fries Avenue force main, which crosses beneath the East Channel between Berths 170 and 221/222 (see Plate 1 - Vicinity Map).

The DPW is currently planning to microtunnel the relocated 30-inch-diameter force main. The invert for the relocated force main will be at either elevation (El.) -68 feet or -110 feet (re: mean lower low water [MLLW] datum).

On behalf of the DPW, the LAHD included the following as add-ons to the geotechnical and environmental subsurface investigations for the POLA Main Channel Deepening Program and associated City of Los Angeles Department of Water and Power (DWP) reclaimed water pipeline projects:

- Overwater and land exploration
- Geotechnical and environmental testing for the DPW force main

### Scope of Investigation

The scope and intent of the geotechnical investigation completed for the DPW Fries Avenue force main relocation was described by DPW's letter dated March 12, 1997. Based on that information, Fugro provided a proposal dated March 14, 1997, in which the scope of work for the investigation included:

1. Planning and coordination;
2. Overwater geotechnical borings;
3. Onshore geotechnical and environmental borings;
4. Geotechnical laboratory testing;
5. Environmental chemistry analyses; and
6. Preparation of a factual data report that describes the field and laboratory procedures and presents the boring logs and laboratory test results.

## Authorization

The subsurface exploration and related investigation efforts for the DPW Fries Avenue force main relocation were authorized by Change Order No. 1, dated April 14, 1997, to LAHD Agreement No. 1948, dated March 26, 1997.

## SUBSURFACE EXPLORATION

### Scope of Exploration

The subsurface exploration conducted specifically for the Fries Avenue force main relocation included the advancement of five borings designated as DPW-01 through DPW-05. The five borings included three overwater borings (DPW-02 through DPW-04) drilled in the East Channel and two land borings (DPW-01 and DPW-05) drilled at the planned force main microtunnel jacking pit locations. The locations of the borings are shown on Plate 2 - Exploration Location Map. The overwater borings were offset laterally about 20 to 60 feet from the planned pipeline alignment so as to avoid the existing 30-inch-diameter force main. Each boring was drilled to about El. -120 feet (re: MLLW datum).

The five borings drilled for the Fries Avenue force main were drilled between April 24 and May 3, 1997. The execution of the boring program was conducted together with the execution of the boring program for the proposed DWP reclaimed water pipeline across the Inner Harbor Turning Basin. The sequence of drilling included the completion of all overwater borings for both projects followed by the advancement of the land borings for both projects. The specific sequence of the borings was based on the requirements imposed by navigation access in the channels and terminal operations in the onshore areas.

A summary of the dates of exploration, location, and surface elevation for each boring location is provided on Plate 3 - Exploration Summary. Boring logs for the five borings are provided on Plates 4 through 8 - Logs of Drill Holes, and a key to many of the terms and symbols used on the boring logs is included as Plate 9 - Key to Terms & Symbols Used on Logs. Soils recovered in the samples were described in general accordance with the methods of ASTM Soil Classification System D2487. A description of the exploration equipment and operations is provided in the subsequent paragraphs.

### Drilling Operations

**Drilling Methods and Borehole Abandonment.** The drilling operation was conducted under the technical guidance and observation of a Fugro Certified Engineering Geologist, who also described and packaged the recovered samples. The five borings for the Fries Avenue force main relocation were advanced using wet, rotary drilling methods. Drilling services for these

borings were provided by Pitcher Drilling of Palo Alto, California, who provided a truck-mounted Failing 1500 drill rig, personnel, and associated equipment.

Subsurface obstructions were encountered at three locations:

1. In boring DPW-01, an approximately 4-inch diameter steel pipeline was encountered at 2-foot depth. The boring was then offset 2 feet to avoid the pipeline.
2. In boring DPW-02, a hard layer or rock (possible riprap) was encountered at shallow depth. We were successful in drilling through that obstruction.
3. In boring DPW-04, a hard layer, rock, or possible concrete was encountered at about 14-foot penetration. The boring location was abandoned, the barge shifted about 15 feet to the west, and the boring was redrilled.

The borings were advanced using non-toxic, revert or bentonite-based drilling mud and a 5-inch, side-discharge drill bit. As per the requirements of the DPW, cuttings from the borings were used to backfill the borings. At boring DPW-05, a surface asphalt cold patch was placed at the top of the backfill.

**Soil Sampling and Field Testing.** Samples were collected at about 3-foot intervals: a) to 15-foot depth in the land borings; b) between El. -60 and -70 feet in all borings; and c) between El. -102 to -112 feet in all borings. The latter two elevation intervals correspond to the two potential microtunnel elevations. Elsewhere, the samples were collected at about 5-foot intervals.

The sampling methods included primarily driven sampling using Standard Penetration Test (SPT) and California liner (with rings) samplers (1-3/8-inch-ID by 2-inch-OD and 2.4-inch-ID by 3-inch-OD, respectively). These samplers were driven using a 140-pound hammer falling 30 inches. The hammer was lifted and dropped using a rope and cathead, with the rope looped twice around the cathead. The number of blows required to drive the samplers the last 12 inches of the 18-inch penetration are shown on the boring logs. Blow counts for the California liner sampler are shown (xx). Only a limited number of samples were collected using pushed (2-7/8-inch-ID by 3-inch-OD) thin-wall tube sampling procedures.

To provide for sample splits for possible environmental testing, most samples within the depth and elevation intervals that corresponded to those where the subsurface was sampled at about 3-foot intervals were collected using a driven California liner sampler. Within those intervals, sample splits for environmental testing were obtained from the collected samples. The environmental subsamples in each boring were maintained on ice and accompanied by chain-of-custody documentation. Prior to collection of each sample for possible environmental testing, the sampling equipment was decontaminated by a detergent (TSP) wash and deionized water rinses (two to three) to prevent cross-contamination.

In the land borings, the samples down to at least 12-foot depth were screened for organic vapors using a field photoionization detector (PID) for volatile organic hydrocarbons. In addition, samples collected with the liner sampler from the possible microtunnel elevation intervals also were screened with the field PID. The field monitoring included the placement of the soil from one sample ring (typically the uppermost ring of each sampling interval) into a sealable plastic bag, placement of the bag in the sun for several minutes, and monitoring the headspace in the bag with a precalibrated hNU PID.

### **Overwater Borings**

To advance the three overwater borings along the route of the force main relocation, Pitcher Drilling's truck-mounted drill rig was mounted on an approximately 55-foot by 24-foot barge. The drill rig was positioned to allow the boring to be advanced through a center well in the barge. The barge was owned by Hamilton Marine, who also supplied and operated a 40-foot, 65-ton, twin-screw tugboat to move the barge and handle the barge's anchors. The barge was held on position using a four-point anchor spread.

### **Borehole Positions and Ground Surface Elevations**

Prior to initiating the field exploration, target boring locations were established by DPW and these locations were preplotted by Fugro's survey group. Field locations were then established using Fugro's Differential Global Positioning System (DGPS) navigation positioning system, referenced to known base stations in the Los Angeles Harbor area. The DGPS also was used to position the barge's anchors. Coordinates calculated from the DGPS system are considered accurate to within about 3 to 5 feet. Coordinates for the boring locations are reported relative to the California State Plane, Zone 7 datum.

Surface elevations for the land borings are based on the ground surface elevations shown on site plans provided by the POLA. These elevations are relative to MLLW datum. Harbor bottom elevations for the overwater borings are based on water depths measured at the beginning of drilling and the published tide chart for the Los Angeles Inner Harbor. Surface elevations are reported to the nearest 0.5 foot. In addition, sample depths for the samples collected from the overwater borings were corrected for tidal variations using the published tide chart.

### **Collection of Groundwater Samples**

Because the borings were drilled using wet, rotary drilling methods, groundwater samples were collected at the two land drilling locations using a Cone Penetration Test (CPT) rig that was supplied and operated by Fugro Geoscience. These samples were collected by advancing the cone with a screened tip to about 3 feet below groundwater. At that point, the sampling ports were opened and the groundwater was bailed from the cone tip. The groundwater samples were collected in sample containers supplied by the environmental laboratory.



## LABORATORY TESTING

### Geotechnical Laboratory Testing

**Testing Program.** Samples from the borings were tested to define pertinent classification and engineering soil properties. After completion of the drilling program, a list of samples and sample types was forwarded to DPW, who then returned the requested laboratory testing program. After Fugro's review of the DPW testing program, a few additional tests were assigned to supplement the testing requested by DPW.

The laboratory testing program requested by DPW included determination of grain size characteristics, Atterberg limits, moisture contents, unit weights, and soil corrosion (pH, total dissolved solids [TDS], chlorides, sulfate) characteristics. Volume change, permeability, and shear strength data were provided by incremental consolidation tests, falling head permeability tests, direct shear tests on granular sediments, and undrained shear strength measurements of fine-grained sediments. Most of the testing was concentrated on samples collected from either the two land borings and/or the two elevation intervals being considered for the force main relocation.

The following listing shows the actual numbers of tests completed and their ASTM standard numbers:

- 42 In-Place Dry Density..... ASTM D2937
- 14 Mechanical (Sieve) Analysis ..... ASTM D422
- 5 Hydrometer Analysis ..... ASTM D422
- 5 Percent Minus the No. 200 Sieve ..... ASTM D1140
- 5 Atterberg Limits..... ASTM D4318
- 6 Direct Shear ..... ASTM D3080
- 1 Triaxial Unconsolidated Undrained..... ASTM D2850
- 3 Incremental Consolidation with Collapse at 0.5 ksf..... ASTM D2435
- 1 Falling Head Permeability ..... ASTM D5084
- 4 Modified Proctor Compaction (on composite samples) ..... ASTM D1557
- 4 Mechanical Sieve Analyses (on composite proctor samples).... ASTM D422
- 6 Soil Corrosion Tests

With the exception of the soil corrosion tests, the testing was performed in Fugro's Ventura laboratory. Soil corrosion tests were performed by ConCeCo of Simi Valley, California.

Because the sample volume available from the individual samples to which DPW assigned a modified compaction test was inadequate to run the test, the modified proctor tests were conducted on composite samples composed of material from adjacent sample intervals with



similar grain size. A sieve analysis was conducted on each of those composite proctor compaction test samples.

**Presentation of Results.** The results of the geotechnical soil tests are provided in Appendix A. Appendix A includes the following presentations:

- Summary of Test Results ..... Plate A-1
- Grain Size Curves ..... Plate A-2
- Plasticity Chart ..... Plate A-3
- Direct Shear Tests ..... Plate A-4
- Triaxial Unconsolidated Undrained Shear Test ..... Plate A-5
- Consolidation Tests with Collapse Measurement ..... Plate A-6
- Modified Proctor Compaction Tests ..... Plate A-7
- Grain Size Curves for Proctor Compaction Test Samples ..... Plate A-8
- Soil Corrosion Test Results ..... Plate A-9

Many of the individual classification test results are also tabulated on the boring logs (Plates 4 through 8).

### **Environmental Chemistry Tests**

**Soil Samples.** Select soil samples recovered from the borings were submitted to Toxscan, Inc. (a state-certified laboratory) for chemical analyses. The Toxscan report is included in its entirety in Appendix B. We note that the depths listed on the Toxscan report for samples collected from borings DPW-02, DPW-03, and DPW-05 are uncorrected for tidal variations. The sample number on the boring log may be used to convert depths of samples from those borings to the true penetration, after correction for tidal variation.

The following listing shows the actual numbers of soil samples collected from the five borings and the types and numbers of tests assigned to them:

- 18 Total Recoverable Petroleum Hydrocarbons (TRPH)..... U.S. EPA 418.1
- 4 Volatile Organics including BTEX and MTBE ..... U.S. EPA 8260
- 5 Semivolatile Organics (BNAs)..... U.S. EPA 8270
- 6 Pesticides and PCBs ..... U.S. EPA 8080
- 6 CCR Title 22 Metals ..... U.S. EPA 6010

Chemical analyses were preferentially assigned to samples from: a) the onshore boring in the depth interval between ground surface and El. -2 feet (MLLW); b) from all five borings in the possible microtunnel elevation interval between El. -60 and -70 feet; and c) from all five borings in the possible microtunnel elevation interval between El. -102 and -112 feet.





**Pore Water Extractions.** An attempt to extract pore water from the soil samples was also conducted by Toxscan to allow testing to be performed on water samples from the borings. In general, however, the samples were too dense to allow the extraction of an adequate pore water volume using centrifuge techniques. Only one soil sample provided adequate volume for testing. The following tests were conducted on the sample:

- pH..... U.S. EPA 150.1
- TDS ..... U.S. EPA 160.1
- Chlorides ..... U.S. EPA 325.3
- Sulfates..... U.S. EPA 375.4

The results for the pore water sample are included in Toxscan's report.

**Groundwater Samples.** The groundwater samples collected using the CPT rig from the two land boring locations were submitted to CAPCO Analytical Services, a state-certified laboratory for chemical analyses. The CAPCO analytical report is provided in its entirety in Appendix C. The following tests were conducted on each of the two groundwater samples:

- Volatile Organics ..... U.S. EPA 624
- CAM Metals..... U.S. EPA 6010/747
- pH..... U.S. EPA 150.1
- TDS ..... U.S. EPA 160.1
- Chlorides ..... U.S. EPA 325.3
- Sulfates..... U.S. EPA 375.4

### OTHER NEARBY SUBSURFACE EXPLORATION

Other exploration for the Main Channel Deepening Program within about 500 feet of the proposed Fries Avenue force main alignment supplements the three overwater borings advanced for the Fries Avenue force main alignment. The locations of the other Main Channel Deepening Program exploration are shown on Plate 2. Those nearby explorations include vibrocore samples and tethered CPT soundings that were conducted during either late summer 1996 or spring 1997. Vibrocore logs and CPT sounding traces for those nearby explorations are reproduced in Appendix D. A further description of the methods used to obtain those data and the testing results are provided in Fugro Report Nos. 96-42-1213 (dated December 18, 1996) and 96-42-1215 (in preparation).



## SUBSURFACE CONDITIONS

### Stratigraphy

**Overview.** The general subsurface stratigraphy along the proposed force main alignment is shown on the cross section included on Plate 10 - Geologic Cross Section DPWA-DPWA'. This cross-section includes the results of the five borings as well as other Main Channel Deepening program exploration within 200 feet of the force main alignment.

As shown on the subsurface cross section, the subsurface materials underlying the force main alignment are composed primarily of granular sediments down to the maximum depth penetrated by the borings. Semi-continuous 5- to 17-foot-thick clay layers are present within two general elevation intervals. With the exception of the surficial fill or harbor bottom sediments, the soils are interpreted to be marine or estuarine sediments of Holocene age.

**Onshore Jacking Pit Locations.** At the force main jacking pit locations, the stratigraphy includes a surface layer of sand fill of variable density. The fill includes oversize and rubble materials in some depth intervals. A minor petroleum odor and low reading on the field PID was noted from the sample that approximately correlated to the depth of groundwater in both land borings.

On the northern side of the East Channel, the approximately 9-foot-thick fill layer is underlain by generally dense to very dense fine sand with silt, silty fine sand, and silty to clayey fine sand. Stiff to very stiff clay layers were penetrated from about El. -26 to -34 feet and from about El. -86 to -92 feet.

On the south side of the East Channel, the jacking pit location appears to overlay one of the pre-development backwater channels. At this location, the fill is interpreted to extend down to at least El. -5 feet and possibly as deep as El. -14 feet. The lower portion of the fill or possibly the upper portion of the slough fill is very loose to loose. The sequence of generally dense to very dense fine sand with silt, silty fine sand, and silty to clayey fine sand is present at about 28-foot depth or El. -14 feet. Stiff to very stiff clay layers were penetrated between about El. -25 and -30 feet and El. -88 to -96 feet.

**Navigation Channel.** The three overwater borings penetrated a surficial layer of very loose harbor bottom sediments that are interpreted to have been deposited subsequent to the last channel deepening program in the early 1980s. The surficial sediment includes both very soft plastic clays and loose silty sands.

The harbor bottom sediments are underlain by the sequence of generally dense to very dense fine sand with silt, silty fine sand, and silty to clayey fine sand. Stiff to hard clay layers

were encountered between about El. - 90 and -107 feet in boring DPW-03, and between about El. -93 and -101 feet in boring DPW-04.

### **Material Characteristics**

**Fill Materials.** The surface fill at the two onshore jacking pit locations is primarily composed of silty fine to coarse sand with variable types and quantities of oversize and rubble inclusions. The density of the fill is similarly variable.

**Holocene Sands.** The native Holocene sands are typically poorly graded fine sands with variable quantities of fines. Above about El. -80 feet, the percentage of fines typically varies from about 5 to 20 percent and the mean grain size typically ranges from about 0.1 to 0.15 millimeter (mm). Below about El. -80 feet, the fines content typically ranges from about 15 to 35 percent and the mean grain size ranges from about 0.08 to 0.15 mm. In this lower depth interval, some depth zones include about 5 to 10 percent clay-size particles finer than 0.002 mm.

The unit dry weight of the Holocene sands typically ranges from about 95 to 105 pounds per cubic foot (pcf) and the unit wet weight is typically between about 123 and 131 pcf. Above about El. -35 feet, the SPT N-values in the Holocene sands typically range from about 30 to 50. Below about El. -35 feet, the SPT N-values in the Holocene sands typically exceed 50. Direct shear tests suggest that the effective angle of internal friction generally exceeds 35 degrees in the Holocene sands.

**Holocene Clays.** Clay layers within the primarily granular Holocene sequence classify as CL on the classification chart, although the plasticity data for some of the layers plots only slightly above the A-line of the plasticity chart. Measure liquid limits range from 36 to 47 and the plasticity index ranges from 18 to 21. Two hydrometer analyses suggest that the clay layers include 5 to 15 percent material coarser than a No. 200 sieve (0.075 mm).

The unit weight data suggest that the upper clay layers in the interval between about El. -24 and -34 feet have water contents approximately equal to the plastic limit. The unit dry weight of those materials is about 115 to 120 pcf. In contrast, the unit dry weight of the lower clay layers appears to range from about 88 to 97 pcf. One triaxial unconsolidated undrained strength test, strength estimates from torvane and pocket penetrometer readings, and sampler driving resistances suggest that the clay layers are typically very stiff, although stiff and hard zones also may be present.

### **Environmental Chemistry Test Results**

The following discussion summarizes the results of the environmental chemistry test results that are presented in Appendices B and C. All concentrations are reported on a wet weight basis.

**Soil Sample Results.** The following list summarizes the results of the non-metals analyses on soil samples.

- Total recoverable hydrocarbons were detected in only one of the 18 samples (a measured value of 3,300 milligrams per kilogram [mg/kg] in the sample from 2 feet in Boring DPW-05).
- No volatile organic compounds were detected in the four samples analyzed.
- Only one semi-volatile organic compound was detected in the five samples analyzed (diethylphthalate at 1,500 micrograms per kilogram [ $\mu\text{g}/\text{kg}$ ] in the sample from 11 feet in boring DPW-01).
- No pesticides or polychlorinated biphenyls (PCBs) were detected in the six samples analyzed.

Of the 17 CAM metals, antimony and silver were not detected in any of the six samples analyzed. The results of the remaining CAM metals analyses on six samples are summarized in the following table.

Analyte	No. of Samples Detected	Typical Range (mg/kg)	Maximum Concentration (mg/kg)
Arsenic	6	0.6 - 1.2	3.2
Barium	6	24 - 36	100
Beryllium	6	0.11 - 0.17	0.53
Cadmium	2	0.24	0.24
Chromium	6	7 - 17	29
Cobalt	6	2.7 - 3.9	8.5
Copper	6	3 - 18	30
Lead	6	1.4 - 3.8	7.2
Mercury	2	0.03 - 0.06	0.06
Molybdenum	6	0.11 - 0.29	0.29
Nickel	6	4 - 12	19
Selenium	1	0.18	0.18
Thallium	2	0.13 - 0.29	0.29
Vanadium	6	15 - 29	40
Zinc	6	15 - 35	60

The largest concentration was most frequently detected in the sample from boring DPW-03 for the depth interval of the deeper option for the microtunnel. Not surprisingly, this sample contains a relatively higher percentage of clay-size fines than do the other analyzed samples. Exceptions to that generality are the detection of the highest barium concentration in the 5-foot sample from boring DPW-01 and the highest copper concentration in the 79-foot sample from boring DPW-01.





**Groundwater and Pore Water Extract Samples.** Volatile organic compounds were not detected in either of the two groundwater samples. Nine of the 17 CAM metals were detected in both groundwater samples. The range of concentrations (measured in milligrams per liter) for those nine analytes are as follows:

- Arsenic ..... 0.04 - 0.16 mg/l
- Barium..... 0.84 - 0.96 mg/l
- Chromium ..... 1.1 - 1.2 mg/l
- Cobalt..... 0.08 - 0.09 mg/l
- Copper..... 0.17 - 0.9 mg/l
- Molybdenum ..... 0.16 - 0.17 mg/l
- Nickel..... 0.26 mg/l
- Vanadium ..... 3.8 - 4.3 mg/l
- Zinc ..... 0.7 - 3.3 mg/l

Where there were differences between the concentrations in the two samples, the higher concentration generally was detected in the sample from location DPW-05. In addition, lead was detected at a concentration of 1.2 mg/l in the sample from DPW-05, but was not detected in the sample from location DPW-01.

The pH, TDS, chlorides, and sulfate measurements on the groundwater and pore water extraction samples were as follows:

- pH..... 6.9 - 8.0
- TDS ..... 30,000 - 43,000 mg/l
- Chlorides ..... 19,000 - 46,000 mg/l
- Sulfates..... 2,100 - 6,100 mg/l

### LIMITATIONS

This geotechnical report has been prepared for the City of Los Angeles Harbor Department and the City of Los Angeles Department of Public Works solely for the planning and design of the proposed relocation of the Fries Avenue force main beneath the East Channel of the Port of Los Angeles Inner Harbor. The applicability of this report and data in the report are specifically limited to current conditions and considerations for the proposed project. Data, results, and interpretations contained in this report are directed at and intended to be utilized within the scope of work contained in Fugro West's March 14, 1997, proposal and the Los Angeles Harbor Department's Change Order No. 1 to Agreement No. 1948. This report is not intended to be used for any other purposes.



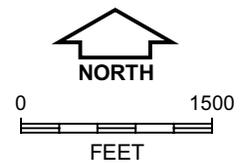
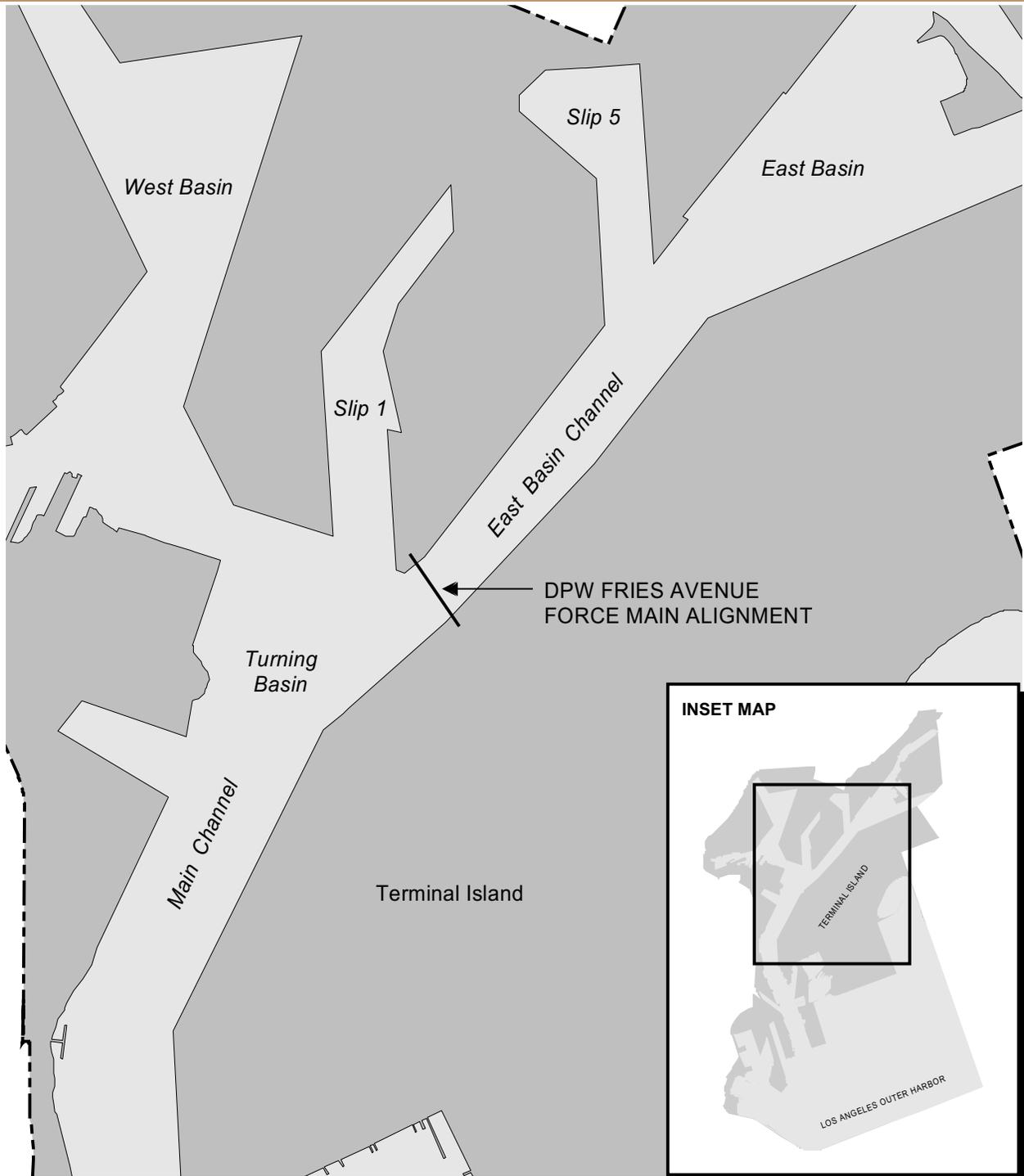


In performing our professional services, we have used that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers currently practicing in this or similar localities. No other warranty, express or implied, is made as to the professional advice included in this report. Fugro West, Inc., makes no claim or representation concerning any activity or conditions falling outside its specified purposes to which this report is directed.

The interpretation of general subsurface conditions is based on subsurface conditions observed at exploration locations only. The information interpreted from those explorations has been used as a basis for our interpretations. Conditions may vary at locations not investigated by our explorations. Subsurface conditions also may change with time due to either natural phenomena or people's activities. We note that any statements, or absence of statements, in this report regarding odors, unusual or suspicious items, or conditions observed are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous/toxic assessment.

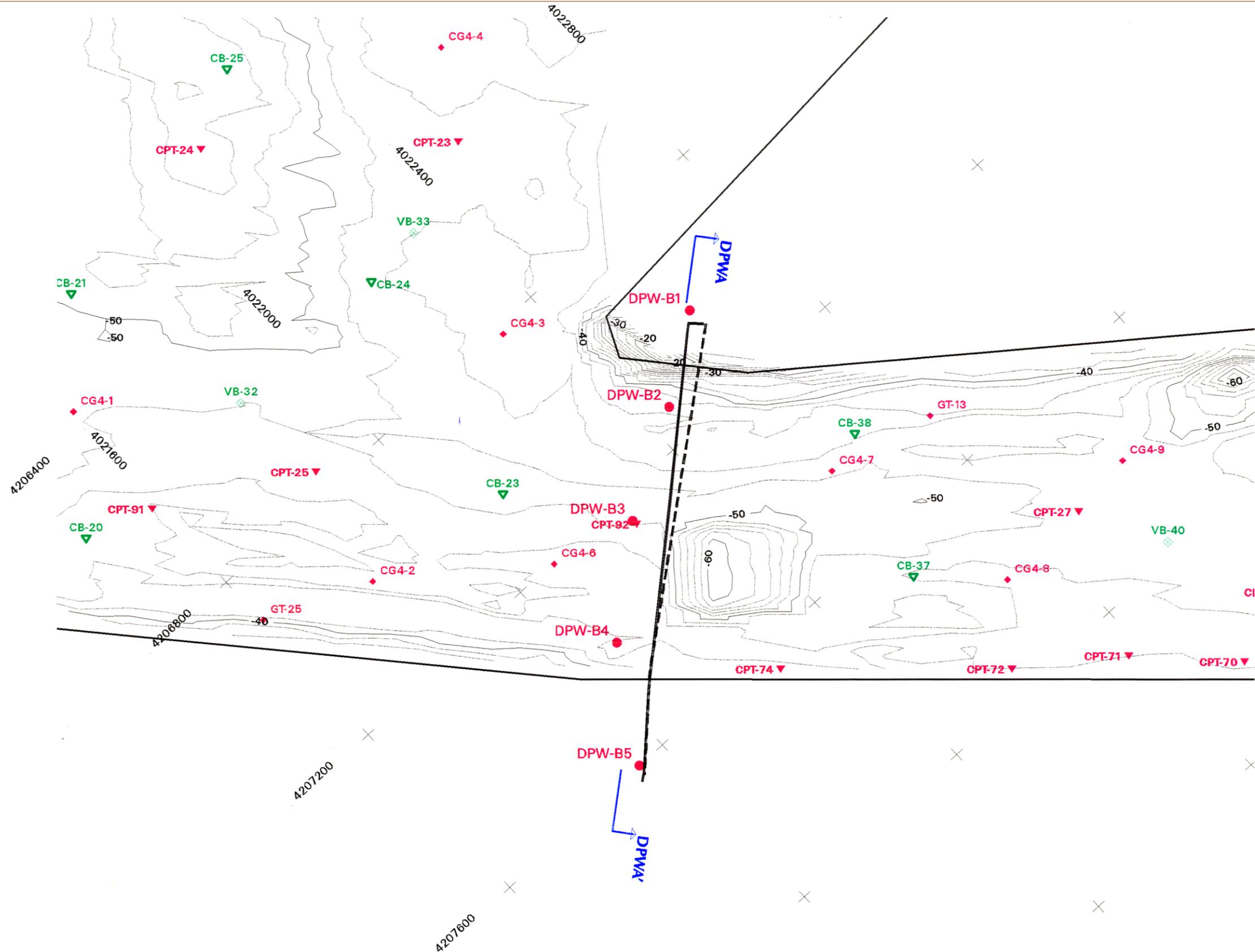


## PLATES



**VICINITY MAP**  
DWP Fries Avenue Force Main  
Port of Los Angeles





**LEGEND**

- 1997 Borings
- ▼ 1997 CPT's
- ◆ 1997 Vibrocores
- ▽ 1996 CPT's
- ◇ 1996 Vibrocores
- Bathymetry (Minor Contours)
- Bathymetry (Major Contours)
- Pierhead Line
- - - Existing Force Main Alignment
- Proposed Relocated Force Main Alignment



SCALE: 1" = 200'



**EXPLORATION LOCATION MAP**  
DPW - Fries Avenue Force Main  
Port of Los Angeles





Location	DPW-01	DPW-02	DPW-03	DPW-04	DPW-05
Date Drilled	4-30-97	4-28-97	4-24-97	4-26-97	5-3-97
Location					
North	4,022,606	4,022,451	4,022,251	4,022,070	4,021,941
East	4,207,027	4,207,135	4,207,247	4,207,397	4,207,599
Surface Elevation	+9.5	-41.5	-46.5	-43.0	+13.6
Final Drilling Depth	131.0	81.5	76.0	79.7	135.5
Bottom Elevation	-121.5	-123.0	-122.5	-122.7	-121.9
Depth to Water	8.0	--	--	--	11.0

**EXPLORATION SUMMARY**  
DPW - Relocated Fries Avenue Force Main  
Port of Los Angeles





ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOWCOUNT	LOCATION: N 4,022,606 E 4,207,027 SURFACE EL: 9.5 ft (rel. MLLW datum)	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	HNu, ppmv
						<b>MATERIAL DESCRIPTION</b>							
						Pavement: 5" asphalt over 10" base							
8	2		1		(33)	Silty, fine to coarse SAND (SM) (FILL): medium dense to dense, tan - with light brown silt pockets (ML) to 3'	116	97	20				0
6	4		2		(35)	- gray, with pieces of asphalt and concrete 5' to 7.5'							0
4	6		3		(32)	- fine to medium grained with gravel, dark gray, saturated, with slight petroleum odor, at 8'	128	96	32				0.3
2	8		4		(23)	Silty fine SAND (SM) to fine SAND with silt (SP-SM): medium dense to dense, dark gray, with mica and shell	127	100	27				0
0	10		5		(25)	- with abundant shell at 14'	123	97	27	7			
-2	12		6		33	- dense to very dense, gray, less shell, below 20'							
-4	14		7		(72)		122	95	28				
-6	16		8		44	Silty to Clayey fine SAND (SM to SC): medium dense, medium gray, with abundant shell fragments and mica - becomes more clayey below 33'							
-8	18		9		(67)	Sandy lean CLAY (CL): stiff to very stiff, light grayish brown, with medium gray silty fine sand (SM) pockets and seams	137	118	17	77	36	19	
-10	20												
-12	22												
-14	24												
-16	26												
-18	28												
-20	30												
-22	32												
-24	34												
-26	36												
-28	38												
-30													

COMPLETION DEPTH: 131.0 ft  
 DEPTH TO WATER: 8.0 ft  
 BACKFILLED WITH: Drill Hole Cuttings  
 DRILLING DATE: April 30, 1997

DRILLING METHOD: Wet Rotary  
 DRILLED BY: Pitcher Drilling  
 LOGGED BY: CDPrentice  
 CHECKED BY: TWMcNeilan

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DPW-01**  
 DPW - Relocated Fries Avenue Force Main





ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOWCOUNT	LOCATION: N 4,022,606 E 4,207,027 SURFACE EL: 9.5 ft (rel. MLLW datum)	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	HNu, ppmv
						<b>MATERIAL DESCRIPTION</b>							
-32	42	[Symbol]	10	[Symbol]	25	Sandy lean CLAY (CL): stiff, light grayish brown, with of medium gray silty fine sand (SM) pockets and seams							
-34	44	[Symbol]				Silty fine SAND (SM): very dense, light gray to light brown, with fine sand (SP) partings - fine sand with silt (SP-SM) to 46'							
-36	46	[Symbol]	11	[Symbol]	(50/5")		134	112	20				
-40	50	[Symbol]											
-42	52	[Symbol]	12	[Symbol]	80								
-44	54	[Symbol]											
-46	56	[Symbol]	13	[Symbol]	(50/4")		128	106	21				
-50	60	[Symbol]				- with abundant shell and mica below 60'							
-52	62	[Symbol]	14	[Symbol]	81								
-54	64	[Symbol]				- hard shell/dolomitic layer at 63'							
-56	66	[Symbol]	15	[Symbol]	74	- lean clay (CL), stiff, light gray, with fine sand, 65' to 65.5'							
-60	70	[Symbol]											0
-62	72	[Symbol]	16	[Symbol]	(50/4")								
-64	74	[Symbol]				Fine SAND with silt (SP-SM): very dense, light gray to light brown, with iron stained streaks							0
-66	76	[Symbol]	17	[Symbol]	(50/4")								
-68	78	[Symbol]	18	[Symbol]	(50/5")		128	101	27				0
-70		[Symbol]	19	[Symbol]	(50/5")		127	100	27				0

COMPLETION DEPTH: 131.0 ft  
 DEPTH TO WATER: 8.0 ft  
 BACKFILLED WITH: Drill Hole Cuttings  
 DRILLING DATE: April 30, 1997

DRILLING METHOD: Wet Rotary  
 DRILLED BY: Pitcher Drilling  
 LOGGED BY: CDPrentice  
 CHECKED BY: TWMcNeilan

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DPW-01**  
 DPW - Relocated Fries Avenue Force Main





ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOWCOUNT	LOCATION: N 4,022,806 E 4,207,027 SURFACE EL: 9.5 ft (rel. MLLW datum)	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	HNu, ppmv
						<b>MATERIAL DESCRIPTION</b>							
-72	82				3")	Fine SAND with silt (SP-SM): very dense, light gray to light brown, with iron stained streaks							
-74	84		20	⊗	50/5"	- interbedded with silty to clayey sand laminations below 84'							
-76	86												
-78	88												
-80	90					- 6" thick clay layer 89' to 89.5'							
-82	92		21	⊗	91/11"								
-84	94												
-86	96					Lean CLAY (CL): very stiff to hard, medium gray, with shell							
-88	98		22	⊗	(51)		124	98	27	89	42	17	
-90	100												
-92	102					Silty fine SAND (SM): very dense, light gray to light brown, with mica and iron stained streaks							
-94	104												
-96	106		23	⊗	50/5"								
-98	108												
-100	110												
-102	112		24	⊗	(50/3")		124	98	27				0
-104	114												
-106	116		25	⊗	(50/3")	- with light gray clay partings at 115'	129	105	23				0
-108	118		26	⊗	(ref/6")		127	98	29				0
-110													

COMPLETION DEPTH: 131.0 ft  
 DEPTH TO WATER: 8.0 ft  
 BACKFILLED WITH: Drill Hole Cuttings  
 DRILLING DATE: April 30, 1997

DRILLING METHOD: Wet Rotary  
 DRILLED BY: Pitcher Drilling  
 LOGGED BY: CDPrentice  
 CHECKED BY: TWMcNeilan

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DPW-01**  
 DPW - Relocated Fries Avenue Force Main





ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOWCOUNT	LOCATION: N 4,022,606 E 4,207,027 SURFACE EL: 9.5 ft (rel. MLLW datum)	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	HNu, ppmv
MATERIAL DESCRIPTION													
-112	122		27		(50/2")	Silty fine SAND (SM): very dense, light gray to light brown, with mica and iron stained streaks							0
-114	124												
-116	126												
-118	128												
-120	130		28	⊗	50/6"								
-122	132												
-124	134												
-126	136												
-128	138												
-130	140												
-132	142												
-134	144												
-136	146												
-138	148												
-140	150												
-142	152												
-144	154												
-146	156												
-148	158												
-150													

COMPLETION DEPTH: 131.0 ft  
 DEPTH TO WATER: 8.0 ft  
 BACKFILLED WITH: Drill Hole Cuttings  
 DRILLING DATE: April 30, 1997

DRILLING METHOD: Wet Rotary  
 DRILLED BY: Pitcher Drilling  
 LOGGED BY: CDPrence  
 CHECKED BY: TWMcNeilan

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DPW-01**  
**DPW - Relocated Fries Avenue Force Main**





ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOWCOUNT	LOCATION: N 4,022,451 E 4,207,135 SURFACE EL: -41.5 ft (rel. MLLW datum)	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	H <sub>Nu</sub> , ppmv
-42			1	push		CLAY (CL) to Clayey SILT (ML): very soft, dark gray to black, with mica							
-44	2												
-46	4		2	push			Clayey fine SAND (SC) to SILT (ML): very loose, dark gray to black, with mica - tan to light brown at 6'						
-48	6												
-50	8			push									
-52	10		3		(50/4")	Silty fine SAND (SM): dense to very dense, tan, with abundant shells and mica							
-54	12												
-56	14		4		92/11"								
-58	16					Fine SAND with silt (SP-SM): dense to very dense, tan, with mica and shell  - with abundant shell to shell hash 21' to 25'							
-60	18		5		(57/6")		127	99	29				0
-62	20		6		50/6"								0
-64	22		7		(50/3")							0	
-66	24												
-68	26		8		(50/3")	131	110	20	3			0	
-70	28												
-72	30		9		50/4"								
-74	32												
-76	34												
-78	36												
-80	38												

COMPLETION DEPTH: 81.5 ft  
 WATER DEPTH: 41.5 ft inclusive of 0.1 ft tide, measured at 0910 hours  
 BACKFILLED WITH: Drill Hole Cuttings  
 DRILLING DATE: April 28, 1997

DRILLING METHOD: Wet Rotary  
 DRILLED BY: Pitcher Drilling  
 LOGGED BY: CDPrentice  
 CHECKED BY: TWMcNeilan

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

LOG OF DRILL HOLE NO. DPW-02  
 DPW - Relocated Fries Avenue Force Main





ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOWCOUNT	LOCATION: N 4,022,451 E 4,207,135 SURFACE EL: -41.5 ft (rel. MLLW datum)	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	HNu, ppmv	
MATERIAL DESCRIPTION														
-82			10	X	82	Silty to Clayey fine SAND (SM-SC): dense to very dense, light brownish gray, with mica and iron stained streaks  - with interbedded brown sandy clay seams and layers 46' to 68'								
-84	42													
-86	44													
-88	46													
-90	48													
-92	50		11		(50/4")									
-94	52													
-96	54													
-98	56													
-100	58													
-102	60		12		(50/4")		123	97	28				0	
-104	62													
-106	64		13		(50/4")		128	103	25				0	
-108	66													
-110	68		14		(50/5")		127	100	27				0	
-112	70													
-114	72		15		(50/3")			27	17			0		
-116	74													
-118	76													
-120	78													

COMPLETION DEPTH: 81.5 ft  
 WATER DEPTH: 41.5 ft inclusive of 0.1 ft tide, measured at 0910 hours  
 BACKFILLED WITH: Drill Hole Cuttings  
 DRILLING DATE: April 28, 1997

DRILLING METHOD: Wet Rotary  
 DRILLED BY: Pitcher Drilling  
 LOGGED BY: CDPrentice  
 CHECKED BY: TWMcNeilan

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DPW-02**  
 DPW - Relocated Fries Avenue Force Main





ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOWCOUNT	LOCATION: N 4,022,451 E 4,207,135 SURFACE EL: -41.5 ft (rel. MLLW datum)	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	HNu, ppmv	
						MATERIAL DESCRIPTION								
-122			16	⊗	50/3"	Silty to Clayey fine SAND (SM-SC): dense to very dense, light brownish gray, with mica and iron stained streaks - medium gray, with shell layers, below 81'								
-124	82													
-126	84													
-128	86													
-130	88													
-132	90													
-134	92													
-136	94													
-138	96													
-140	98													
-142	100													
-144	102													
-146	104													
-148	106													
-150	108													
-152	110													
-154	112													
-156	114													
-158	116													
-160	118													

COMPLETION DEPTH: 81.5 ft  
 WATER DEPTH: 41.5 ft inclusive of 0.1 ft tide, measured at 0910 hours  
 BACKFILLED WITH: Drill Hole Cuttings  
 DRILLING DATE: April 28, 1997

DRILLING METHOD: Wet Rotary  
 DRILLED BY: Pitcher Drilling  
 LOGGED BY: CDPrentice  
 CHECKED BY: TWMcNeilan

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DPW-02**  
 DPW - Relocated Fries Avenue Force Main





ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOWCOUNT	LOCATION: N 4,022,251 E 4,207,247	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	HNu, ppr/vv
						SURFACE EL: -46.5 ft (rel. MLLW datum)							
						<b>MATERIAL DESCRIPTION</b>							
-48	2			● (push)		Silty, fine to medium SAND (SM): very loose to loose, dark gray to black, with abundant silt pockets, shell fragments, and mica							
-50	4		2		(12)		122	94	29	16			
-52	6					Silty fine SAND (SM): dense to very dense, tan to light brown, with abundant shell fragments and mica							
-54	8		3	⊗	60				22	20			
-56	10												
-58	12		4		(60/ 6")	Fine SAND with silt (SP-SM): dense to very dense, tan to light brown, with mica and shell fragments	128	102	26	7			0
-60	14					- abundant shell to 14'							
-62	16		5		(100/ 11")		129	104	24				0
-64	18		6		(50/ 6")								0
-66	20		7		(46/ 6")		125	99	27				0
-68	22												
-70	24												
-72	26		8	⊗	50/6"								
-74	28					Silty fine SAND (SM): dense to very dense, tan to light brown, with mica and iron stained streaks							
-76	30		9		(50/ 5")								
-78	32					- light gray to light brown below 32'							
-80	34		10	⊗	50/6"								
-82	36												
-84	38												
-86			11		(50/				28	13			

COMPLETION DEPTH: 76.0 ft  
 WATER DEPTH: 47.0 ft inclusive of 0.4 ft tide, measured at 0645 hours  
 BACKFILLED WITH: Drill Hole Cuttings  
 DRILLING DATE: April 24, 1997

DRILLING METHOD: Wet Rotary  
 DRILLED BY: Pitcher Drilling  
 LOGGED BY: CDPrentice  
 CHECKED BY: TWMcNeilan

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DPW-03**  
 DPW - Relocated Fries Avenue Force Main





ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOWCOUNT	LOCATION: N 4,022,251 E 4,207,247	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	HNu, pprmv
						SURFACE EL: -46.5 ft (rel. MLLW datum)							
						<b>MATERIAL DESCRIPTION</b>							
-88	42				4")	Silty fine SAND (SM): dense to very dense, tan to light brown, with mica and iron stained streaks							
-90	44		12	⊗	42	Lean CLAY (CL): stiff to very stiff, dark gray, with shell							
-92	46					- silt (ML), stiff, olive green, thinly bedded to laminated, to 44'							
-94	48												
-96	50		13	⊗	push								
-98	52												
-100	54												
-102	56		14	⊗	(25)	- with organics and fine sand partings and seams below 55'	117	88	34		44	19	0
-104	58		15	⊗	(52)								0
-106	60												
-108	62		16	⊗	(50/4")	Silty to Clayey SAND (SM-SC): dense to very dense, dark gray and brown, with mica	131	107	22	26	NP	NP	0
-110	64		17	⊗	(50/3")				18				0
-112	66												
-114	68												
-116	70		18	⊗	50/4"	Silty fine SAND (SM): dense to very dense, tan, with orange colored partings and mica							
-118	72												
-120	74												
-122	76		19	⊗	50/4"	- with black mica partings at about 5 degrees inclination at 75'							
-124	78												
-126													

COMPLETION DEPTH: 76.0 ft  
 WATER DEPTH: 47.0 ft inclusive of 0.4 ft tide, measured at 0645 hours  
 BACKFILLED WITH: Drill Hole Cuttings  
 DRILLING DATE: April 24, 1997

DRILLING METHOD: Wet Rotary  
 DRILLED BY: Pitcher Drilling  
 LOGGED BY: CDPrentice  
 CHECKED BY: TWMcNeilan

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DPW-03**  
 DPW - Relocated Fries Avenue Force Main





ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOWCOUNT	LOCATION: N 4,022,070 E 4,207,397 SURFACE EL: -43.0 ft (rel. MLLW datum)	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	HNu, ppmv
						<b>MATERIAL DESCRIPTION</b>							
-44	2					Silty fine SAND (SM): loose, dark gray, with mica and abundant shell fragments and silt pockets							
-46			1	push									
-48	4												
-50	6		2	X	69	Silty fine SAND (SM): dense, light gray and light brown, with abundant shells and mica							
-52	8												
-54	10		4	(50/6")			131	105	25				
-56	12		3	(50/6")									
-58	14		5	X	76								
-60	16		6	(50/6")			127	101	26				0
-62	18		7	(60/6")									0
-64	20		8	(57/6")			132	107	23				0
-66	22		9	(50/6")									0
-68	24												
-70	26												
-72	28		10	(53/6")		Silty to Clayey fine SAND (SM-SC): dense to very dense, light brown and light gray, with mica							
-74	30												
-76	32												
-78	34		11	X	50	- fine to coarse sand with silt (SW-SM), dense, light gray, with abundant shell, silt pockets, and iron stained streaks, 33' to 34.5'							
-80	36												
-82	38		12	(55/6")									

COMPLETION DEPTH: 79.7 ft  
 WATER DEPTH: 43.5 ft inclusive of 0.5 ft tide, measured at 0850 hours  
 BACKFILLED WITH: Drill Hole Cuttings  
 DRILLING DATE: April 26, 1997

DRILLING METHOD: Wet Rotary  
 DRILLED BY: Pitcher Drilling  
 LOGGED BY: CDPrentice  
 CHECKED BY: TWMcNeilan

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DPW-04**  
 DPW - Relocated Fries Avenue Force Main





ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOWCOUNT	LOCATION: N 4,022,070 E 4,207,397 SURFACE EL: -43.0 ft (rel. MLLW datum)	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	HNu, ppmv
-84	42					Silty to Clayey fine SAND (SM-SC): dense to very dense, light brown and light gray, with mica							
-86	44												
-88	46		13	⊗	53								
-90	48					Lean CLAY (CL): stiff, dark gray, with scattered shells							
-92	50												
-94	52		14	⊗	(33)								
-96	54					Silty to Clayey SAND (SM-SC): dense to very dense, gray, with mica							
-98	56												
-100	58		15	⊗	(48/6")		126	97	30				0
-102	60					Silty fine SAND (SM): dense to very dense, light brownish gray, with abundant mica and iron stained streaks							
-104	62		16	⊗	(7)		128	101	26	31			0
-106	64		17	⊗	(78/5")		126	99	26	33			0
-108	66					- with mica at 79'							
-110	68		18	⊗	50/5"								0
-112	70												
-114	72												
-116	74												
-118	76												
-120	78												
-122	78		19	⊗	50/6"								

COMPLETION DEPTH: 79.7 ft  
 WATER DEPTH: 43.5 ft inclusive of 0.5 ft tide, measured at 0850 hours  
 BACKFILLED WITH: Drill Hole Cuttings  
 DRILLING DATE: April 26, 1997

DRILLING METHOD: Wet Rotary  
 DRILLED BY: Pitcher Drilling  
 LOGGED BY: CDPrentice  
 CHECKED BY: TWMcNeilan

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

LOG OF DRILL HOLE NO. DPW-04  
 DPW - Relocated Fries Avenue Force Main





ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOWCOUNT	LOCATION: N 4,021,941 E 4,207,599	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	HNu, ppmv
						SURFACE EL: 13.6 ft (rel. MLLW datum)							
						<b>MATERIAL DESCRIPTION</b>							
						Pavement: 6" asphalt over 6" base							
12	2		1		(71)	Fine to medium SAND with silt (SP-SM) (FILL): dense, light gray, with clay pockets and shell	123	107	15				0
10	4		2		(72)	- with scattered coarse gravel at 5'							0
8	6		3		(19)	- medium dense at 8'	112	95	18				0
6	8		4		(13)	Silty, fine to coarse SAND (SM) (FILL?): loose to medium dense, gray, wet, with abundant shell fragments and mica							0
4	10		5		(44)	- dense, with gravel, pieces of milled wood, tar, clay pockets, and slight petroleum odor, 14' to 15.5'	127	107	19				0.5
2	12		6		6	- very loose to loose (fill?), abundant shell fragments, below 18'	124	96	29				
0	14		7		(5)								
-2	16		8		48	Silty fine SAND (SM): dense, medium gray, with abundant shells and mica							
-4	18		9		(66)								
-6	20												
-8	22												
-10	24												
-12	26												
-14	28												
-16	30												
-18	32												
-20	34												
-22	36												
-24	38					Sandy lean CLAY (CL): very stiff to hard, medium brown, with mica							
-26													

COMPLETION DEPTH: 135.5 ft  
 DEPTH TO WATER: 11.0 ft  
 BACKFILLED WITH: Drill Hole Cuttings  
 DRILLING DATE: May 3, 1997

DRILLING METHOD: Wet Rotary  
 DRILLED BY: Pitcher Drilling  
 LOGGED BY: CDPrentice  
 CHECKED BY: TWMcNeilan

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DPW-05**  
 DPW - Relocated Fries Avenue Force Main





ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOWCOUNT	LOCATION: N 4,021,941 E 4,207,599	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	FINu, ppmv	
						SURFACE EL: 13.6 ft (rel. MLLW datum)								
		<b>MATERIAL DESCRIPTION</b>												
-28	42	[Symbol]	10	[Symbol]	(86)	Sandy lean CLAY (CL): very stiff to hard, medium brown, with mica	139	121	15					
-30	44	[Symbol]	11	[Symbol]	28	Interbedded Clayey fine SAND (SC), dense, brown, with mica, and Sandy lean CLAY (CL), firm to stiff, brownish gray								
-32	46	[Symbol]												
-34	48	[Symbol]												
-36	50	[Symbol]	12	[Symbol]	(50/5")	Fine SAND with silt (SP-SM): very dense, light gray to light brown, with shell fragments	126	98	28					
-38	52	[Symbol]												
-40	54	[Symbol]												
-42	56	[Symbol]	13	[Symbol]	90	- with faint yellow streaks at 55'								
-44	58	[Symbol]												
-46	60	[Symbol]	14	[Symbol]	50/3"	- with abundant shells at 60' - difficult drilling, hard shell layer, 60.5' to 61.5'								
-48	62	[Symbol]												
-50	64	[Symbol]												
-52	66	[Symbol]	15	[Symbol]	(ref/5")	Silty fine SAND (SM): very dense, light gray, with mica and shell fragments	128	103	25					
-54	68	[Symbol]												
-56	70	[Symbol]	16	[Symbol]	50/5"	- light brown, with abundant shells, at 70'								
-58	72	[Symbol]												
-60	74	[Symbol]												
-62	76	[Symbol]	17	[Symbol]	(50/4")	- fine to medium grained 75' to 79'							0	
-64	78	[Symbol]	18	[Symbol]	(ref/4")								0	
-66														

COMPLETION DEPTH: 135.5 ft  
 DEPTH TO WATER: 11.0 ft  
 BACKFILLED WITH: Drill Hole Cuttings  
 DRILLING DATE: May 3, 1997

DRILLING METHOD: Wet Rotary  
 DRILLED BY: Pitcher Drilling  
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The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DPW-05**  
 DPW - Relocated Fries Avenue Force Main





ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOWCOUNT	LOCATION: N 4,021,941 E 4,207,599 SURFACE EL: 13.6 ft (rel. MLLW datum)	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	HNu, ppmv	
-68	82		19	ref/6"		Silty fine SAND (SM): very dense, light gray, with mica and shell fragments							0	
-70	84		20	(ref/6")			125	99	27	26			0	
-72	86													
-74	88													
-76	90													
-78	92		21	50/6"		Fine to medium SAND with silt (SP-SM): very dense, light brown to light gray, with mica and shells								
-80	94													
-82	96													
-84	98		22	50/5"										
-86	100													
-88	102													
-90	104		23	(80/11")		Lean CLAY (CL) with sand: very stiff to hard, gray	125	96	31		47	21		
-92	106													
-94	108													
-96	110													
-98	112		24	50/6"		Silty to Clayey fine SAND (SM-SC): very dense, light gray and brown, with mica and iron stained streaks  - interbedded clay (CL) layers 115' to 117'								
-100	114													
-102	116													
-104	118		25	(50/4")						28			0	
-106														

COMPLETION DEPTH: 135.5 ft  
 DEPTH TO WATER: 11.0 ft  
 BACKFILLED WITH: Drill Hole Cuttings  
 DRILLING DATE: May 3, 1997

DRILLING METHOD: Wet Rotary  
 DRILLED BY: Pitcher Drilling  
 LOGGED BY: CDPrentice  
 CHECKED BY: TWMcNeilan

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DPW-05**  
 DPW - Relocated Fries Avenue Force Main





ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLERS	SAMPLER BLOWCOUNT	LOCATION: N 4,021,941 E 4,207,599 SURFACE EL: 13.6 ft (rel. MLLW datum)	UNIT WET WEIGHT, pcf	UNIT DRY WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %	HNu, ppmv
						<b>MATERIAL DESCRIPTION</b>							
-108	122		26	(ref/ 6")		Silty to Clayey fine SAND (SM-SC): very dense, light gray and brown, with mica and iron stained streaks	121	93	30				
-110	124		27	(ref/ 6")									
-112	126		28	(ref/ 6")		Fine to medium SAND with silt (SP-SM): very dense, light gray, with mica and clay pockets	130	104	25				0
-114	128												
-116	130												
-118	132												
-120	134												
-122	136		29	ref/ 6"		Silty fine SAND (SM): very dense, brownish gray, with mica							
-124	138												
-126	140												
-128	142												
-130	144												
-132	146												
-134	148												
-136	150												
-138	152												
-140	154												
-142	156												
-144	158												
-146													

COMPLETION DEPTH: 135.5 ft  
 DEPTH TO WATER: 11.0 ft  
 BACKFILLED WITH: Drill Hole Cuttings  
 DRILLING DATE: May 3, 1997

DRILLING METHOD: Wet Rotary  
 DRILLED BY: Pitcher Drilling  
 LOGGED BY: CDPrentice  
 CHECKED BY: TWMcNeilan

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

**LOG OF DRILL HOLE NO. DPW-05**  
 DPW - Relocated Fries Avenue Force Main

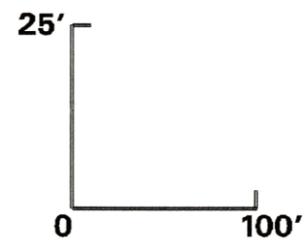
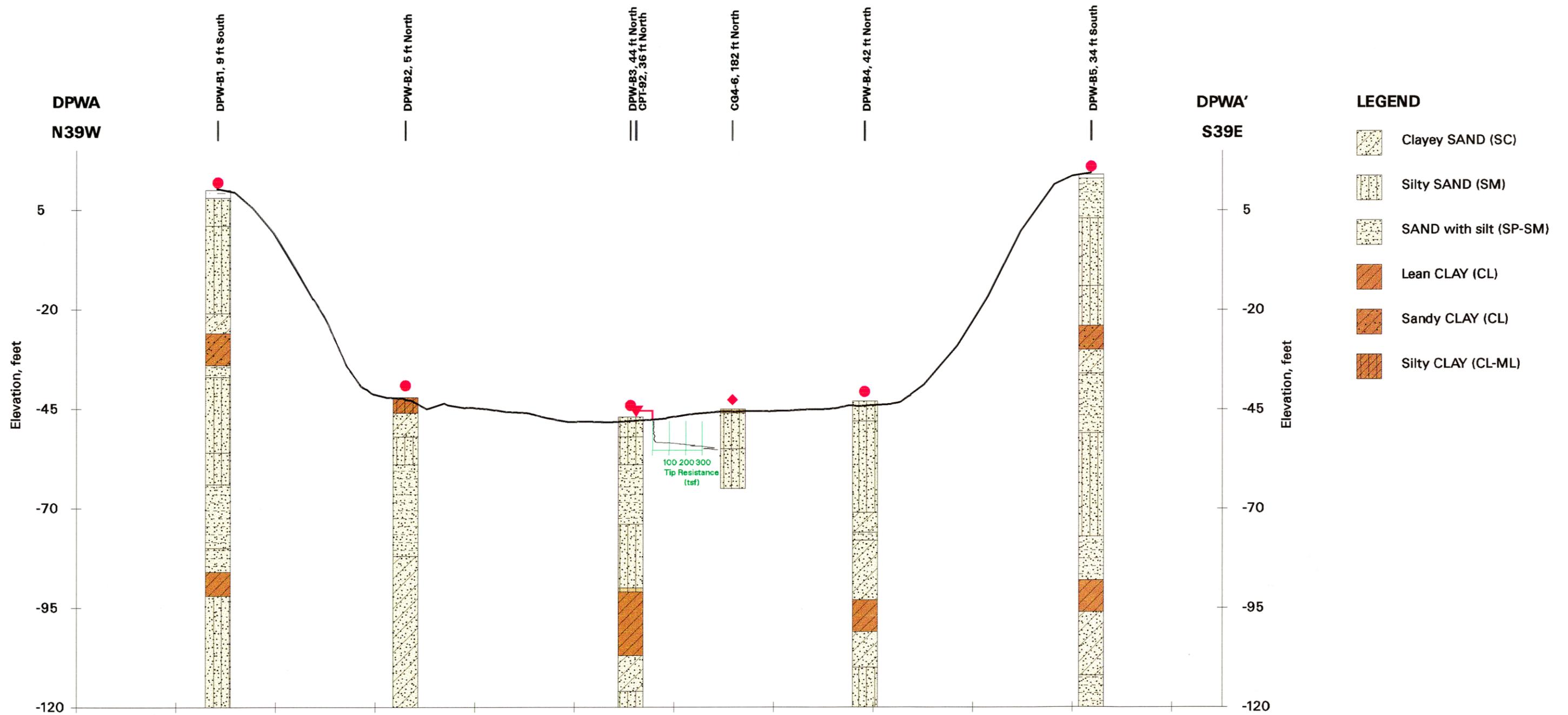




ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLES	BLOWCOUNT / REC"/DRIVE"	LOCATION: The drill hole location referencing local landmarks or coordinates SURFACE EL: Using local, MSL, MLLW or other datum	General Notes	
						<b>MATERIAL DESCRIPTION</b>		
-12	2		1		25	Well graded GRAVEL (GW)	<b>COARSE GRAINED</b>  1 Soil Texture Symbol 2 Sloped line in symbol column indicates transitional boundary 3 Samplers and sampler dimensions (unless otherwise noted in report text) are as follows: Symbol for: 1 SPT Sampler, driven 1 3/8" ID, 2" OD 2 CA Liner Sampler, driven 2 3/8" ID, 3" OD 3 CA Liner Sampler, disturbed 2 3/8" ID, 3" OD 4 Recovery Interval 5 Thin-walled Tube, pushed 2 7/8" ID, 3" OD 6 Bulk Bag Sample (from cuttings) 7 Hand Auger Sample 8 Rock Core Sample 9 No Sample Recovered 10 Vibracore Sample 11 Pitcher Sample	
-14	4		2		(25)	Poorly graded GRAVEL (GP)		
-16	6		3		(25)	Well graded SAND (SW)		
-18	8		4		(25)	Poorly graded SAND (SP)		
-20	10		5		(25)	Clayey SAND (SC)		
-22	12		6		18"/30"	Silty SAND (SM)		
-24	14		7			SAND with silt (SP-SM)		
-26	16		8			Fat CLAY (CH)		
-28	18		9			Lean CLAY (CL)		
-30	20		10		20"/24"	Silty CLAY (CL-ML)		
-32	22		11		(25)	Elastic SILT (MH)		
-34	24				30"/30"	SILT (ML)	<b>FINE GRAINED</b>  4 Sampler Driving Resistance Number of blows with 140 lb. hammer, falling 30-in. to drive sampler 1-ft. after seating sampler 6-in.; for example, Blows/ft Description 25 25 blows drove sampler 12" after initial 6" of seating 86/11" After driving sampler the initial 6" of seating, 36 blows drove sampler through the second 6" interval, and 50 blows drove the sampler 5" into the third interval 50/6" 50 blows drove sampler 6" after initial 6" of seating Ref/3" 50 blows drove sampler 3" during initial 6" seating interval  5 Blow counts for California Liner Sampler shown in ( )  6 Length of sample symbol approximates recovery length  7 Classification of Soils per ASTM D2487 or D2488  8 Geologic Formation noted in bold font at the top of interpreted interval  9 Strength Legend Q = Unconfined Compression u = Unconsolidated Undrained Triaxial t = Torvane p = Pocket Penetrometer m = Miniature Vane  10 Water Level Symbols Initial or perched water level Final ground water level Seepages encountered  11 Rock Quality Designation (RQD) is the sum of recovered core pieces greater than 4 inches divided by the length of the cored interval	
-36	26				30"/30"	Clayey SILT (ML/CL)		
-38	28				20"/24"	SANDSTONE		
-40	30					SILTSTONE		
-42	32					CLAYSTONE		
-44	34					MUDSTONE		
-46	36					GRANITE		
-48	38					SHALE		
						Paving and/or Base Materials		
								<b>ROCK</b>

KEY TO TERMS & SYMBOLS USED ON LOGS





Vertical Exaggeration = 4X  
CPT Tip Resistance: 1" = 600 tsf  
Exploration logs are projected a maximum of 250 feet into the section.

The boring and CPT interpretations presented are based on empirical correlations. Those correlations may represent a simplification of actual conditions encountered at the time of exploration at the explored location. Subsurface conditions may differ at other locations and with the passage of time.

**GEOLOGIC CROSS SECTION DPWA-DPWA'**  
DPW - Fries Avenue Force Main  
Port of Los Angeles



**APPENDIX A**  
**LABORATORY TEST RESULTS**



LOCAT'N	SAMPLE DESCRIPTION						UNDRAINED SHEAR STRENGTHS			DIRECT SHEAR		CORROSIVITY TESTS				PERMEABILITY (k), cm/sec	TEST LISTING		
																		DEPTH, ft	UWW pcf
DPW-01	Silty, fine to coarse SAND (SM)																		T
1																			
3.0	116	97	20																
DPW-01	Silty, fine to coarse SAND (SM)																		
2																			
5.0																			
DPW-01	Silty, fine to coarse SAND (SM)																		T
3																			
8.2	128	96	32																
DPW-01	Silty fine SAND (SM) to fine SAND with silt (SP-SM)																		T
4																			
11.5	127	100	27																
DPW-01	Fine SAND with silt (SP-SM)																		T, S
5																			
14.4	123	97	27	7															
DPW-01	Silty fine SAND (SM) to fine SAND with silt (SP-SM)																		T
7																			
25.6	122	95	28																
DPW-01	Sandy lean CLAY (CL)									0.9	37								T, A, S, D
9																			
35.7	137	118	17	77	36	19													
DPW-01	Silty fine SAND (SM)																		T
11																			
45.4	134	112	20																
DPW-01	Sandy lean CLAY (CL)																		T
13																			
55.3	128	106	21																
DPW-01	Silty fine SAND (SM)																		
16																			
70.0																			
DPW-01	Fine SAND with silt (SP-SM)																		
17																			
73.0																			
DPW-01	Fine SAND with silt (SP-SM)																		C
18																			
76.0	128	101	27																
DPW-01	Fine SAND with silt (SP-SM)																		T, k
18																			
76.5	127	100	27																3E-03
DPW-01	Fine SAND with silt (SP-SM)																		Co
19																			
79.0													144	8.02	493	3124			
DPW-01	Lean CLAY (CL)						2.8	1.7											T, A, S-H, U, TV
22																			
98.0	124	98	27	89	42	17													

**Classification Tests**  
 UWW = Unit Wet Weight  
 UDW = Unit Dry Weight  
 MC = Moisture Content  
 Fines = % passing #200 Sieve  
 LL = Liquid Limit  
 PI = Plasticity Index

**Compressive Strength Tests**  
 CU = Consolidated Undrained  
 QU = Unconfined Compression  
 UU = Unconsolidated Undrained  
 TV = Torvane  
 PP = Pocket Penetrometer  
 MV = Miniature Vane

**Corrosivity Tests**  
 R = Resistivity, ohm-cm, satur.  
 pH = pH  
 Cl = Chloride, ppm  
 SO4 = Sulfate, ppm

**Test Listing Abbreviations**  
 M = Moisture Content  
 T = Total & Dry Density  
 S = Grain Size Analysis  
 H = Hydrometer  
 A = Atterberg Limits  
 FC = Percent <#200 Sieve

D = Direct Shear  
 P = Compaction Test  
 CU = CU Triaxial  
 U = UU Triaxial  
 Co = Corrosivity Tests  
 k = Permeability Test

**SUMMARY OF LABORATORY TEST RESULTS**  
DPW - Relocated Fries Avenue Force Main













LOCAT'N	SAMPLE DESCRIPTION						UNDRAINED SHEAR STRENGTHS			DIRECT SHEAR		CORROSIVITY TESTS				PERMEABILITY (k), cm/sec	TEST LISTING
DEPTH, ft	UWW pcf	UDW pcf	MC %	FINES %	LL %	PI %											
DPW-05	Fine to medium SAND with silt (SP-SM)																T
1																	
2.0	123	107	15														
DPW-05	Fine to medium SAND with silt (SP-SM)																
2																	
5.0																	
DPW-05	Fine to medium SAND with silt (SP-SM)																T
3																	
8.0	112	95	18														
DPW-05	Silty, fine to coarse SAND (SM)																
4																	
11.0																	
DPW-05	Silty, fine to coarse SAND (SM)																T
5																	
14.0	127	107	19														
DPW-05	Silty, fine to coarse SAND (SM)																T
5																	
14.0	124	96	29														
DPW-05	Fine SAND (SP)																T, S
7																	
25.0	130	101	28	5													
DPW-05	Silty fine SAND (SM)									0.6	39						T, D
9																	
35.0	132	110	20														
DPW-05	Sandy lean CLAY (CL)									0.9	36						D
10																	
40.0	139	121	15														
DPW-05	Fine SAND with silt (SP-SM)																T
12																	
50.0	126	98	28														
DPW-05	Silty fine SAND (SM)																T
15																	
65.0	128	103	25														
DPW-05	Silty fine SAND (SM)																
17																	
75.0																	
DPW-05	Silty fine SAND (SM)																
18																	
78.0																	
DPW-05	Silty fine SAND (SM)											286	8.21	401	1371		Co
19																	
81.0																	
DPW-05	Silty fine SAND (SM)									0.1	38						D
20																	
84.0			27														

**Classification Tests**  
 UWW = Unit Wet Weight  
 UDW = Unit Dry Weight  
 MC = Moisture Content  
 Fines = % passing #200 Sieve  
 LL = Liquid Limit  
 PI = Plasticity Index

**Compressive Strength Tests**  
 CU = Consolidated Undrained  
 QU = Unconfined Compression  
 UU = Unconsolidated Undrained  
 TV = Torvane  
 PP = Pocket Penetrometer  
 MV = Miniature Vane

**Corrosivity Tests**  
 R = Resistivity, ohm-cm, satur.  
 pH = pH  
 Cl = Chloride, ppm  
 SO4 = Sulfate, ppm

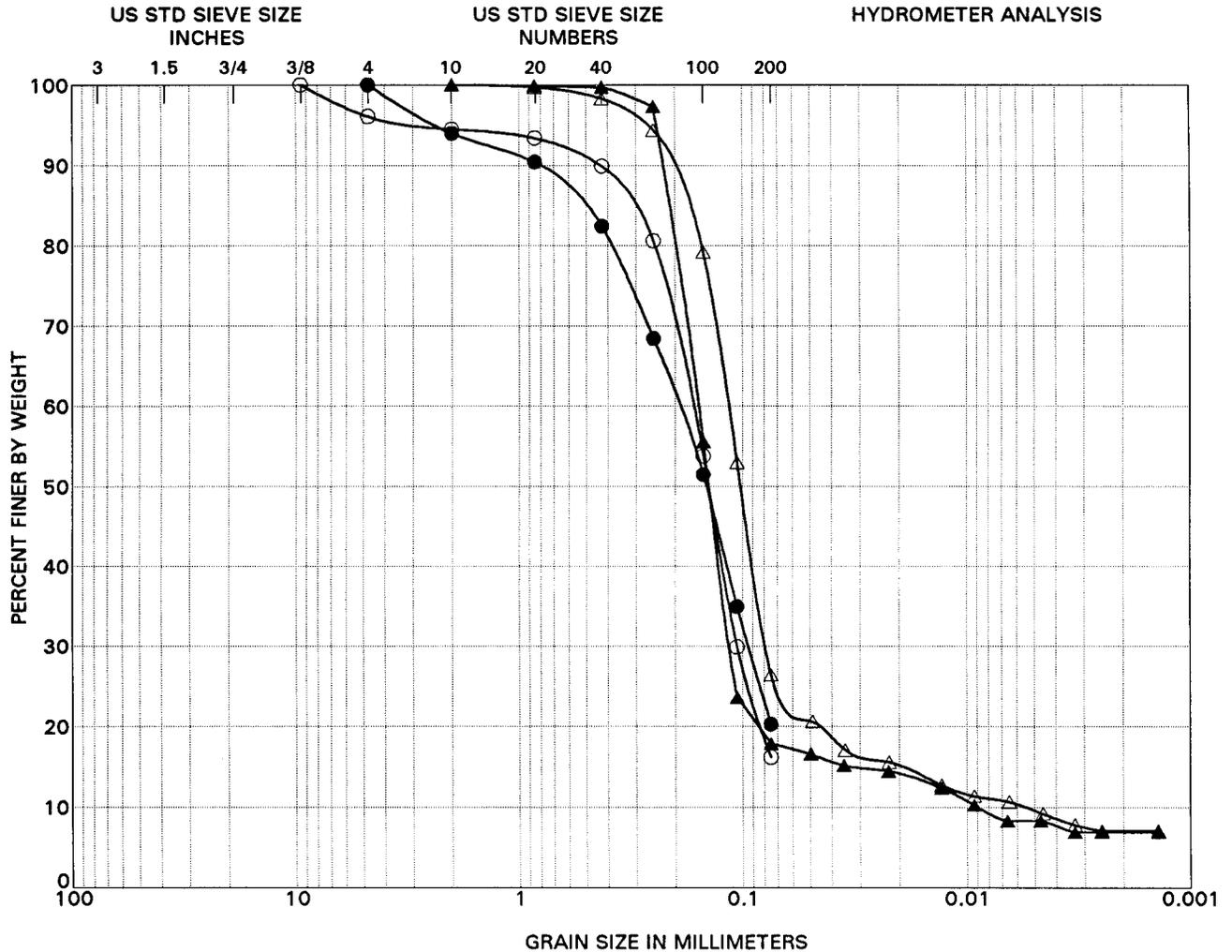
**Test Listing Abbreviations**  
 M = Moisture Content  
 T = Total & Dry Density  
 S = Grain Size Analysis  
 H = Hydrometer  
 A = Atterberg Limits  
 FC = Percent <#200 Sieve  
 D = Direct Shear  
 P = Compaction Test  
 CU = CU Triaxial  
 U = UU Triaxial  
 Co = Corrosivity Tests  
 k = Permeability Test

**SUMMARY OF LABORATORY TEST RESULTS**  
 DPW - Relocated Fries Avenue Force Main









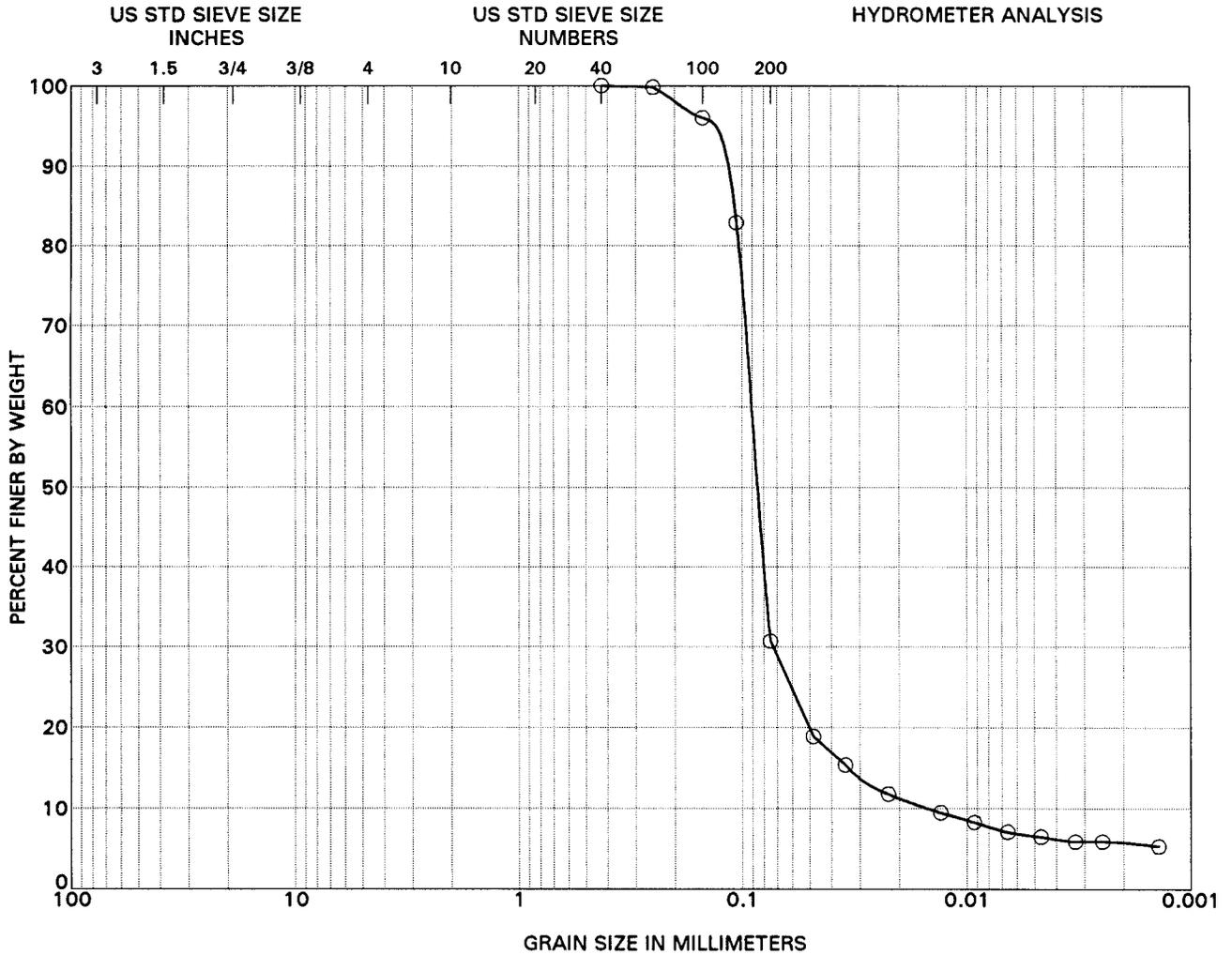
GRAVEL		SAND			SILT or CLAY
coarse	fine	coarse	medium	fine	

LEGEND	
(location)	(depth, ft)
○	DPW-03 3.0
●	DPW-03 7.2
△	DPW-03 61.1
▲	DPW-03 64.3

CLASSIFICATION	<u>C<sub>c</sub></u>	<u>C<sub>u</sub></u>
Silty fine SAND (SM)		
Silty fine SAND (SM)		
Silty to Clayey fine SAND (SM-SC)		
Silty to Clayey fine SAND (SM-SC)		

**GRAIN SIZE CURVES**  
 DPW - Relocated Fries Avenue Force Main





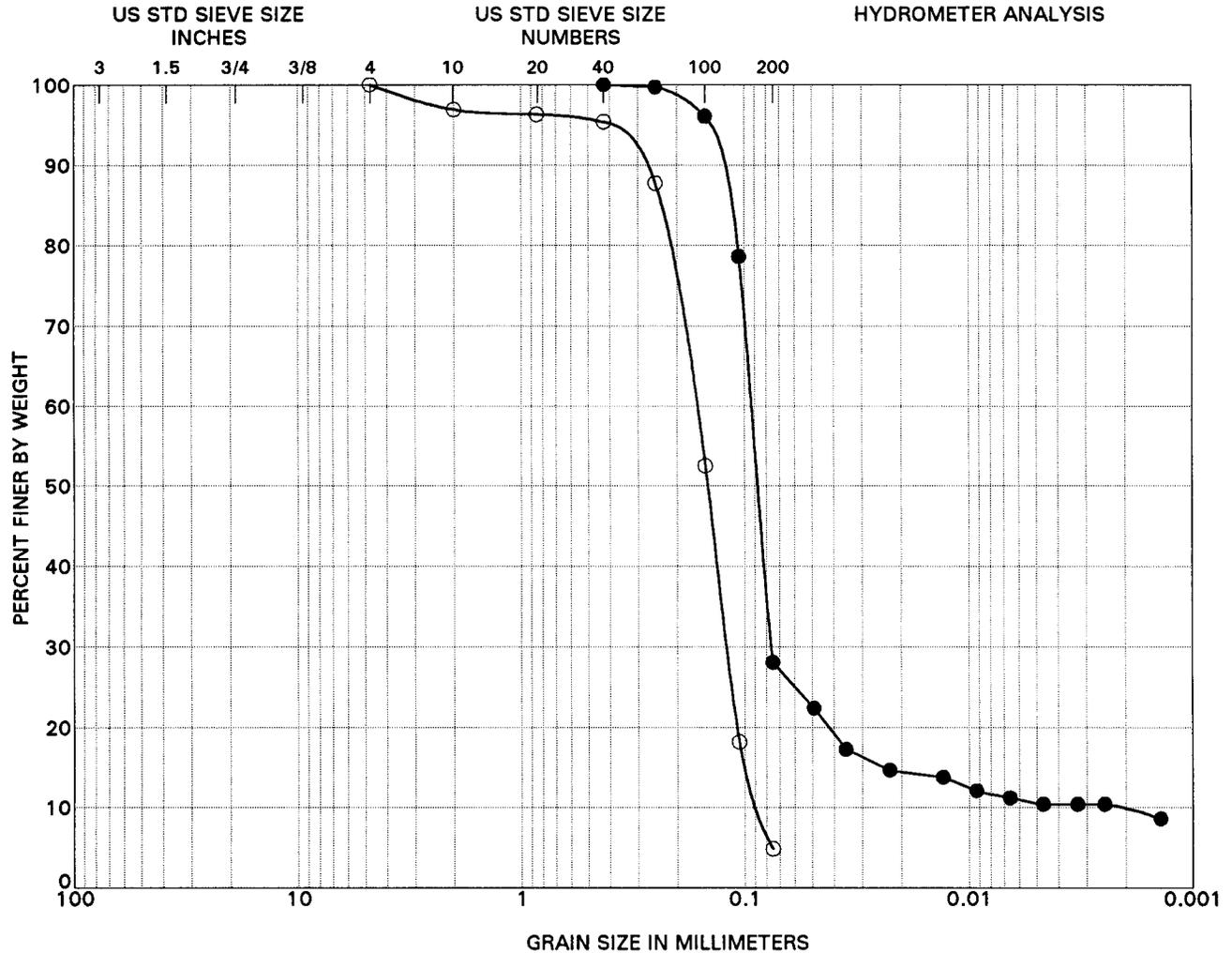
GRAVEL		SAND			SILT or CLAY
coarse	fine	coarse	medium	fine	

LEGEND	
(location)	(depth, ft)
○ DPW-04	63.3

CLASSIFICATION	C <sub>c</sub>	C <sub>u</sub>
Silty to Clayey fine SAND (SM-SC)		

**GRAIN SIZE CURVES**  
 DPW - Relocated Fries Avenue Force Main



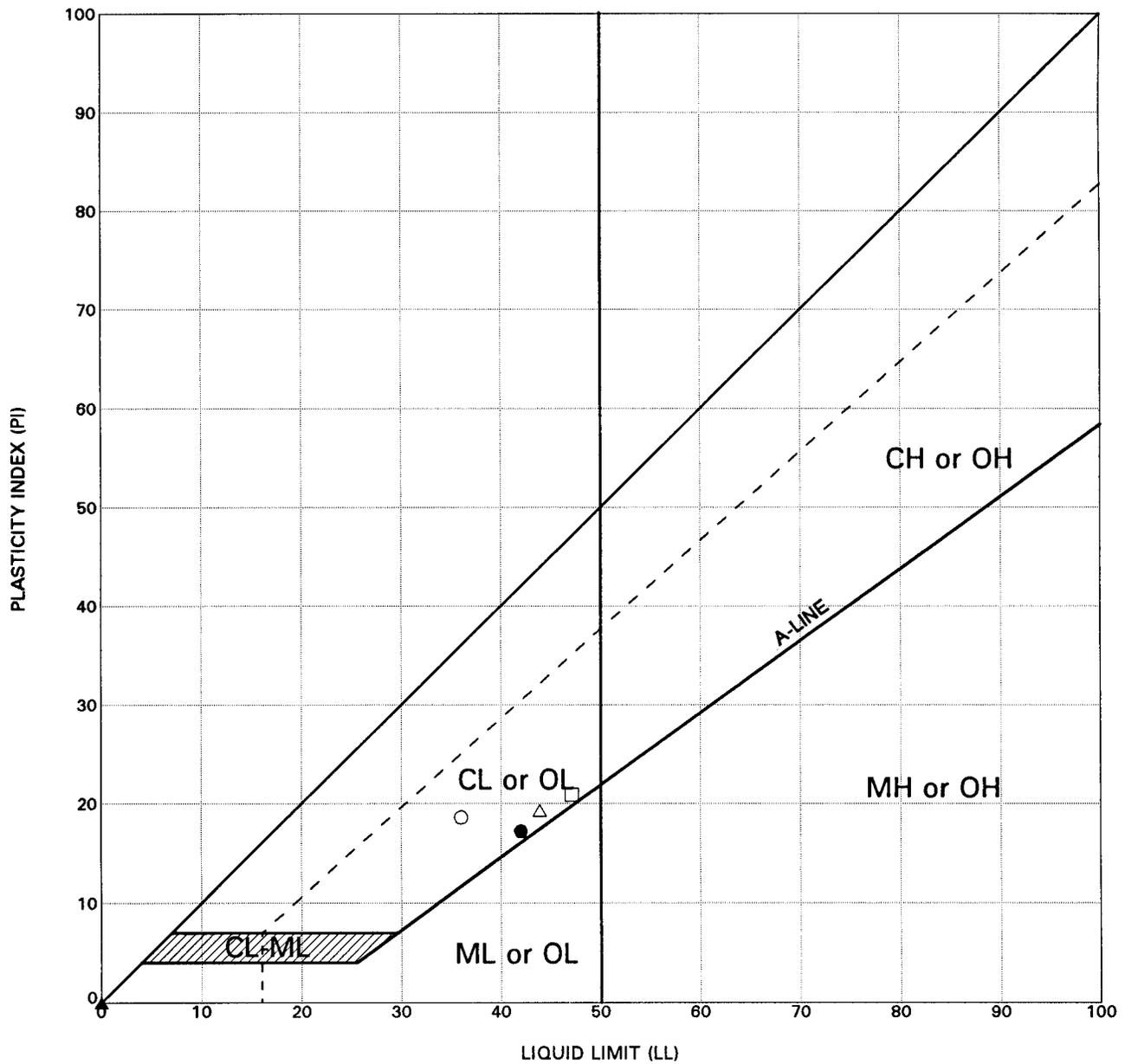


GRAVEL		SAND			SILT or CLAY
coarse	fine	coarse	medium	fine	

LEGEND	
(location)	(depth, ft)
○	DPW-05 25.0
●	DPW-05 117.0

CLASSIFICATION	C <sub>c</sub>	C <sub>u</sub>
Fine SAND (SP)	1.0	1.9
Silty to Clayey fine SAND (SM-SC)		

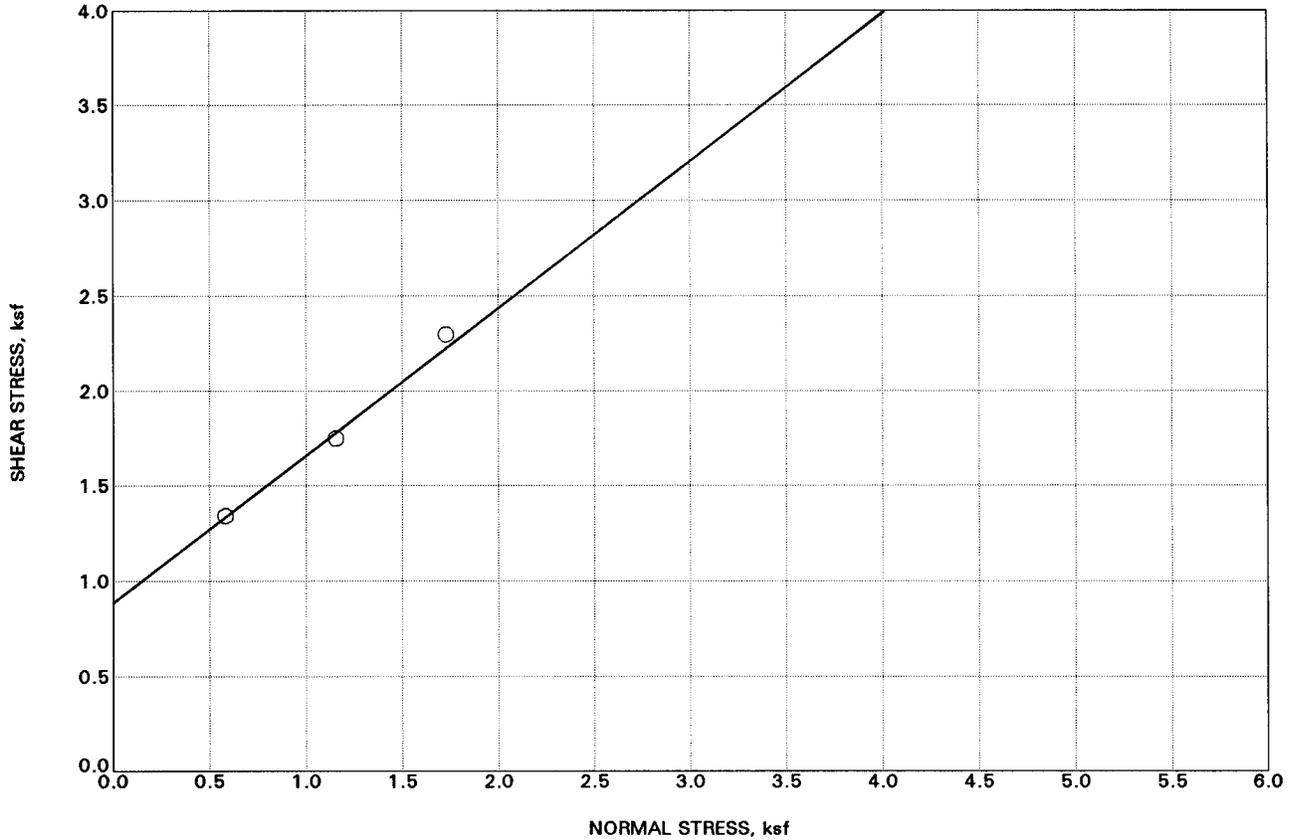
**GRAIN SIZE CURVES**  
 DPW - Relocated Fries Avenue Force Main



LEGEND		CLASSIFICATION	ATTERBERG LIMITS TEST RESULTS			
(location)	(depth, ft)		LIQUID LIMIT(LL)	PLASTIC LIMIT(PL)	PLASTICITY INDEX (PI)	
○	DPW-01	35.7	Sandy lean CLAY (CL)	36	17	19
●	DPW-01	98.0	Lean CLAY (CL)	42	25	17
△	DPW-03	55.7	Lean CLAY (CL)	44	25	19
▲	DPW-03	61.1	Silty to Clayey fine SAND (SM-SC)	NP	NP	NP
□	DPW-05	104.0	Sandy lean CLAY (CL)	47	26	21

**PLASTICITY CHART**  
 DPW - Relocated Fries Avenue Force Main





EFFECTIVE COHESION, ksf 0.90

EFFECTIVE ANGLE OF INTERNAL FRICTION, deg 37

LOCATION DPW-01

DEPTH, ft 35.7

MOISTURE CONTENT, % 17

UNIT DRY WEIGHT, pcf 118

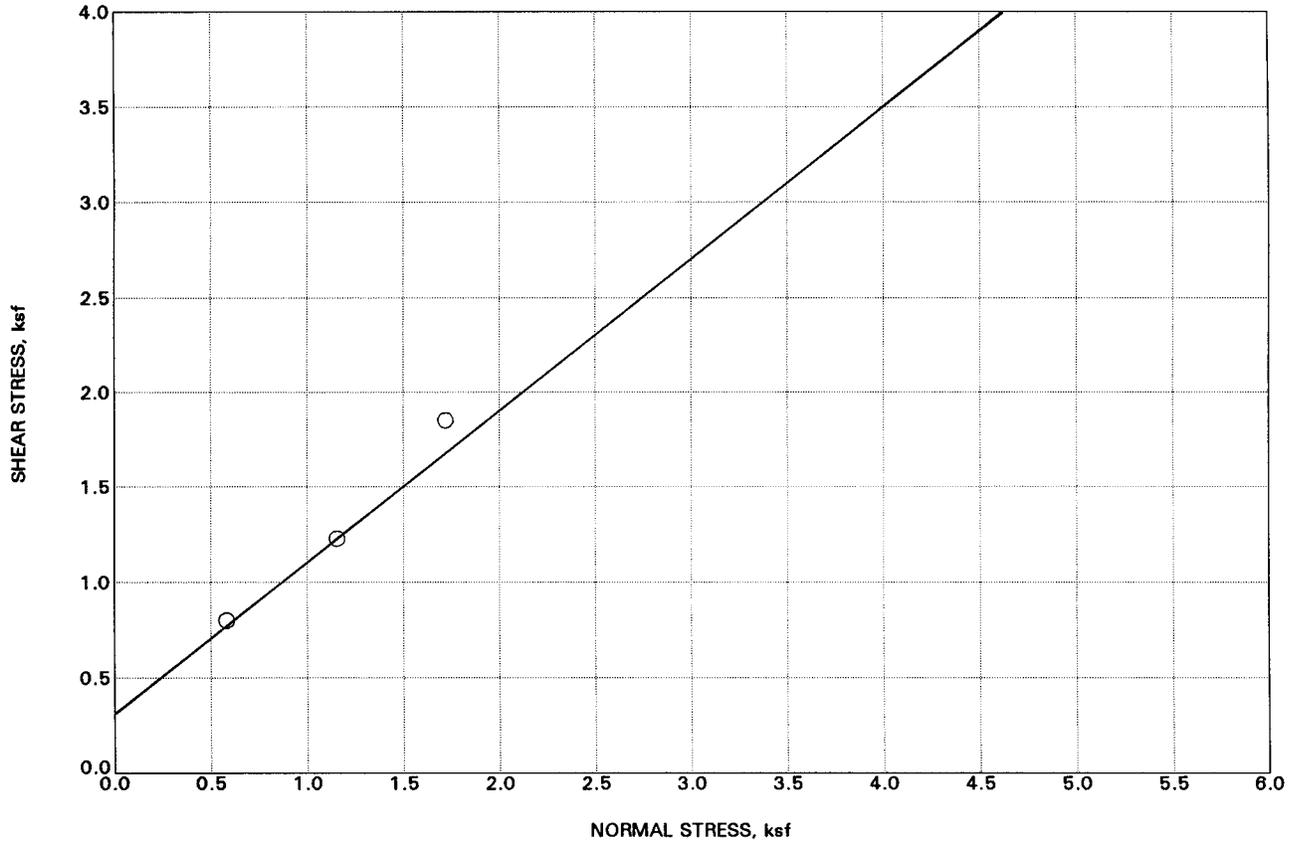
MATERIAL DESCRIPTION Sandy lean CLAY (CL)

SAMPLE CONDITION In Situ

**DIRECT SHEAR TEST RESULTS**  
DPW - Relocated Fries Avenue Force Main

PLATE A-4a





EFFECTIVE COHESION, ksf 0.30

EFFECTIVE ANGLE OF INTERNAL FRICTION, deg 38

LOCATION DPW-01

DEPTH, ft 115.0

MOISTURE CONTENT, % 23

UNIT DRY WEIGHT, pcf 105

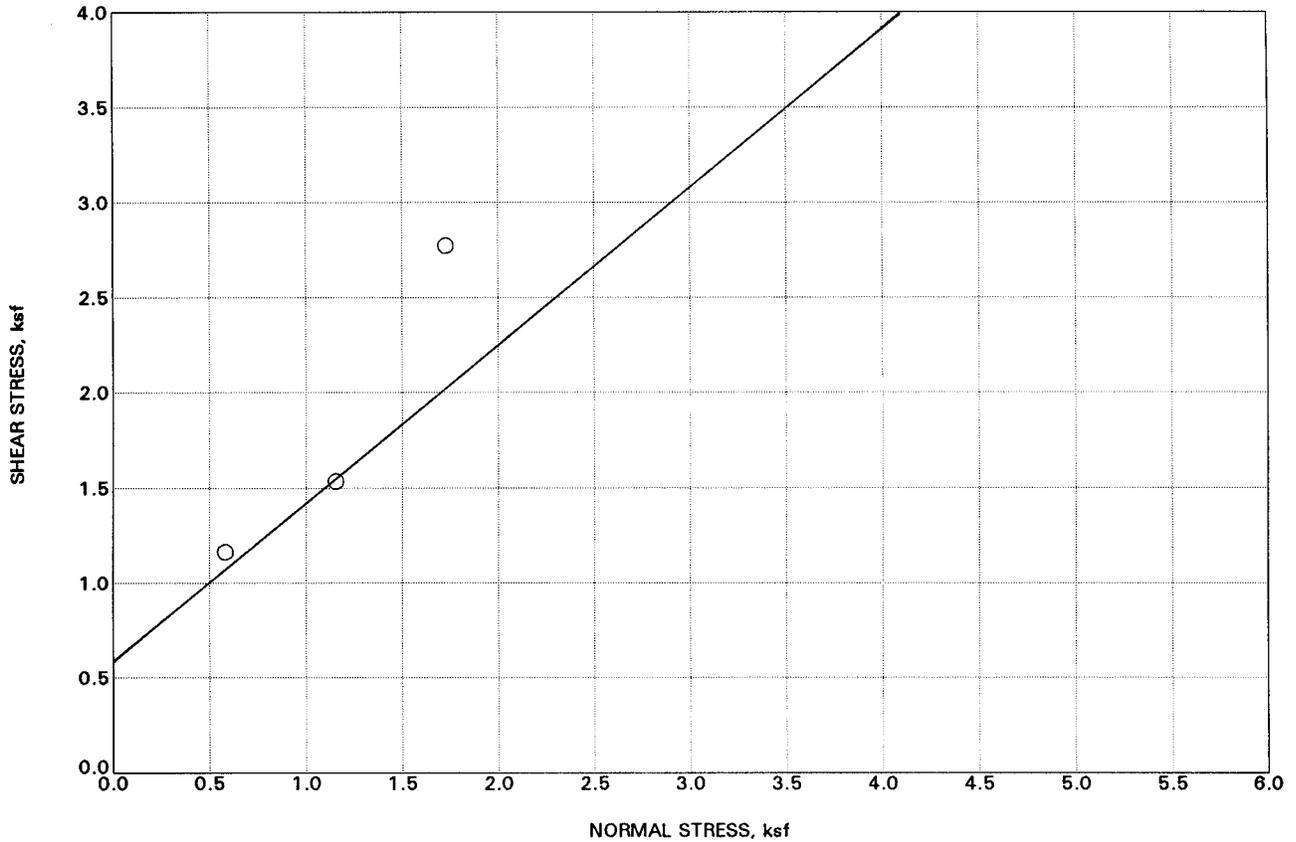
MATERIAL DESCRIPTION Silty fine SAND (SM)

SAMPLE CONDITION In Situ,

**DIRECT SHEAR TEST RESULTS**  
 DPW - Relocated Fries Avenue Force Main

PLATE A-4b





EFFECTIVE COHESION, ksf 0.60

EFFECTIVE ANGLE OF INTERNAL FRICTION, deg 39

LOCATION DPW-05

DEPTH, ft 35.0

MOISTURE CONTENT, % 20

UNIT DRY WEIGHT, pcf 110

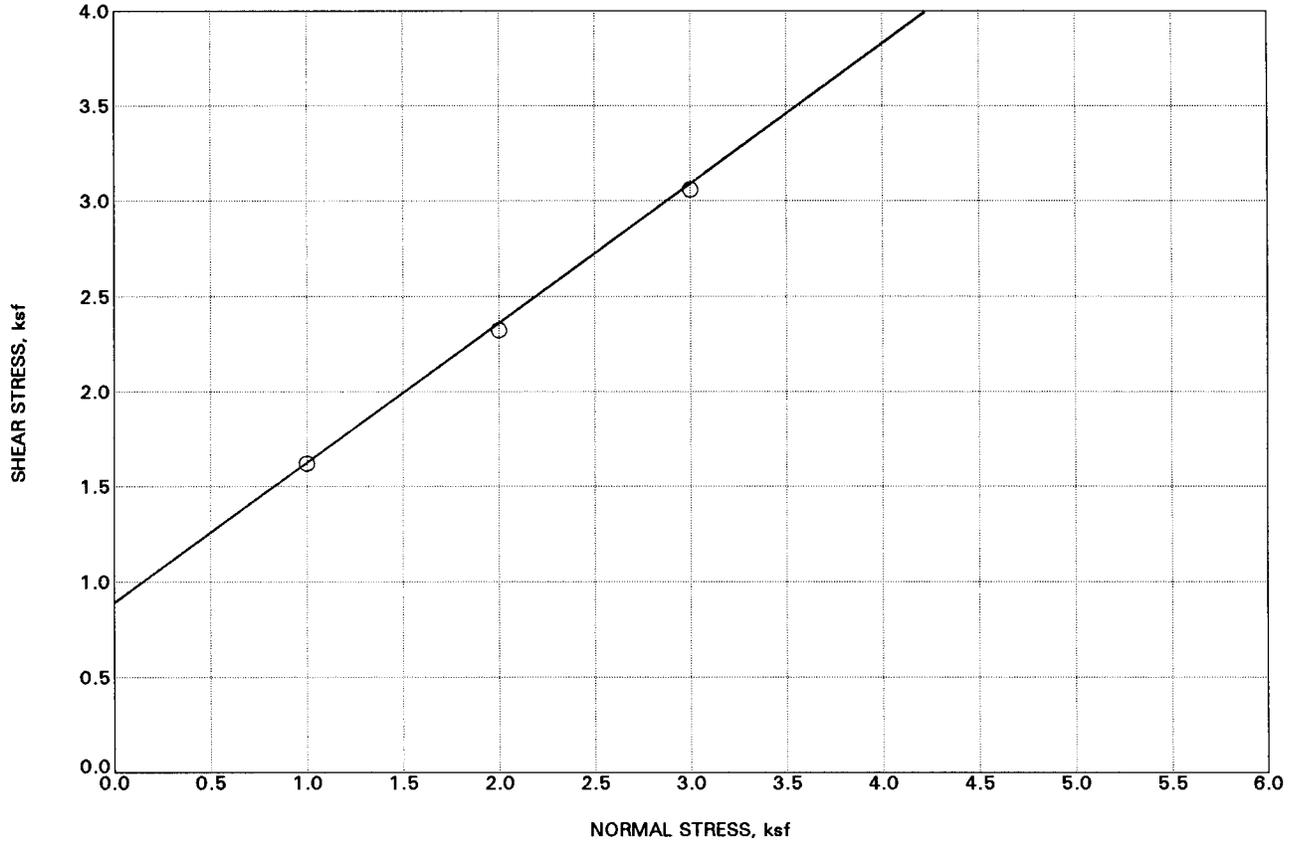
MATERIAL DESCRIPTION Silty fine SAND (SM)

SAMPLE CONDITION In Situ,

**DIRECT SHEAR TEST RESULTS**  
 DPW - Relocated Fries Avenue Force Main

PLATE A-4c





EFFECTIVE COHESION, ksf 0.9

EFFECTIVE ANGLE OF INTERNAL FRICTION, deg 36

LOCATION DPW-05

DEPTH, ft 40.0

MOISTURE CONTENT, % 15

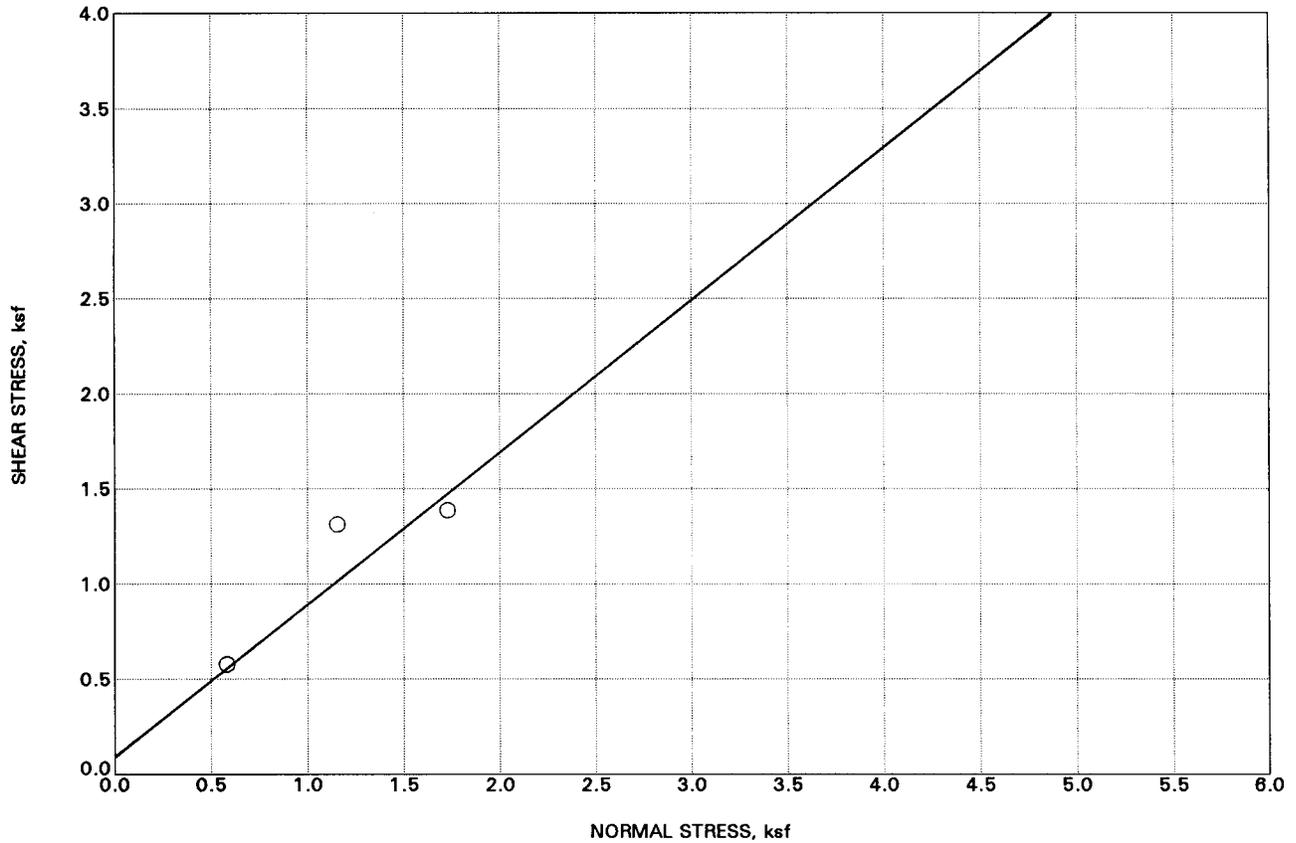
UNIT DRY WEIGHT, pcf 121

MATERIAL DESCRIPTION Sandy lean CLAY (CL)

SAMPLE CONDITION In Situ,

**DIRECT SHEAR TEST RESULTS**  
DPW - Relocated Fries Avenue Force Main





EFFECTIVE COHESION, ksf 0.10

EFFECTIVE ANGLE OF INTERNAL FRICTION, deg 38

LOCATION DPW-05

DEPTH, ft 84.0

MOISTURE CONTENT, % 27

UNIT DRY WEIGHT, pcf

MATERIAL DESCRIPTION

Silty fine SAND (SM)

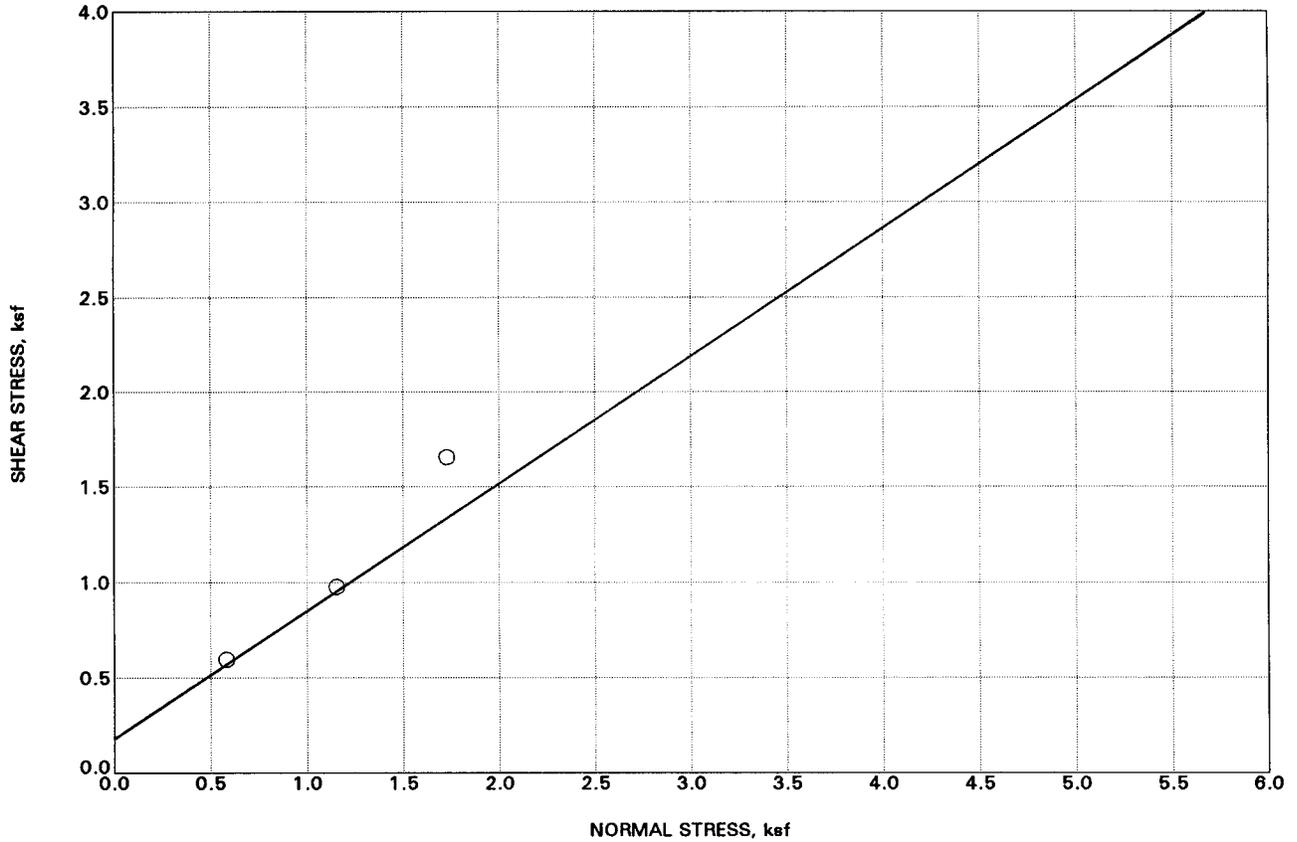
SAMPLE CONDITION

In Situ,

**DIRECT SHEAR TEST RESULTS**  
DPW - Relocated Fries Avenue Force Main

PLATE A-4e





EFFECTIVE COHESION, ksf 0.20

EFFECTIVE ANGLE OF INTERNAL FRICTION, deg 33

LOCATION DPW-05

DEPTH, ft 120.3

MOISTURE CONTENT, % 30

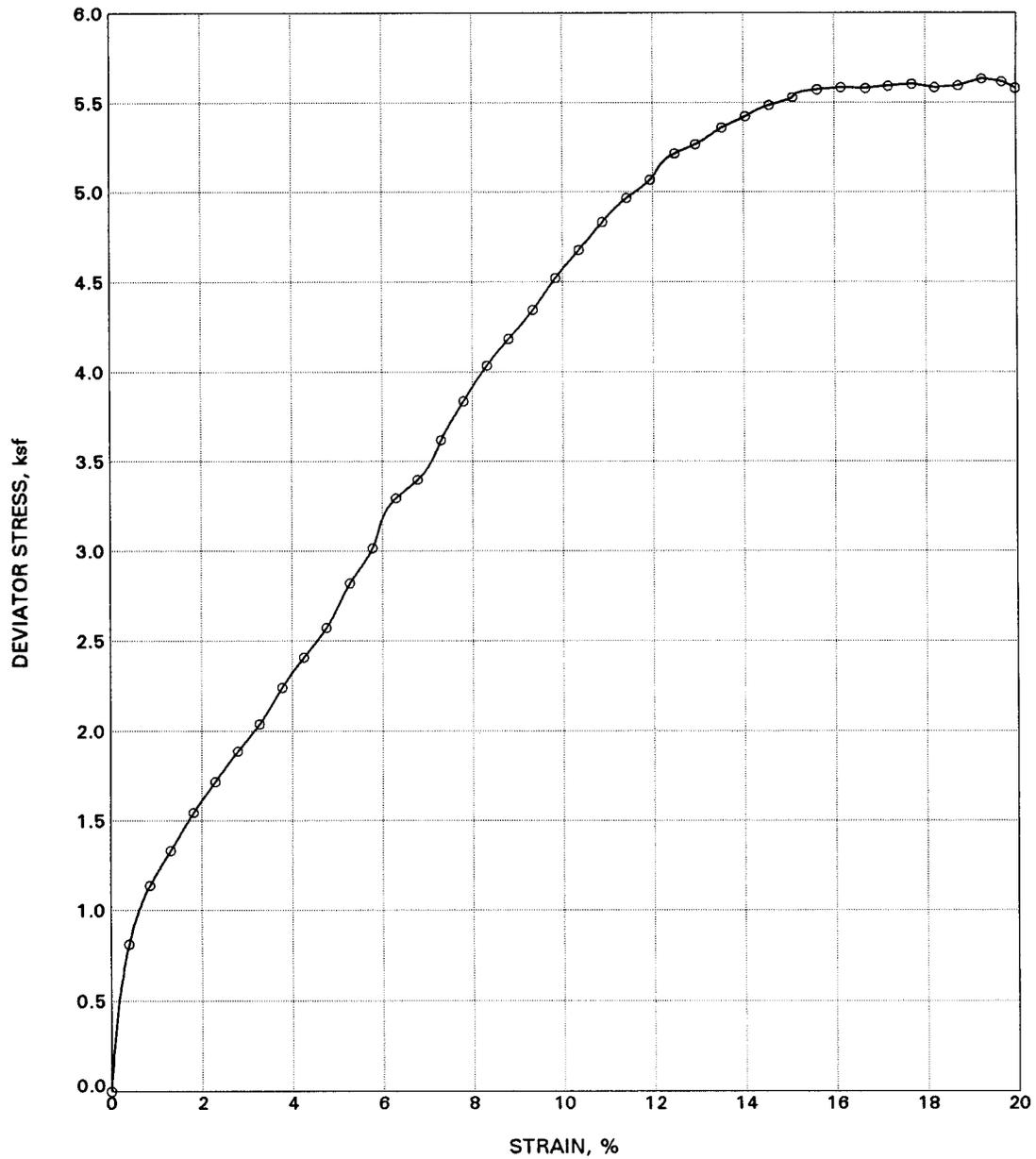
UNIT DRY WEIGHT, pcf 93

MATERIAL DESCRIPTION Silty to Clayey fine SAND (SM-SC)

SAMPLE CONDITION In Situ

**DIRECT SHEAR TEST RESULTS**  
 DPW - Relocated Fries Avenue Force Main



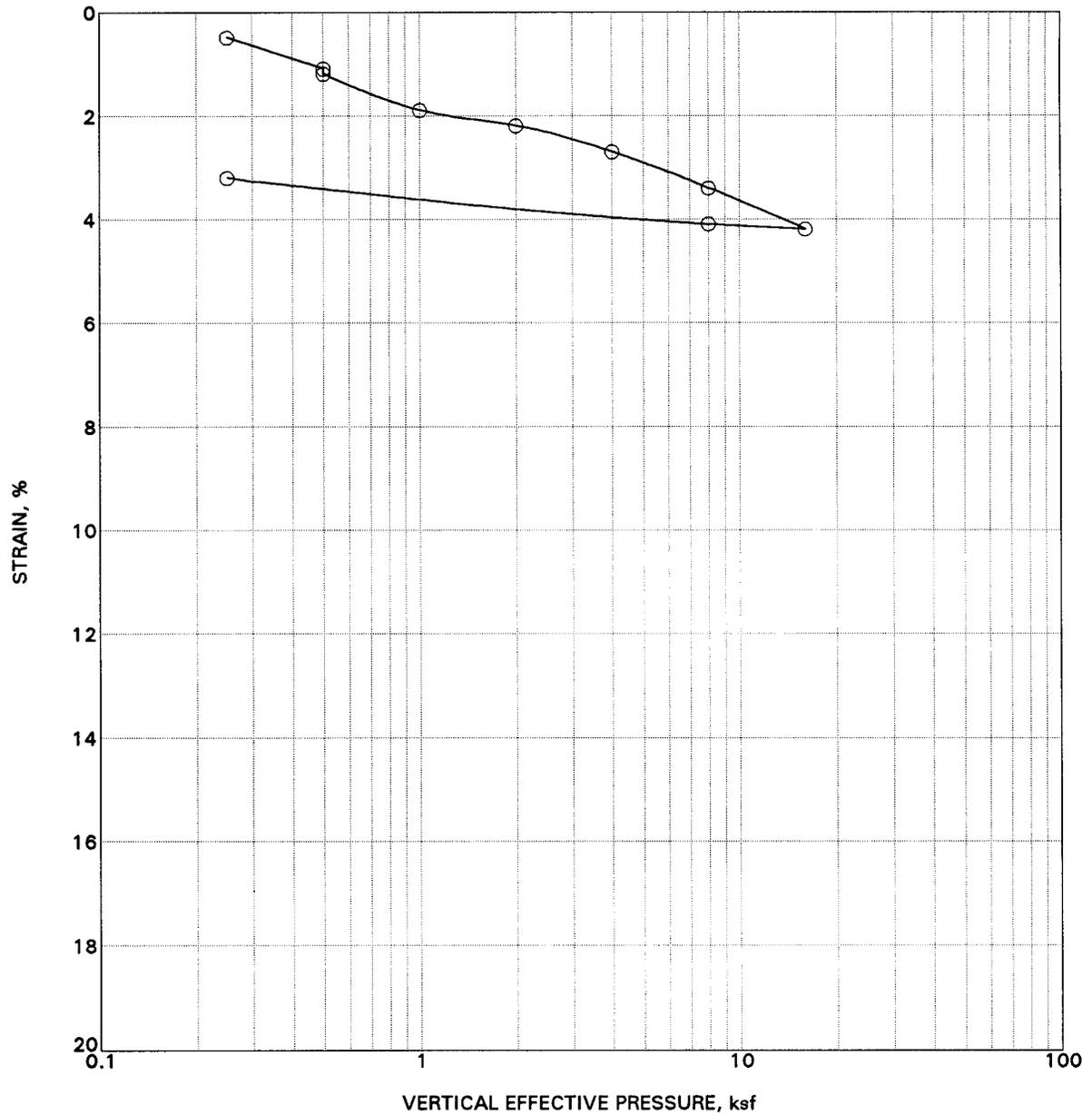


PEAK UNDRAINED SHEAR STRENGTH, ksf 2.8  
 CONFINING STRESS, ksf 9.81

LOCATION DPW-01  
 DEPTH, ft 98.0  
 MOISTURE CONTENT, % 27  
 UNIT DRY WEIGHT, pcf 98  
 MATERIAL DESCRIPTION Lean CLAY (CL)

**UNCONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS**  
 DPW - Relocated Fries Avenue Force Main

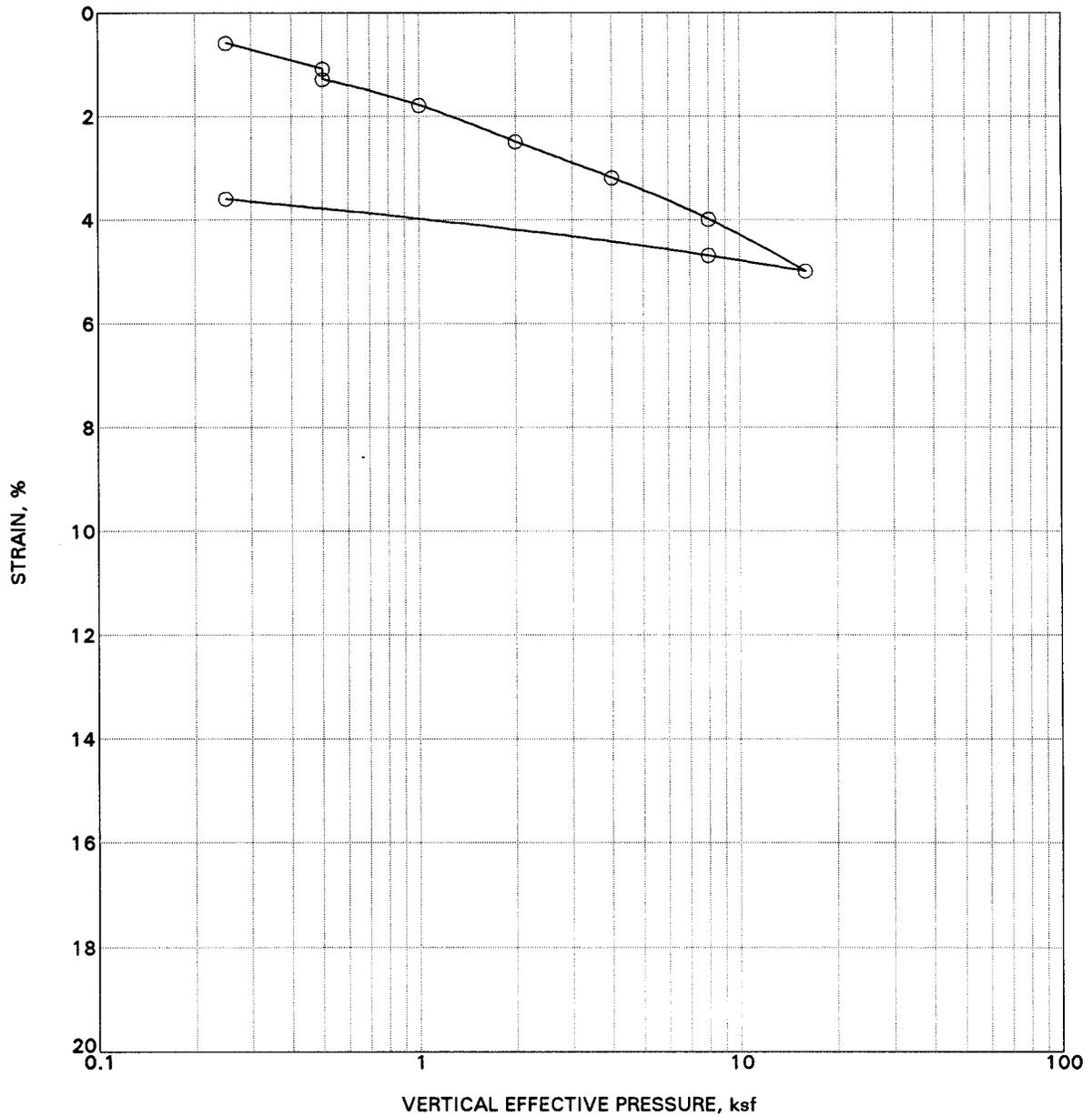




LOCATION	DPW-01
DEPTH, ft	76.0
INITIAL MOISTURE CONTENT, %	27
UNIT DRY WEIGHT, pcf	101
MATERIAL DESCRIPTION	Fine SAND with silt (SP-SM)
SAMPLE CONDITION	In Situ

**CONSOLIDATION TEST RESULTS**  
DPW - Relocated Fries Avenue Force Main



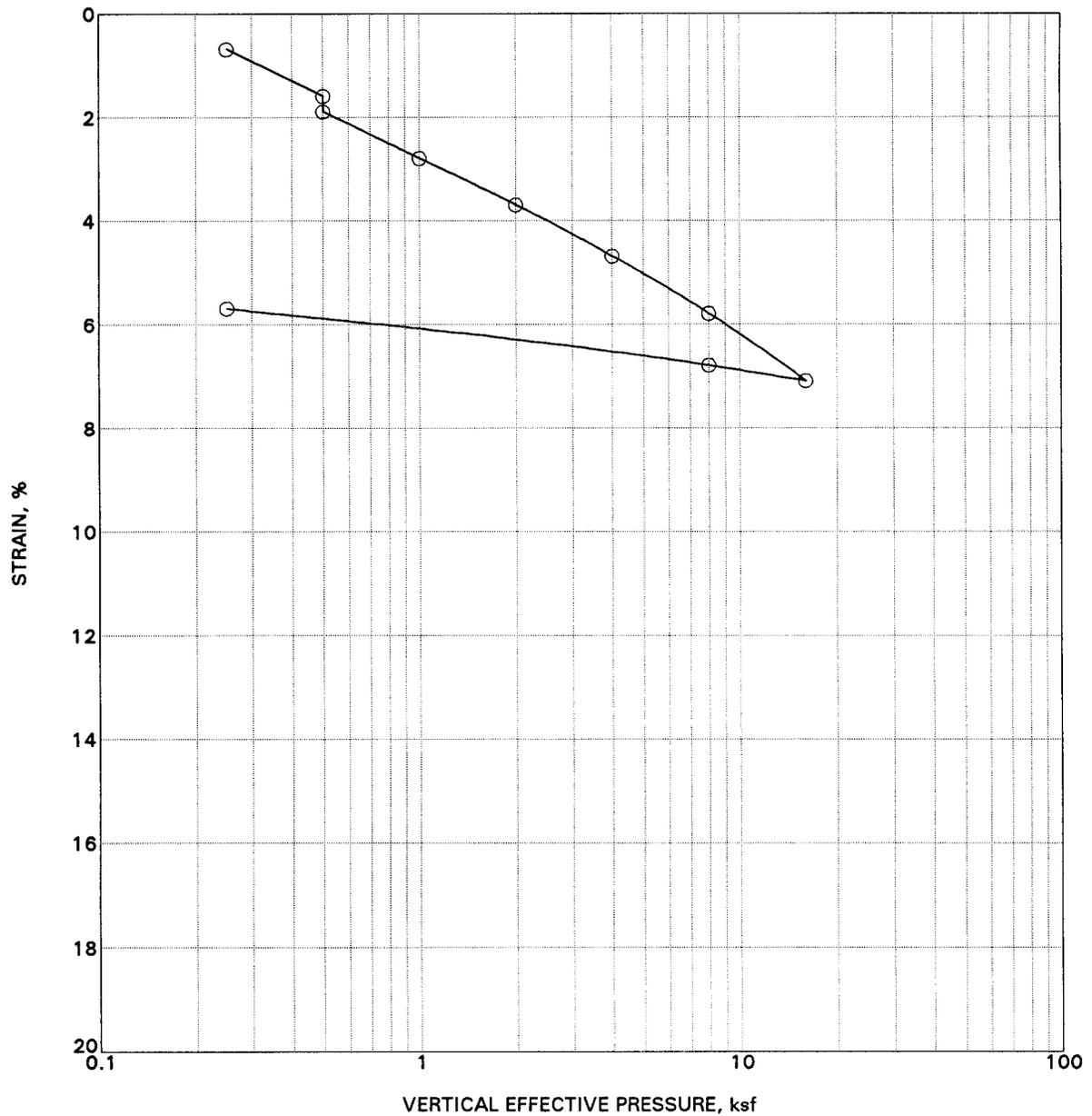


LOCATION  
DEPTH, ft  
INITIAL MOISTURE CONTENT, %  
UNIT DRY WEIGHT, pcf  
MATERIAL DESCRIPTION  
SAMPLE CONDITION

DPW-05  
84.2  
26  
99  
Silty fine SAND (SM)  
In Situ

**CONSOLIDATION TEST RESULTS**  
**DPW - Relocated Fries Avenue Force Main**

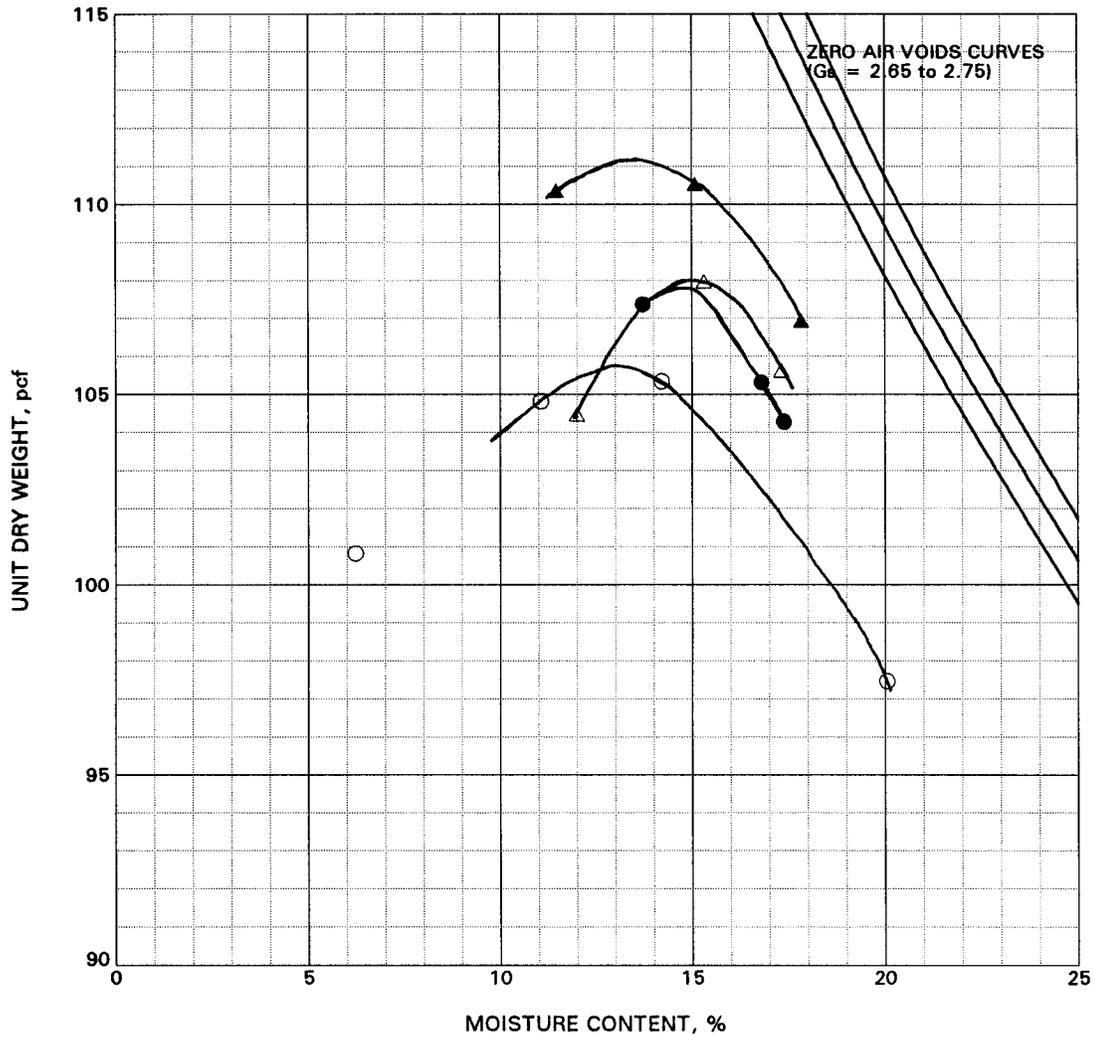




LOCATION	DPW-05
DEPTH, ft	120.3
INITIAL MOISTURE CONTENT, %	30
UNIT DRY WEIGHT, pcf	93
MATERIAL DESCRIPTION	Silty to Clayey fine SAND (SM-SC)
SAMPLE CONDITION	In Situ

**CONSOLIDATION TEST RESULTS**  
**DPW - Relocated Fries Avenue Force Main**



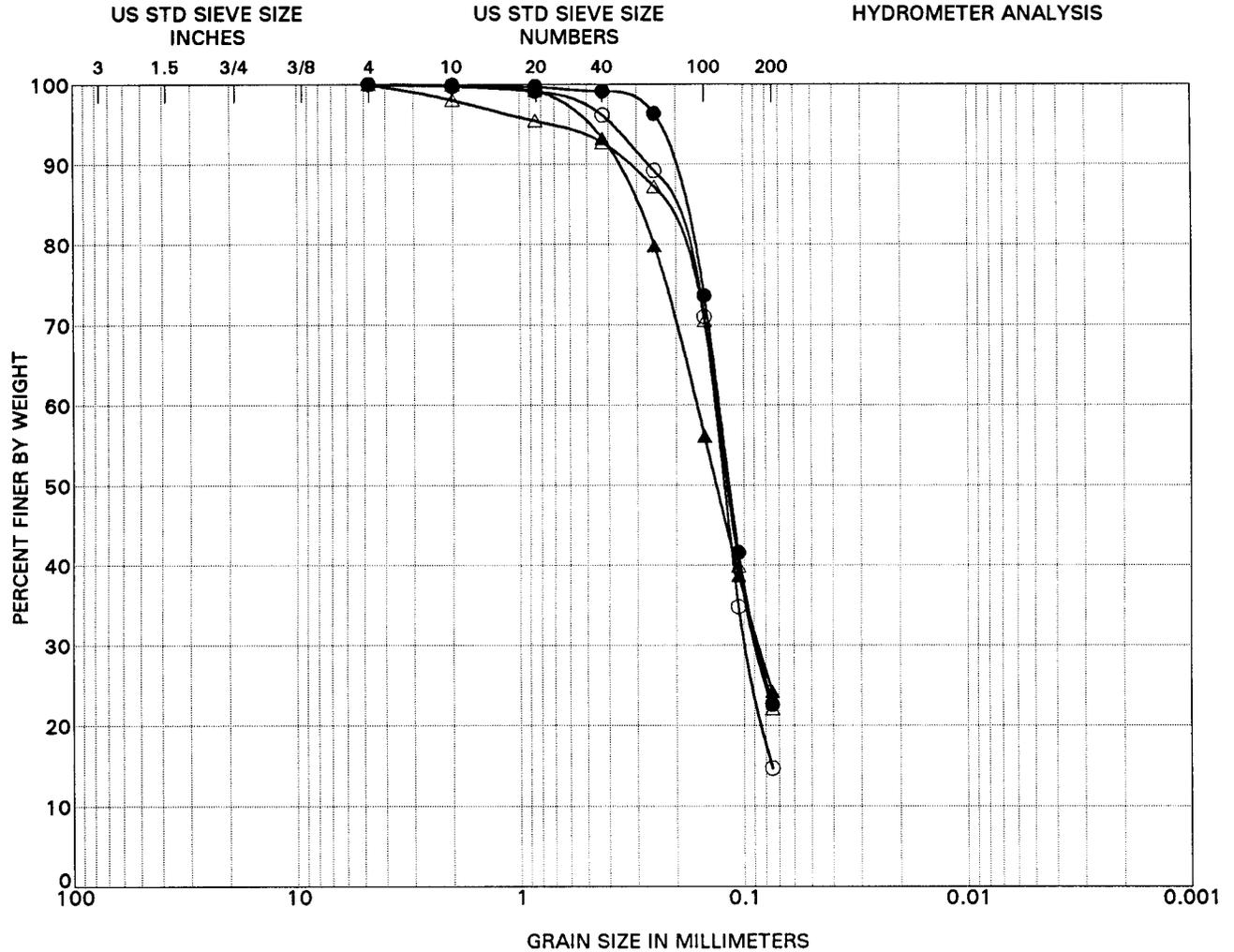


LEGEND		CLASSIFICATION	MAXIMUM UNIT DRY WEIGHT, pcf	OPTIMUM WATER CONTENT, %
(location)	(depth, ft)			
○	DPW-01 45 - 60	Silty fine SAND (SM)	106.0	13.0
●	DPW-01 105-121	Silty fine SAND (SM)	107.5	14.5
△	DPW-05 14 - 35	Silty fine SAND (SM)	109.0	15.0
▲	DPW-05 91-98 & 117-126	Silty to Clayey fine SAND (SM-SC)	111.0	13.5

Test Method: ASTM D1557

**COMPACTION TEST RESULTS**  
 DPW - Relocated Fries Avenue Force Main



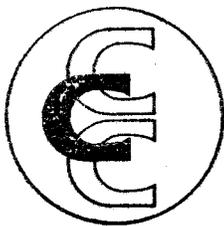


GRAVEL		SAND			SILT or CLAY
coarse	fine	coarse	medium	fine	

LEGEND		CLASSIFICATION	<u>C<sub>c</sub></u>	<u>C<sub>u</sub></u>
(location)	(depth, ft)			
○	DPW-01 45-60	Silty fine SAND (SM)		
●	DPW-01 105-121	Silty fine SAND (SM)		
△	DPW-05 14-35	Silty fine SAND (SM)		
▲	DPW-05 91-98 & 117-126	Silty to Clayey fine SAND (SM-SC)		

**GRAIN SIZE CURVES**  
 DPW - Relocated Fries Avenue Force Main





# ConCeCo Engineering, Inc.

May 19, 1997

2160 Winifred Street  
Mail: P.O. Box 115  
Simi Valley, CA 93062  
Job No.: 1S97049

Fugro West, Inc.  
Attention: Tom McNeilan:  
5855 Olivas Park Drive  
Ventura, CA 93003-7672

Subject: DPW - Relocated Fries Avenue Force Main  
Fugro Job No. 9642-1218

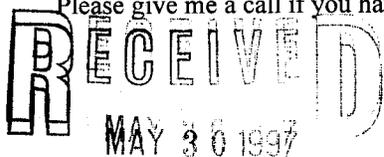
Dear Tom McNeilan:

Results of the soil testing you requested are listed below:

Sample No.	pH	<sup>1</sup> Resistivity (ohm-cm)		<sup>2</sup> Sulfate (mg/kg)	<sup>2</sup> Chloride (mg/kg)	Description
		As Rec'd	Saturated			
B1-19c-79	8.02	152	144	493	3124	Lt. Brown fine sand, moist
B1-26b-118	7.40	204	176	447	1166	Grayish brown fine sand, saturated
B3-7b-22	7.86	136	120	583	3488	Med. Brown fine sand, clean, near saturated.
B3-17a-67	7.82	104	98	770	4904	Grayish brown fine sand silt, moist to saturated
B5-19-81	8.21	340	286	401	1371	Gray fine sand, moist to saturated
B5-27-123	7.84	116	100	705	4482	Gray fine sand, moist

- NOTE: 1. Sulfate and chloride analyzed by EPA Method 300, "Chemical Analysis of Water and Waste". (EPA-600/4-79-020).  
 2. Resistivity determined by soil box per ASTM G57.  
 3. Ferrous metals require corrosion protection.  
 4. Concrete products require sulfate resistant cement.

Please give me a call if you have any questions.



Very truly yours,  
ConCeCo Engineering, Inc.

**FUGRO WEST, INC.**

*Roger J. Carlsen*  
Roger J. Carlsen, P.E.

RJC:ch

**PLATE A-9**

**APPENDIX B**  
**TOXSCAN ANALYTICAL REPORT**



June 2, 1997

ToxScan Number: T-14666

Fugro West, Inc.  
5855 Olivas Park Drive  
Ventura, CA 93003-7672

Attn: Tom McNeilan

PROJECT NAME: Force Main Crossing  
DATE SAMPLED: April 24 - May 14, 1997  
DATE RECEIVED: April 30 - May 14, 1997  
MATRIX: Pore Water, Sediment

Please find the enclosed test results for the parameters requested for analysis. The samples were analyzed within holding time using the following methods:

pH by EPA Method 150.1  
Total Dissolved Solids by EPA Method 160.1  
Total Recoverable Petroleum Hydrocarbons by EPA Method 1664 (SGT-HEM)  
Total Metals (Sb, Ba, Be, Cd, Cr, Co, Cu, Pb, Mo, Ni, Ag, Tl, V, Zn) by EPA Method 6020  
Total Arsenic by EPA Method 7060  
Total Mercury by EPA Method 7471  
Total Selenium by EPA Method 7741  
Pesticides and PCBs by EPA Method 8080  
Semivolatiles by EPA Method 8270  
Volatile Organic Compounds, including MTBE by EPA Method 8260  
Chloride and Sulfate by EPA Method 300.0

The samples were received intact and were handled with the proper chain-of-custody procedures. Appropriate QA/QC guidelines were employed during the analyses on a minimum of a 5% basis. QC results were within limits and are reported with or following the data for each analysis.

Volatile Organic Compounds analysis (including MTBE) was conducted by Advanced Technology Laboratory, Sulfate and Chloride analyses were conducted by Soil Control Laboratory, and pore water extraction was conducted by Moss Landing Marine Laboratories. All results are included in this report.

If you have any questions or require any additional information, please feel free to call.

Sincerely,

Philip D. Carpenter, Ph.D.  
President

Enclosures

*This cover letter is an integral part of the report.*

Client: Fugro West, Inc.  
Method: EPA Method(s) 150.1  
Date Completed: 5/15/97  
Matrix: Pore Water  
Units: units

ToxScan Number: T-14666

<b>Client</b>		<b>ToxScan</b>		<b>Sample</b>	<b>Reporting</b>
<b><u>Sample ID</u></b>	<b><u>Site ID</u></b>	<b><u>Lab ID</u></b>	<b><u>Analyte</u></b>	<b><u>Value</u></b>	<b><u>Limit</u></b>
	DPW-03	14666-33	pH	8.0	0.10

Client: Fugro West, Inc.  
Method: EPA Method(s) 160.1  
Date Completed: 5/16/97  
Matrix: Pore Water  
Units: mg/L

ToxScan Number: T-14666

<u>Client</u> <u>Sample ID</u>	<u>Site ID</u>	<u>ToxScan</u> <u>Lab ID</u>	<u>Analyte</u>	<u>Sample</u> <u>Value</u>	<u>Reporting</u> <u>Limit</u>
	DPW-03	14666-33	Total Dissolved Solids	42000	1.0

Client: Fugro West, Inc.  
 Method: EPA Method(s) 1664  
 Date Completed: 5/20/97  
 Matrix: Sediment  
 Units: mg/Kg

ToxScan Number: T-14666

<u>Client Sample ID</u>	<u>Site ID</u>	<u>ToxScan Lab ID</u>	<u>Analyte</u>	<u>Wet Wt. Sample Value</u>	<u>Dry Wt. Sample Value</u>	<u>Wet Reporting Limit</u>
7a	DPW-03, 22 ft	14666-03	TRPH-Gravimetric	ND	ND	100
15a	DPW-03, 61 ft	14666-05	TRPH-Gravimetric	ND	ND	100
8a	DPW-04A, 21 ft	14666-08	TRPH-Gravimetric	ND	ND	100
16a	DPW-04A, 63 ft	14666-11	TRPH-Gravimetric	ND	ND	100
	DPW-02 SA# 7a - 25.5'	14666-12	TRPH-Gravimetric	ND	ND	100
	DPW-02 SA# 14a - 70.5'	14666-15	TRPH-Gravimetric	ND	ND	100
1b	DPW-01 SA# 1b @ 2'	14666-16	TRPH-Gravimetric	ND	ND	100
2b	DPW-01 SA# 2b @ 5'	14666-17	TRPH-Gravimetric	ND	ND	100
4b	DPW-01 SA# 4b @ 11'	14666-18	TRPH-Gravimetric	ND	ND	100
5b	DPW-01 SA# 5b @ 14'	14666-19	TRPH-Gravimetric	ND	ND	100
18b	DPW-01 SA# 18b @ 76'	14666-21	TRPH-Gravimetric	ND	ND	100
25b	SA# 25b @ 115'	14666-23	TRPH-Gravimetric	ND	ND	100
1b	DPW-05 @ 2'	14666-24	TRPH-Gravimetric	ND	ND	100
2b	DPW-05 @ 5'	14666-25	TRPH-Gravimetric	ND	ND	100
3b	DPW05 @ 8'	14666-26	TRPH-Gravimetric	ND	ND	100
5b	DPW-05 @ 14'	14666-28	TRPH-Gravimetric	3300		100

Client: Fugro West, Inc.  
Method: EPA Method(s) 1664  
Date Completed: 5/20/97  
Matrix: Sediment  
Units: mg/Kg

ToxScan Number: T-14666

<u>Client</u> <u>Sample ID</u>	<u>Site ID</u>	<u>ToxScan</u> <u>Lab ID</u>	<u>Analyte</u>	<u>Wet Wt.</u> <u>Sample</u> <u>Value</u>	<u>Dry Wt.</u> <u>Sample</u> <u>Value</u>	<u>Wet</u> <u>Reporting</u> <u>Limit</u>
19b	DPW-05 @ 81'	14666-30	TRPH-Gravimetric	ND	ND	100
25c	DPW-05 @ 117'	14666-31	TRPH-Gravimetric	ND	ND	100

Client: Fugro West, Inc.  
 Method: EPA Method(s) 6020 7060 7471 7741  
 Date Completed: 5/28/97 - 6/2/97  
 Matrix: Sediment  
 Units: mg/kg

ToxScan Number: T-14666

Total Metals

<u>Client</u> <u>Sample ID</u>	<u>Site ID</u>	<u>ToxScan</u> <u>Lab ID</u>	<u>Analyte</u>	<u>Wet Wt.</u> <u>Sample</u> <u>Value</u>	<u>Wet</u> <u>Reporting</u> <u>Limit</u>
7a	DPW-03, 22 ft	14666-03	Antimony	ND	1.0
			Arsenic	1.1	0.10
			Barium	24	0.10
			Beryllium	0.17	0.10
			Cadmium	ND	0.10
			Chromium	7.7	0.10
			Cobalt	2.9	0.10
			Copper	3.7	0.10
			Lead	1.4	0.10
			Mercury	ND	0.020
			Molybdenum	0.12	0.10
			Nickel	4.4	0.10
			Selenium	ND	0.10
			Silver	ND	0.10
			Thallium	ND	0.10
			Vanadium	16	0.10
			Zinc	15	1.0

Client: Fugro West, Inc.  
 Method: EPA Method(s) 6020 7060 7471 7741  
 Date Completed: 5/28/97 - 6/2/97  
 Matrix: Sediment  
 Units: mg/kg

ToxScan Number: T-14666

Total Metals

Client	Site ID	ToxScan Lab ID	Analyte	Wet Wt. Sample Value	Wet Reporting Limit
15a	DPW-03, 61 ft	14666-05	Antimony	ND	1.0
			Arsenic	3.2	0.10
			Barium	35	0.10
			Beryllium	0.53	0.10
			Cadmium	0.24	0.10
			Chromium	29	0.10
			Cobalt	8.5	0.10
			Copper	18	0.10
			Lead	7.2	0.10
			Mercury	ND	0.020
			Molybdenum	1.9	0.10
			Nickel	19	0.10
			Selenium	0.18	0.10
			Silver	ND	0.10
			Thallium	0.29	0.10
			Vanadium	40	0.10
			Zinc	60	1.0

Client: Fugro West, Inc.  
 Method: EPA Method(s) 6020 7060 7471 7741  
 Date Completed: 5/28/97 - 6/2/97  
 Matrix: Sediment  
 Units: mg/kg

ToxScan Number: T-14666

Total Metals

<u>Client</u>	<u>Site ID</u>	<u>ToxScan</u>	<u>Wet Wt.</u>	<u>Wet</u>
<u>Sample ID</u>		<u>Lab ID</u>	<u>Sample</u>	<u>Reporting</u>
			<u>Value</u>	<u>Limit</u>
2b	DPW-01 SA# 2b @ 5'	14666-17	Antimony	ND 1.0
			Arsenic	1.2 0.10
			Barium	100 0.10
			Beryllium	0.20 0.10
			Cadmium	0.24 0.10
			Chromium	17 0.10
			Cobalt	3.9 0.10
			Copper	10 0.10
			Lead	3.8 0.10
			Mercury	0.030 0.020
			Molybdenum	0.29 0.10
			Nickel	12 0.10
			Selenium	ND 0.10
			Silver	ND 0.10
			Thallium	0.13 0.10
			Vanadium	29 0.10
			Zinc	28 1.0

Client: Fugro West, Inc.  
 Method: EPA Method(s) 6020 7060 7471 7741  
 Date Completed: 5/28/97 - 6/2/97  
 Matrix: Sediment  
 Units: mg/kg

ToxScan Number: T-14666

Total Metals

<u>Client</u> <u>Sample ID</u>	<u>Site ID</u>	<u>ToxScan</u> <u>Lab ID</u>	<u>Analyte</u>	<u>Wet Wt.</u> <u>Sample</u> <u>Value</u>	<u>Wet</u> <u>Reporting</u> <u>Limit</u>
19b	DPW-01 SA# 19b @ 79'	14666-22	Antimony	ND	1.0
			Arsenic	1.1	0.10
			Barium	33	0.10
			Beryllium	0.13	0.10
			Cadmium	ND	0.10
			Chromium	9.3	0.10
			Cobalt	3.7	0.10
			Copper	30	0.10
			Lead	2.3	0.10
			Mercury	ND	0.020
			Molybdenum	0.25	0.10
			Nickel	6.3	0.10
			Selenium	ND	0.10
			Silver	ND	0.10
			Thallium	ND	0.10
			Vanadium	19	0.10
			Zinc	35	1.0

Client: Fugro West, Inc.  
 Method: EPA Method(s) 6020 7060 7471 7741  
 Date Completed: 5/28/97 - 6/2/97  
 Matrix: Sediment  
 Units: mg/kg

ToxScan Number: T-14666

Total Metals

<u>Client</u>	<u>Site ID</u>	<u>ToxScan</u>	<u>Analyte</u>	<u>Wet Wt.</u>	<u>Dry Wt.</u>	<u>Wet</u>
<u>Sample ID</u>		<u>Lab ID</u>		<u>Sample</u>	<u>Sample</u>	<u>Reporting</u>
				<u>Value</u>	<u>Value</u>	<u>Limit</u>
1b	DPW-05 @ 2'	14666-24	Antimony	ND	ND	1.0
			Arsenic	1.0		0.10
			Barium	36		0.10
			Beryllium	0.13		0.10
			Cadmium	ND	ND	0.10
			Chromium	8.5		0.10
			Cobalt	2.7		0.10
			Copper	4.8		0.10
			Lead	3.2		0.10
			Mercury	0.059		0.020
			Molybdenum	0.11		0.10
			Nickel	5.7		0.10
			Selenium	ND	ND	0.10
			Silver	ND	ND	0.10
			Thallium	ND	ND	0.10
			Vanadium	15		0.10
			Zinc	19		1.0

Client: Fugro West, Inc.  
 Method: EPA Method(s) 6020 7060 7471 7741  
 Date Completed: 5/28/97 - 6/2/97  
 Matrix: Sediment  
 Units: mg/kg

ToxScan Number: T-14666

Total Metals

<u>Client</u>	<u>Site ID</u>	<u>ToxScan</u>	<u>Analyte</u>	<u>Wet Wt.</u>	<u>Dry Wt.</u>	<u>Wet</u>
<u>Sample ID</u>		<u>Lab ID</u>		<u>Sample</u>	<u>Sample</u>	<u>Reporting</u>
				<u>Value</u>	<u>Value</u>	<u>Limit</u>
3b	DPW05 @ 8'	14666-26	Antimony	ND	ND	1.0
			Arsenic	0.63		0.10
			Barium	32		0.10
			Beryllium	0.11		0.10
			Cadmium	ND	ND	0.10
			Chromium	8.4		0.10
			Cobalt	2.7		0.10
			Copper	3.4		0.10
			Lead	2.2		0.10
			Mercury	ND	ND	0.020
			Molybdenum	0.14		0.10
			Nickel	5.0		0.10
			Selenium	ND	ND	0.10
			Silver	ND	ND	0.10
			Thallium	ND	ND	0.10
			Vanadium	18		0.10
			Zinc	16		1.0

## EXPLANATION OF ACRONYMS FOR PROJECT # T-14666

The following is a glossary for acronyms that may be used in this report.

<u>Abbreviation</u>	<u>Definition</u>
LCS	Laboratory Control Spike
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable
ND	None Detected
REP	Replicate
RPD	Relative Percent Difference
SRM	Standard Reference Material
TOC	Total Organic Carbon

QC FOR PROJECT # T-14666

LABORATORY METHOD BLANK SUMMARY

Matrix: Water

<u>Analyte</u>	<u>Amount</u>	<u>Reporting Limit</u>	<u>Units</u>	<u>EPA Method Number</u>
Total Dissolved Solids	ND	1.0	mg/L	160.1

QC FOR PROJECT # T-14666

LABORATORY METHOD BLANK SUMMARY

Matrix: Sediment

<u>Analyte</u>	<u>Amount</u>	<u>Reporting Limit</u>	<u>Units</u>	<u>EPA Method Number</u>
TRPH-Gravimetric	ND	100	mg/Kg	1664

## QC FOR PROJECT # T-14666

### LABORATORY METHOD BLANK SUMMARY

Matrix: water

#### Total Metals

<u>Analyte</u>	<u>Amount</u>	<u>Reporting Limit mg/L</u>	<u>EPA Method Number</u>
Antimony	ND	1.0	6020
Arsenic	ND	0.10	7060
Barium	ND	0.10	6020
Beryllium	ND	0.10	6020
Cadmium	ND	0.10	6020
Chromium	ND	0.10	6020
Cobalt	ND	0.10	6020
Copper	ND	0.10	6020
Lead	ND	0.10	6020
Mercury	ND	0.020	7471
Molybdenum	ND	0.10	6020
Nickel	ND	0.10	6020
Selenium	ND	0.10	7741
Silver	ND	0.10	6020
Thallium	ND	0.10	6020
Vanadium	ND	0.10	6020
Zinc	ND	1.0	6020

**QC FOR PROJECT # 14666**

MATRIX SPIKE / MATRIX SPIKE DUPLICATE SUMMARY:

Matrix: Soil

<u>Analyte</u>	<u>Sample</u>	<u>Spike Amount ppm</u>	<u>MS % Rec</u>	<u>MSD % Rec</u>	<u>RPD</u>
Antimony	14701-02	2.9	49	41	18
Arsenic	14588-86	10	102	103	1
Barium	14701-02	14	a	a	NA
Beryllium	14701-02	0.29	108	104	4
Cadmium	14701-02	0.29	100	92	8
Chromium	14701-02	2.9	109	97	12
Cobalt	14701-02	2.9	105	98	7
Copper	14701-02	2.9	a	a	NA
Lead	14701-02	1.4	94	85	10
Mercury	14588-86	1.0	84	94	11
Molybdenum	14701-02	2.9	95	90	5
Nickel	14701-02	2.9	94	83	12
Selenium	14588-86	5.0	103	105	2
Silver	14701-02	0.29	83	45	59
Thallium	14701-02	2.9	67	67	0
Vanadium	14701-02	2.9	98	91	7
Zinc	14701-02	2.9	a	a	NA

a Sample value greater than 3X the spike and the spike is usually not reported.

QC FOR PROJECT # T-14666

Concentrations of the following are in mg/L

SRM SUMMARY:

Matrix: Water

<u>Analyte</u>	<u>Amount Found</u>	<u>Dilution</u>	<u>Corrected Value</u>	<u>SRM</u>	<u>Certified Value</u>	<u>% Recovery</u>
Total Dissolved Solids	600	1	600	ERA 9966	655	92

ERA 9966 = Environmental Resource Associates, WasteWatR Lot No. 9966

QC FOR PROJECT # T-14666

Concentrations of the following are in mg/kg

SRM SUMMARY:

Matrix: sediment

Total Metals

<u>Analyte</u>	<u>Amount Found</u>	<u>Dilution</u>	<u>Corrected Value</u>	<u>SRM</u>	<u>Certified Value</u>	<u>% Recovery</u>
Antimony	ND	20	ND	MESS-1	0.730	NA
Arsenic	0.194	50	9.69	MESS-1	10.6	91
Beryllium	0.0520	20	1.04	MESS-1	1.90	54
Cadmium	0.0267	20	0.533	MESS-1	0.590	90
Chromium	1.60	20	32.0	MESS-1	71.0	45
Cobalt	0.545	20	10.9	MESS-1	10.8	101
Copper	1.19	20	23.9	MESS-1	25.1	95
Lead	1.51	20	30.1	MESS-1	34.0	89
Mercury	0.0752	1	0.0752	BEST-1	0.0920	82
Nickel	1.28	20	25.6	MESS-1	29.5	87
Selenium	0.147	2	0.293	MESS-1	0.340	88
Vanadium	1.97	20	39.3	MESS-1	72.4	54
Zinc	8.70	20	174	MESS-1	191	91

BEST-1 = National Research Council Canada, marine sediment

MESS-1 = National Research Council Canada, marine sediment.

QC FOR PROJECT # T-14666

Concentrations of the following are in ug/L

SRM SUMMARY:

Matrix: water

Total Metals

<u>Analyte</u>	<u>Amount Found</u>	<u>Dilution</u>	<u>Corrected Value</u>	<u>SRM</u>	<u>Certified Value</u>	<u>% Recovery</u>
Antimony	69.8	1	69.8	ERA 9970	64.7	108
Arsenic	7.67	10	76.7	ERA 9970	76.5	100
Barium	380	1	380	ERA 9970	388	98
Beryllium	130	1	130	ERA 9970	124	105
Cadmium	95.1	1	95.1	ERA 9970	95.9	99
Chromium	230	1	230	ERA 9970	241	95
Cobalt	214	1	214	ERA 9970	212	101
Copper	115	1	115	ERA 9970	118	97
Lead	129	1	129	ERA 9970	132	98
Mercury	9.38	1	9.38	ERA 9970	10.6	89
Molybdenum	132	1	132	ERA 9970	129	102
Nickel	407	1	407	ERA 9970	406	100
Selenium	4.74	20	94.8	ERA 9970	97.1	98
Silver	62.5	1	62.5	ERA 9970	61.8	101
Thallium	62.8	1	62.8	ERA 9970	64.7	97
Vanadium	185	1	185	ERA 9970	189	98
Zinc	212	1	212	ERA 9970	221	96

ERA 9970 = Environmental Resource Associates, WasteWatR Lot No. 9970

Client: Fugro West, Inc.  
Method: EPA Method 8270  
Date Extracted: 05/08/97  
Date Analyzed: 05/20/97  
Matrix: Sediment  
Units: ug/Kg (ppb)

ToxScan Number: T-14666

ToxScan Lab ID: Method Blank

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
Phenol	ND	330
Bis(2-chloroethyl)ether	ND	330
2-Chlorophenol	ND	330
1,3-Dichlorobenzene	ND	330
1,4-Dichlorobenzene	ND	330
Benzyl alcohol	ND	800
1,2-Dichlorobenzene	ND	330
2-Methylphenol	ND	330
Bis(2-chloroisopropyl)ether	ND	800
Hexachloroethane	ND	330
N-Nitrosodipropylamine	ND	800
4-Methylphenol	ND	330
Nitrobenzene	ND	330
Isophorone	ND	330
2-Nitrophenol	ND	330
2,4-Dimethylphenol	ND	330
Bis(2-chloroethoxy)methane	ND	800
2,4-Dichlorophenol	ND	330
1,2,4-Trichlorobenzene	ND	330
Naphthalene	ND	330
4-Chloroaniline	ND	800
Hexachlorobutadiene	ND	330
4-Chloro-3-methylphenol	ND	330
2-Methylnaphthalene	ND	330
Hexachlorocyclopentadiene	ND	330
2,4,6-Trichlorophenol	ND	330
2,4,5-Trichlorophenol	ND	330
2-Chloronaphthalene	ND	330
2-Nitroaniline	ND	800
Acenaphthylene	ND	330
Dimethylphtalate	ND	330
2,6-Dinitrotoluene	ND	330
Acenaphthene	ND	330
3-Nitroaniline	ND	800

ND = Not Detected

Client: Fugro West, Inc.  
Method: EPA Method 8270  
Date Extracted: 05/08/97  
Date Analyzed: 05/20/97  
Matrix: Sediment  
Units: ug/Kg (ppb)

ToxScan Number: T-14666

ToxScan Lab ID: Method Blank

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
2,4-Dinitrophenol	ND	800
Dibenzofuran	ND	330
2,4-Dinitrotoluene	ND	330
4-Nitrophenol	ND	800
Fluorene	ND	330
4-Chlorophenyl phenyl ether	ND	330
Diethylphthalate	ND	330
4-Nitroaniline	ND	800
4,6-Dinitro-2-methylphenol	ND	800
N-Nitrosodiphenylamine	ND	330
4-Bromophenyl phenyl ether	ND	330
Hexachlorobenzene	ND	330
Pentachlorophenol	ND	800
Phenanthrene	ND	330
Anthracene	ND	330
Carbazole	ND	330
Di-n-butylphthalate	ND	330
Fluoranthene	ND	330
Pyrene	ND	330
Butyl benzyl phthalate	ND	330
Benzo(a)anthracene	ND	330
Chrysene	ND	330
3,3'-Dichlorobenzidine	ND	330
Bis(2-ethylhexyl)phthalate	ND	330
Di-n-octylphthalate	ND	330
Benzo(b)fluoranthene	ND	330
Benzo(k)fluoranthene	ND	330
Benzo(a)pyrene	ND	330
Indeno(1,2,3-cd)pyrene	ND	330
Dibenzo(a,h)anthracene	ND	330
Benzo(g,h,i)perylene	ND	330

ND = Not Detected

Client: Fugro West, Inc.  
Method: EPA Method 8270  
Date Extracted: 05/08/97  
Date Analyzed: 05/20/97  
Matrix: Sediment  
Units: ug/Kg (ppb) as received

ToxScan Number: T-14666

Client Sample ID: 7a  
Station ID: DPW-03, 22 ft  
ToxScan Lab ID: 14666-03A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
Phenol	ND	330
Bis(2-chloroethyl)ether	ND	330
2-Chlorophenol	ND	330
1,3-Dichlorobenzene	ND	330
1,4-Dichlorobenzene	ND	330
Benzyl alcohol	ND	800
1,2-Dichlorobenzene	ND	330
2-Methylphenol	ND	330
Bis(2-chloroisopropyl)ether	ND	800
Hexachloroethane	ND	330
N-Nitrosodipropylamine	ND	800
4-Methylphenol	ND	330
Nitrobenzene	ND	330
Isophorone	ND	330
2-Nitrophenol	ND	330
2,4-Dimethylphenol	ND	330
Bis(2-chloroethoxy)methane	ND	800
2,4-Dichlorophenol	ND	330
1,2,4-Trichlorobenzene	ND	330
Naphthalene	ND	330
4-Chloroaniline	ND	800
Hexachlorobutadiene	ND	330
4-Chloro-3-methylphenol	ND	330
2-Methylnaphthalene	ND	330
Hexachlorocyclopentadiene	ND	330
2,4,6-Trichlorophenol	ND	330
2,4,5-Trichlorophenol	ND	330
2-Chloronaphthalene	ND	330
2-Nitroaniline	ND	800
Acenaphthylene	ND	330
Dimethylphthalate	ND	330
2,6-Dinitrotoluene	ND	330
Acenaphthene	ND	330
3-Nitroaniline	ND	800

ND = Not Detected

Client: Fugro West, Inc.  
Method: EPA Method 8270  
Date Extracted: 05/08/97  
Date Analyzed: 05/20/97  
Matrix: Sediment  
Units: ug/Kg (ppb) as received

ToxScan Number: T-14666

Client Sample ID: 7a  
Station ID: DPW-03, 22 ft  
ToxScan Lab ID: 14666-03A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
2,4-Dinitrophenol	ND	800
Dibenzofuran	ND	330
2,4-Dinitrotoluene	ND	330
4-Nitrophenol	ND	800
Fluorene	ND	330
4-Chlorophenyl phenyl ether	ND	330
Diethylphthalate	ND	330
4-Nitroaniline	ND	800
4,6-Dinitro-2-methylphenol	ND	800
N-Nitrosodiphenylamine	ND	330
4-Bromophenyl phenyl ether	ND	330
Hexachlorobenzene	ND	330
Pentachlorophenol	ND	800
Phenanthrene	ND	330
Anthracene	ND	330
Carbazole	ND	330
Di-n-butylphthalate	ND	330
Fluoranthene	ND	330
Pyrene	ND	330
Butyl benzyl phthalate	ND	330
Benzo(a)anthracene	ND	330
Chrysene	ND	330
3,3'-Dichlorobenzidine	ND	330
Bis(2-ethylhexyl)phthalate	ND	330
Di-n-octylphthalate	ND	330
Benzo(b)fluoranthene	ND	330
Benzo(k)fluoranthene	ND	330
Benzo(a)pyrene	ND	330
Indeno(1,2,3-cd)pyrene	ND	330
Dibenzo(a,h)anthracene	ND	330
Benzo(g,h,i)perylene	ND	330

ND = Not Detected

Client: Fugro West, Inc.  
Method: EPA Method 8270  
Date Extracted: 05/08/97  
Date Analyzed: 05/20/97  
Matrix: Sediment  
Units: ug/Kg (ppb) as received

ToxScan Number: T-14666

Client Sample ID: 4b  
Station ID: DPW-01 SA# 4b@11'  
ToxScan Lab ID: 14666-18A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
Phenol	ND	330
Bis(2-chloroethyl)ether	ND	330
2-Chlorophenol	ND	330
1,3-Dichlorobenzene	ND	330
1,4-Dichlorobenzene	ND	330
Benzyl alcohol	ND	800
1,2-Dichlorobenzene	ND	330
2-Methylphenol	ND	330
Bis(2-chloroisopropyl)ether	ND	800
Hexachloroethane	ND	330
N-Nitrosodipropylamine	ND	800
4-Methylphenol	ND	330
Nitrobenzene	ND	330
Isophorone	ND	330
2-Nitrophenol	ND	330
2,4-Dimethylphenol	ND	330
Bis(2-chloroethoxy)methane	ND	800
2,4-Dichlorophenol	ND	330
1,2,4-Trichlorobenzene	ND	330
Naphthalene	ND	330
4-Chloroaniline	ND	800
Hexachlorobutadiene	ND	330
4-Chloro-3-methylphenol	ND	330
2-Methylnaphthalene	ND	330
Hexachlorocyclopentadiene	ND	330
2,4,6-Trichlorophenol	ND	330
2,4,5-Trichlorophenol	ND	330
2-Chloronaphthalene	ND	330
2-Nitroaniline	ND	800
Acenaphthylene	ND	330
Dimethylphthalate	ND	330
2,6-Dinitrotoluene	ND	330
Acenaphthene	ND	330
3-Nitroaniline	ND	800

ND = Not Detected

Client: Fugro West, Inc.  
Method: EPA Method 8270  
Date Extracted: 05/08/97  
Date Analyzed: 05/20/97  
Matrix: Sediment  
Units: ug/Kg (ppb) as received

ToxScan Number: T-14666

Client Sample ID: 4b  
Station ID: DPW-01 SA# 4b@11'  
ToxScan Lab ID: 14666-18A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
2,4-Dinitrophenol	ND	800
Dibenzofuran	ND	330
2,4-Dinitrotoluene	ND	330
4-Nitrophenol	ND	800
Fluorene	ND	330
4-Chlorophenyl phenyl ether	ND	660 *
Diethylphthalate	15000	330
4-Nitroaniline	ND	800
4,6-Dinitro-2-methylphenol	ND	800
N-Nitrosodiphenylamine	ND	330
4-Bromophenyl phenyl ether	ND	330
Hexachlorobenzene	ND	330
Pentachlorophenol	ND	800
Phenanthrene	ND	330
Anthracene	ND	330
Carbazole	ND	330
Di-n-butylphthalate	ND	330
Fluoranthene	ND	330
Pyrene	ND	330
Butyl benzyl phthalate	ND	330
Benzo(a)anthracene	ND	330
Chrysene	ND	330
3,3'-Dichlorobenzidine	ND	330
Bis(2-ethylhexyl)phthalate	ND	330
Di-n-octylphthalate	ND	330
Benzo(b)fluoranthene	ND	330
Benzo(k)fluoranthene	ND	330
Benzo(a)pyrene	ND	330
Indeno(1,2,3-cd)pyrene	ND	330
Dibenzo(a,h)anthracene	ND	330
Benzo(g,h,i)perylene	ND	330

ND = Not Detected

\* Reporting limit raised due to sample dilution necessitated by matrix interference

Client: Fugro West, Inc.  
Method: EPA Method 8270  
Date Extracted: 05/08/97  
Date Analyzed: 05/20/97  
Matrix: Sediment  
Units: ug/Kg (ppb) as received

ToxScan Number: T-14666

Client Sample ID: 18b  
Station ID: DPW-01 SA#18b@76'  
ToxScan Lab ID: 14666-21A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
Phenol	ND	330
Bis(2-chloroethyl)ether	ND	330
2-Chlorophenol	ND	330
1,3-Dichlorobenzene	ND	330
1,4-Dichlorobenzene	ND	330
Benzyl alcohol	ND	800
1,2-Dichlorobenzene	ND	330
2-Methylphenol	ND	330
Bis(2-chloroisopropyl)ether	ND	800
Hexachloroethane	ND	330
N-Nitrosodipropylamine	ND	800
4-Methylphenol	ND	330
Nitrobenzene	ND	330
Isophorone	ND	330
2-Nitrophenol	ND	330
2,4-Dimethylphenol	ND	330
Bis(2-chloroethoxy)methane	ND	800
2,4-Dichlorophenol	ND	330
1,2,4-Trichlorobenzene	ND	330
Naphthalene	ND	330
4-Chloroaniline	ND	800
Hexachlorobutadiene	ND	330
4-Chloro-3-methylphenol	ND	330
2-Methylnaphthalene	ND	330
Hexachlorocyclopentadiene	ND	330
2,4,6-Trichlorophenol	ND	330
2,4,5-Trichlorophenol	ND	330
2-Chloronaphthalene	ND	330
2-Nitroaniline	ND	800
Acenaphthylene	ND	330
Dimethylphthalate	ND	330
2,6-Dinitrotoluene	ND	330
Acenaphthene	ND	330
3-Nitroaniline	ND	800

ND = Not Detected

Client: Fugro West, Inc.  
Method: EPA Method 8270  
Date Extracted: 05/08/97  
Date Analyzed: 05/20/97  
Matrix: Sediment  
Units: ug/Kg (ppb) as received

ToxScan Number: T-14666

Client Sample ID: 18b  
Station ID: DPW-01 SA#18b@76'  
ToxScan Lab ID: 14666-21A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
2,4-Dinitrophenol	ND	800
Dibenzofuran	ND	330
2,4-Dinitrotoluene	ND	330
4-Nitrophenol	ND	800
Fluorene	ND	330
4-Chlorophenyl phenyl ether	ND	330
Diethylphthalate	ND	330
4-Nitroaniline	ND	800
4,6-Dinitro-2-methylphenol	ND	800
N-Nitrosodiphenylamine	ND	330
4-Bromophenyl phenyl ether	ND	330
Hexachlorobenzene	ND	330
Pentachlorophenol	ND	800
Phenanthrene	ND	330
Anthracene	ND	330
Carbazole	ND	330
Di-n-butylphthalate	ND	330
Fluoranthene	ND	330
Pyrene	ND	330
Butyl benzyl phthalate	ND	330
Benzo(a)anthracene	ND	330
Chrysene	ND	330
3,3'-Dichlorobenzidine	ND	330
Bis(2-ethylhexyl)phthalate	ND	330
Di-n-octylphthalate	ND	330
Benzo(b)fluoranthene	ND	330
Benzo(k)fluoranthene	ND	330
Benzo(a)pyrene	ND	330
Indeno(1,2,3-cd)pyrene	ND	330
Dibenzo(a,h)anthracene	ND	330
Benzo(g,h,i)perylene	ND	330

ND = Not Detected

Client: Fugro West, Inc.  
Method: EPA 8080  
Date Extracted: May 08, 1997  
Date Analyzed: May 15, 1997  
Matrix: Sediment  
Units: ug/Kg (ppb)

ToxScan Number: T-14666

Client Sample ID: 1b  
Site ID: DPW-05 @ 2'  
ToxScan Lab ID: 14666-24-A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
Aldrin	ND	8.0
alpha-BHC	ND	8.0
beta-BHC	ND	8.0
delta-BHC	ND	8.0
gamma-BHC	ND	8.0
alpha-Chlordane	ND	8.0
gamma-Chlordane	ND	8.0
4,4'-DDD	ND	8.0
4,4'-DDE	ND	8.0
4,4'-DDT	ND	16
Dieldrin	ND	16
Endosulfan I	ND	8.0
Endosulfan II	ND	16
Endosulfan Sulfate	ND	16
Endrin	ND	8.0
Endrin Aldehyde	ND	16
Endrin Ketone	ND	16
Heptachlor	ND	8.0
Heptachlor Epoxide	ND	8.0
Methoxychlor	ND	80
Toxaphene	ND	160
Aroclor-1016	ND	160
Aroclor-1221	ND	160
Aroclor-1232	ND	160
Aroclor-1242	ND	160
Aroclor-1248	ND	160
Aroclor-1254	ND	160
Aroclor-1260	ND	160
Total PCB's	ND	160

Client: Fugro West, Inc.  
Method: EPA 8080  
Date Extracted: May 08, 1997  
Date Analyzed: May 15, 1997  
Matrix: Sediment  
Units: ug/Kg (ppb)

ToxScan Number: T-14666

Client Sample ID: 3b  
Site ID: DPW-05 @ 8'  
ToxScan Lab ID: 14666-26-A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
Aldrin	ND	8.0
alpha-BHC	ND	8.0
beta-BHC	ND	8.0
delta-BHC	ND	8.0
gamma-BHC	ND	8.0
alpha-Chlordane	ND	8.0
gamma-Chlordane	ND	8.0
4,4'-DDD	ND	8.0
4,4'-DDE	ND	8.0
4,4'-DDT	ND	16
Dieldrin	ND	16
Endosulfan I	ND	8.0
Endosulfan II	ND	16
Endosulfan Sulfate	ND	16
Endrin	ND	8.0
Endrin Aldehyde	ND	16
Endrin Ketone	ND	16
Heptachlor	ND	8.0
Heptachlor Epoxide	ND	8.0
Methoxychlor	ND	80
Toxaphene	ND	160
Aroclor-1016	ND	160
Aroclor-1221	ND	160
Aroclor-1232	ND	160
Aroclor-1242	ND	160
Aroclor-1248	ND	160
Aroclor-1254	ND	160
Aroclor-1260	ND	160
Total PCB's	ND	160

Client: Fugro West, Inc.  
Method: EPA Method 8270  
Date Extracted: 05/08/97  
Date Analyzed: 05/20/97  
Matrix: Sediment  
Units: ug/Kg (ppb) as received

ToxScan Number: T-14666

Client Sample ID: 3b  
Station ID: DPW-05 @8'  
ToxScan Lab ID: 14666-26A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
2,4-Dinitrophenol	ND	800
Dibenzofuran	ND	330
2,4-Dinitrotoluene	ND	330
4-Nitrophenol	ND	800
Fluorene	ND	330
4-Chlorophenyl phenyl ether	ND	330
Diethylphthalate	ND	330
4-Nitroaniline	ND	800
4,6-Dinitro-2-methylphenol	ND	800
N-Nitrosodiphenylamine	ND	330
4-Bromophenyl phenyl ether	ND	330
Hexachlorobenzene	ND	330
Pentachlorophenol	ND	800
Phenanthrene	ND	330
Anthracene	ND	330
Carbazole	ND	330
Di-n-butylphthalate	ND	330
Fluoranthene	ND	330
Pyrene	ND	330
Butyl benzyl phthalate	ND	330
Benzo(a)anthracene	ND	330
Chrysene	ND	330
3,3'-Dichlorobenzidine	ND	330
Bis(2-ethylhexyl)phthalate	ND	330
Di-n-octylphthalate	ND	330
Benzo(b)fluoranthene	ND	330
Benzo(k)fluoranthene	ND	330
Benzo(a)pyrene	ND	330
Indeno(1,2,3-cd)pyrene	ND	330
Dibenzo(a,h)anthracene	ND	330
Benzo(g,h,i)perylene	ND	330

ND = Not Detected

Client: Fugro West, Inc.  
Method: EPA Method 8270  
Date Extracted: 05/08/97  
Date Analyzed: 05/20/97  
Matrix: Sediment  
Units: ug/Kg (ppb) as received

ToxScan Number: T-14666

Client Sample ID: 3b  
Station ID: DPW-05 @8'  
ToxScan Lab ID: 14666-26A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
Phenol	ND	330
Bis(2-chloroethyl)ether	ND	330
2-Chlorophenol	ND	330
1,3-Dichlorobenzene	ND	330
1,4-Dichlorobenzene	ND	330
Benzyl alcohol	ND	800
1,2-Dichlorobenzene	ND	330
2-Methylphenol	ND	330
Bis(2-chloroisopropyl)ether	ND	800
Hexachloroethane	ND	330
N-Nitrosodipropylamine	ND	800
4-Methylphenol	ND	330
Nitrobenzene	ND	330
Isophorone	ND	330
2-Nitrophenol	ND	330
2,4-Dimethylphenol	ND	330
Bis(2-chloroethoxy)methane	ND	800
2,4-Dichlorophenol	ND	330
1,2,4-Trichlorobenzene	ND	330
Naphthalene	ND	330
4-Chloroaniline	ND	800
Hexachlorobutadiene	ND	330
4-Chloro-3-methylphenol	ND	330
2-Methylnaphthalene	ND	330
Hexachlorocyclopentadiene	ND	330
2,4,6-Trichlorophenol	ND	330
2,4,5-Trichlorophenol	ND	330
2-Chloronaphthalene	ND	330
2-Nitroaniline	ND	800
Acenaphthylene	ND	330
Dimethylphthalate	ND	330
2,6-Dinitrotoluene	ND	330
Acenaphthene	ND	330
3-Nitroaniline	ND	800

ND = Not Detected

Client: Fugro West, Inc.  
Method: EPA Method 8270  
Date Extracted: 05/08/97  
Date Analyzed: 05/20/97  
Matrix: Sediment  
Units: ug/Kg (ppb) as received

ToxScan Number: T-14666

Client Sample ID: 4b  
Station ID: DPW-05 @11'  
ToxScan Lab ID: 14666-27A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
Phenol	ND	330
Bis(2-chloroethyl)ether	ND	330
2-Chlorophenol	ND	330
1,3-Dichlorobenzene	ND	330
1,4-Dichlorobenzene	ND	330
Benzyl alcohol	ND	800
1,2-Dichlorobenzene	ND	330
2-Methylphenol	ND	330
Bis(2-chloroisopropyl)ether	ND	800
Hexachloroethane	ND	330
N-Nitrosodipropylamine	ND	800
4-Methylphenol	ND	330
Nitrobenzene	ND	330
Isophorone	ND	330
2-Nitrophenol	ND	330
2,4-Dimethylphenol	ND	330
Bis(2-chloroethoxy)methane	ND	800
2,4-Dichlorophenol	ND	330
1,2,4-Trichlorobenzene	ND	330
Naphthalene	ND	330
4-Chloroaniline	ND	800
Hexachlorobutadiene	ND	330
4-Chloro-3-methylphenol	ND	330
2-Methylnaphthalene	ND	330
Hexachlorocyclopentadiene	ND	330
2,4,6-Trichlorophenol	ND	330
2,4,5-Trichlorophenol	ND	330
2-Chloronaphthalene	ND	330
2-Nitroaniline	ND	800
Acenaphthylene	ND	330
Dimethylphthalate	ND	330
2,6-Dinitrotoluene	ND	330
Acenaphthene	ND	330
3-Nitroaniline	ND	800

ND = Not Detected

Client: Fugro West, Inc.  
Method: EPA Method 8270  
Date Extracted: 05/08/97  
Date Analyzed: 05/20/97  
Matrix: Sediment  
Units: ug/Kg (ppb) as received

ToxScan Number: T-14666

Client Sample ID: 4b  
Station ID: DPW-05 @11'  
ToxScan Lab ID: 14666-27A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
2,4-Dinitrophenol	ND	800
Dibenzofuran	ND	330
2,4-Dinitrotoluene	ND	330
4-Nitrophenol	ND	800
Fluorene	ND	330
4-Chlorophenyl phenyl ether	ND	330
Diethylphthalate	ND	330
4-Nitroaniline	ND	800
4,6-Dinitro-2-methylphenol	ND	800
N-Nitrosodiphenylamine	ND	330
4-Bromophenyl phenyl ether	ND	330
Hexachlorobenzene	ND	330
Pentachlorophenol	ND	800
Phenanthrene	ND	330
Anthracene	ND	330
Carbazole	ND	330
Di-n-butylphthalate	ND	330
Fluoranthene	ND	330
Pyrene	ND	330
Butyl benzyl phthalate	ND	330
Benzo(a)anthracene	ND	330
Chrysene	ND	330
3,3'-Dichlorobenzidine	ND	330
Bis(2-ethylhexyl)phthalate	ND	330
Di-n-octylphthalate	ND	330
Benzo(b)fluoranthene	ND	330
Benzo(k)fluoranthene	ND	330
Benzo(a)pyrene	ND	330
Indeno(1,2,3-cd)pyrene	ND	330
Dibenzo(a,h)anthracene	ND	330
Benzo(g,h,i)perylene	ND	330

ND = Not Detected

Client: Fugro West, Inc.  
Method: EPA Method 8270  
Date Extracted: 05/08/97  
Date Analyzed: 05/20/97  
Matrix: Sediment

ToxScan Number: T-14666

Quality Control Report:

Surrogate recoveries expressed as percentages

<u>Sample Identification</u>	<u>S1</u>	<u>S2</u>	<u>S3</u>	<u>S4</u>	<u>S5</u>	<u>S6</u>
Method Blank 05/08/97	71	72	59	71	68	87
Laboratory Control Sample 05/08/97	45	53	85	81	78	99
7a	72	73	88	81	75	89
4b	48	57	88	85	60	91
18b	46	52	87	78	72	95
3b	48	57	90	84	77	95
4b	50	54	98	89	67	107

<u>Surrogates:</u>	<u>QC Limits</u>
S1 = 2-Fluorophenol (S.S.)	25-121
S2 = Phenol-d5 (S.S.)	24-113
S3 = Nitrobenzene-d5 (S.S.)	23-120
S4 = 2-Fluorobiphenyl (S.S.)	30-115
S5 = Tribromophenol (S.S.)	19-122
S6 = Terphenyl-d14 (S.S.)	18-137

Client: Fugro West, Inc.  
Method: EPA Method 8270  
Date Extracted: 05/08/97  
Date Analyzed: 05/20/97  
Matrix: Sediment

ToxScan Number: T-14666

Quality Control Report:

Spike recoveries expressed as percentages

<u>Spiked Compound</u>	<u>LCS % Rec</u>	<u>QC LIMITS % Rec</u>
Phenol	58	26-100
2-Chlorophenol	82	25-102
1,4-Dichlorobenzene	76	28-104
N-Nitrosodipropylamine	60	41-126
1,2,4-Trichlorobenzene	80	38-107
4-Chloro-3-methylphenol	74	26-103
Acenaphthene	82	31-137
2,4-Dinitrotoluene	78	28-100
4-Nitrophenol	68	11-114
Pentachlorophenol	62	17-109
Pyrene	104	35-142

LCS = Laboratory Control Sample

Client: Fugro West, Inc.  
Method: EPA 8080  
Date Extracted: May 08, 1997  
Date Analyzed: May 15, 1997  
Matrix: Sediment  
Units: ug/Kg (ppb)

ToxScan Number: T-14666

Client Sample ID: 7a  
Site ID: DPW-03, 22 ft  
ToxScan Lab ID: 14666-03-A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
Aldrin	ND	8.0
alpha-BHC	ND	8.0
beta-BHC	ND	8.0
delta-BHC	ND	8.0
gamma-BHC	ND	8.0
alpha-Chlordane	ND	8.0
gamma-Chlordane	ND	8.0
4,4'-DDD	ND	8.0
4,4'-DDE	ND	8.0
4,4'-DDT	ND	16
Dieldrin	ND	16
Endosulfan I	ND	8.0
Endosulfan II	ND	16
Endosulfan Sulfate	ND	16
Endrin	ND	8.0
Endrin Aldehyde	ND	16
Endrin Ketone	ND	16
Heptachlor	ND	8.0
Heptachlor Epoxide	ND	8.0
Methoxychlor	ND	80
Toxaphene	ND	160
Aroclor-1016	ND	160
Aroclor-1221	ND	160
Aroclor-1232	ND	160
Aroclor-1242	ND	160
Aroclor-1248	ND	160
Aroclor-1254	ND	160
Aroclor-1260	ND	160
Total PCB's	ND	160

Client: Fugro West, Inc.  
Method: EPA 8080  
Date Extracted: May 08, 1997  
Date Analyzed: May 15, 1997  
Matrix: Sediment  
Units: ug/Kg (ppb)

ToxScan Number: T-14666

Client Sample ID: 15a  
Site ID: DPW-03, 61 ft  
ToxScan Lab ID: 14666-05-A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
Aldrin	ND	8.0
alpha-BHC	ND	8.0
beta-BHC	ND	8.0
delta-BHC	ND	8.0
gamma-BHC	ND	8.0
alpha-Chlordane	ND	8.0
gamma-Chlordane	ND	8.0
4,4'-DDD	ND	8.0
4,4'-DDE	ND	8.0
4,4'-DDT	ND	16
Dieldrin	ND	16
Endosulfan I	ND	8.0
Endosulfan II	ND	16
Endosulfan Sulfate	ND	16
Endrin	ND	8.0
Endrin Aldehyde	ND	16
Endrin Ketone	ND	16
Heptachlor	ND	8.0
Heptachlor Epoxide	ND	8.0
Methoxychlor	ND	80
Toxaphene	ND	160
Aroclor-1016	ND	160
Aroclor-1221	ND	160
Aroclor-1232	ND	160
Aroclor-1242	ND	160
Aroclor-1248	ND	160
Aroclor-1254	ND	160
Aroclor-1260	ND	160
Total PCB's	ND	160

Client: Fugro West, Inc.  
Method: EPA 8080  
Date Extracted: May 08, 1997  
Date Analyzed: May 15, 1997  
Matrix: Sediment  
Units: ug/Kg (ppb)

ToxScan Number: T-14666

Client Sample ID: 2b  
Site ID: DPW-01 SA# 2b @ 5'  
ToxScan Lab ID: 14666-17-A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
Aldrin	ND	8.0
alpha-BHC	ND	8.0
beta-BHC	ND	8.0
delta-BHC	ND	8.0
gamma-BHC	ND	8.0
alpha-Chlordane	ND	8.0
gamma-Chlordane	ND	8.0
4,4' -DDD	ND	8.0
4,4' -DDE	ND	8.0
4,4' -DDT	ND	16
Dieldrin	ND	16
Endosulfan I	ND	8.0
Endosulfan II	ND	16
Endosulfan Sulfate	ND	16
Endrin	ND	8.0
Endrin Aldehyde	ND	16
Endrin Ketone	ND	16
Heptachlor	ND	8.0
Heptachlor Epoxide	ND	8.0
Methoxychlor	ND	80
Toxaphene	ND	160
Aroclor-1016	ND	160
Aroclor-1221	ND	160
Aroclor-1232	ND	160
Aroclor-1242	ND	160
Aroclor-1248	ND	160
Aroclor-1254	ND	160
Aroclor-1260	ND	160
Total PCB's	ND	160

Client: Fugro West, Inc.  
Method: EPA 8080  
Date Extracted: May 08, 1997  
Date Analyzed: May 15, 1997  
Matrix: Sediment  
Units: ug/Kg (ppb)

ToxScan Number: T-14666

Client Sample ID: 19b  
Site ID: DPW-01 SA# 19b @ 79'  
ToxScan Lab ID: 14666-22-A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
Aldrin	ND	8.0
alpha-BHC	ND	8.0
beta-BHC	ND	8.0
delta-BHC	ND	8.0
gamma-BHC	ND	8.0
alpha-Chlordane	ND	8.0
gamma-Chlordane	ND	8.0
4,4'-DDD	ND	8.0
4,4'-DDE	ND	8.0
4,4'-DDT	ND	16
Dieldrin	ND	16
Endosulfan I	ND	8.0
Endosulfan II	ND	16
Endosulfan Sulfate	ND	16
Endrin	ND	8.0
Endrin Aldehyde	ND	16
Endrin Ketone	ND	16
Heptachlor	ND	8.0
Heptachlor Epoxide	ND	8.0
Methoxychlor	ND	80
Toxaphene	ND	160
Aroclor-1016	ND	160
Aroclor-1221	ND	160
Aroclor-1232	ND	160
Aroclor-1242	ND	160
Aroclor-1248	ND	160
Aroclor-1254	ND	160
Aroclor-1260	ND	160
Total PCB's	ND	160

Client: Fugro West, Inc.  
Method: EPA 8080  
Date Extracted: May 08, 1997  
Date Analyzed: May 15, 1997  
Matrix: Sediment  
Units: ug/Kg (ppb)

ToxScan Number: T-14666

Client Sample ID: 1b  
Site ID: DWP-05 @ 2'  
ToxScan Lab ID: 14666-24-A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
Aldrin	ND	8.0
alpha-BHC	ND	8.0
beta-BHC	ND	8.0
delta-BHC	ND	8.0
gamma-BHC	ND	8.0
alpha-Chlordane	ND	8.0
gamma-Chlordane	ND	8.0
4,4'-DDD	ND	8.0
4,4'-DDE	ND	8.0
4,4'-DDT	ND	16
Dieldrin	ND	16
Endosulfan I	ND	8.0
Endosulfan II	ND	16
Endosulfan Sulfate	ND	16
Endrin	ND	8.0
Endrin Aldehyde	ND	16
Endrin Ketone	ND	16
Heptachlor	ND	8.0
Heptachlor Epoxide	ND	8.0
Methoxychlor	ND	80
Toxaphene	ND	160
Aroclor-1016	ND	160
Aroclor-1221	ND	160
Aroclor-1232	ND	160
Aroclor-1242	ND	160
Aroclor-1248	ND	160
Aroclor-1254	ND	160
Aroclor-1260	ND	160
Total PCB's	ND	160

Client: Fugro West, Inc.  
Method: EPA 8080  
Date Extracted: May 08, 1997  
Date Analyzed: May 15, 1997  
Matrix: Sediment  
Units: ug/Kg (ppb)

ToxScan Number: T-14666

Client Sample ID: 3b  
Site ID: DWP-05 @ 8'  
ToxScan Lab ID: 14666-26-A

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
Aldrin	ND	8.0
alpha-BHC	ND	8.0
beta-BHC	ND	8.0
delta-BHC	ND	8.0
gamma-BHC	ND	8.0
alpha-Chlordane	ND	8.0
gamma-Chlordane	ND	8.0
4,4'-DDD	ND	8.0
4,4'-DDE	ND	8.0
4,4'-DDT	ND	16
Dieldrin	ND	16
Endosulfan I	ND	8.0
Endosulfan II	ND	16
Endosulfan Sulfate	ND	16
Endrin	ND	8.0
Endrin Aldehyde	ND	16
Endrin Ketone	ND	16
Heptachlor	ND	8.0
Heptachlor Epoxide	ND	8.0
Methoxychlor	ND	80
Toxaphene	ND	160
Aroclor-1016	ND	160
Aroclor-1221	ND	160
Aroclor-1232	ND	160
Aroclor-1242	ND	160
Aroclor-1248	ND	160
Aroclor-1254	ND	160
Aroclor-1260	ND	160
Total PCB's	ND	160

Client: Fugro West, Inc.  
Method: EPA 8080  
Date Extracted: May 08, 1997  
Date Analyzed: May 15, 1997  
Matrix: Sediment  
Units: ug/Kg (ppb)

ToxScan Number: T-14666

Client Sample ID: Method Blank  
ToxScan Lab ID: MB050897

<u>Analyte</u>	<u>Sample Value</u>	<u>Reporting Limit</u>
Aldrin	ND	8.0
alpha-BHC	ND	8.0
beta-BHC	ND	8.0
delta-BHC	ND	8.0
gamma-BHC	ND	8.0
alpha-Chlordane	ND	8.0
gamma-Chlordane	ND	8.0
4,4'-DDD	ND	8.0
4,4'-DDE	ND	8.0
4,4'-DDT	ND	16
Dieldrin	ND	16
Endosulfan I	ND	8.0
Endosulfan II	ND	16
Endosulfan Sulfate	ND	16
Endrin	ND	8.0
Endrin Aldehyde	ND	16
Endrin Ketone	ND	16
Heptachlor	ND	8.0
Heptachlor Epoxide	ND	8.0
Methoxychlor	ND	80
Toxaphene	ND	160
Aroclor-1016	ND	160
Aroclor-1221	ND	160
Aroclor-1232	ND	160
Aroclor-1242	ND	160
Aroclor-1248	ND	160
Aroclor-1254	ND	160
Aroclor-1260	ND	160
Total PCB's	ND	160

Client: Fugro West, Inc.  
Method: EPA 8080  
Date Extracted: May 08, 1997  
Date Analyzed: May 15, 1997  
Matrix: Sediment

ToxScan Number: T-14666

Quality Control Report

Surrogate recoveries expressed as percentages:

<u>Sample ID</u>	<u>Tetrachloro-m-xylene</u>	<u>Decachlorobiphenyl</u>	<u>QC Limits</u>
Method Blank	87	96	50-150
Lab Control Sample	88	98	50-150
7a	89	99	50-150
15a	90	103	50-150
2b	89	101	50-150
19b	92	97	50-150
1b	88	96	50-150
3b	87	97	50-150

Client: Fugro West, Inc.  
Method: EPA 8080  
Date Extracted: May 08, 1997  
Date Analyzed: May 15, 1997  
Matrix: Sediment

ToxScan Number: T-14666

Quality Control Report

Spike recoveries expressed as percentages:

<u>Spiked Compound</u>	<u>LCS % REC</u>	<u>QC LIMITS % REC</u>
Lindane	98	46-127
Heptachlor	95	35-130
Aldrin	100	34-132
Dieldrin	99	31-134
Endrin	110	42-139
DDT	90	23-134

LCS = Laboratory Control Sample

ANALYTICAL CHEMISTS  
and  
BACTERIOLOGISTS  
Approved by State of California

# SOIL CONTROL LAB

42 HANGAR WAY  
WATSONVILLE

Tel: 408 724-5422  
FAX: 408 724-3188

In any reference, please  
quote Certified Analysis  
Number appearing hereon.

120149-1-3344

A Division of Control Laboratories Inc.

ToxScan Inc.  
42 Hangar Way  
Watsonville CA 95076

19 MAY 97

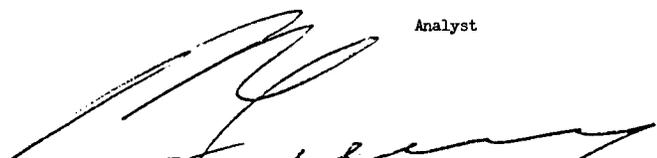
## CERTIFIED ANALYTICAL REPORT

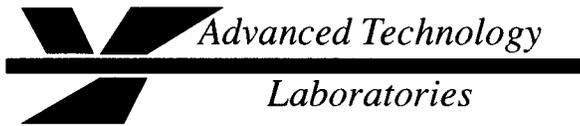
MATERIAL: Water sample received 15 May 1997  
IDENTIFICATION: T-14666-33-B, Fugro, Sample: DPW-03  
REPORT: Quantitative chemical analysis is as follows expressed  
as milligrams per liter (parts per million):

Sulfate (as SO <sub>4</sub> )	2910
Chloride (Cl)	22,500

The undersigned certifies that the above is a true and  
accurate report of the findings of this Laboratory.

Analyst





May 16, 1997

ELAP No.: 1838

Toxscan, Inc.  
42 Hangar Way  
Watsonville, CA 95076

ATTN: Mr. Doug Clark

Client's Project: T-14666  
Lab No.: 17402-001/004

Gentlemen:

Enclosed are the results for sample(s) received by Advanced Technology Laboratories and tested for the parameters indicated in the enclosed chain of custody.

Thank you for the opportunity to service the needs of your company. Please feel free to call me at (310) 989 - 4045 if I can be of further assistance to your company.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Edgar P. Caballero'.

Edgar P. Caballero  
Laboratory Director  
EPC/ms

Enclosures

This cover letter is an integral part of this analytical report.

This report pertains only to the samples investigated and does not necessarily apply to other apparently identical or similar materials. This report is submitted for the exclusive use of the client to whom it is addressed. Any reproduction of this report or use of this Laboratory's name for advertising or publicity purpose without authorization is prohibited.

*Mailing Address: P.O. Box 9108 Newport Beach, CA 92658  
1510 E. 33rd Street Signal Hill, CA 90807 Tel: 310 989-4045 Fax: 310 989-4040*



Client: Toxscan, Inc.  
 Attn: Mr. Doug Clark

Client's Project: T-14666  
 Date Received: 05/09/97  
 Matrix: Soil  
 Units: ug/kg  
 Date Amended: 06/10/97

EPA Method 8260

Lab No.:	Method Blank		17402-001		17402-002		17402-003		17402-004		
Client Sample I.D.:	--		DPW-01 SA #46 @ 11'		DPW-01 SA #18B @ 76'		DPW-05 @ 8'		DPW-05 @ 11'		
ANALYTE	MDL	DLR	Results	DLR	Results	DLR	Results	DLR	Results	DLR	Results
trans-1,2-Dichloroethene	5	5	ND	5	ND	5	ND	5	ND	5	ND
1,2-Dichloropropane	5	5	ND	5	ND	5	ND	5	ND	5	ND
1,3-Dichloropropane	5	5	ND	5	ND	5	ND	5	ND	5	ND
2,2-Dichloropropane	5	5	ND	5	ND	5	ND	5	ND	5	ND
1,1-Dichloropropene	5	5	ND	5	ND	5	ND	5	ND	5	ND
Ethylbenzene	5	5	ND	5	ND	5	ND	5	ND	5	ND
Hexachlorobutadiene	5	5	ND	5	ND	5	ND	5	ND	5	ND
Isopropylbenzene	5	5	ND	5	ND	5	ND	5	ND	5	ND
p-Isopropyltoluene	5	5	ND	5	ND	5	ND	5	ND	5	ND
Methylene Chloride	15	15	ND	15	ND	15	ND	15	ND	15	ND
Naphthalene	5	5	ND	5	ND	5	ND	5	ND	5	ND
n-Propylbenzene	5	5	ND	5	ND	5	ND	5	ND	5	ND
Styrene	5	5	ND	5	ND	5	ND	5	ND	5	ND
1,1,1,2-Tetrachloroethane	5	5	ND	5	ND	5	ND	5	ND	5	ND
1,1,2,2-Tetrachloroethane	5	5	ND	5	ND	5	ND	5	ND	5	ND
Tetrachloroethene	5	5	ND	5	ND	5	ND	5	ND	5	ND
Toluene	5	5	ND	5	ND	5	ND	5	ND	5	ND
1,2,3-Trichlorobenzene	5	5	ND	5	ND	5	ND	5	ND	5	ND
1,2,4-Trichlorobenzene	5	5	ND	5	ND	5	ND	5	ND	5	ND
1,1,1-Trichloroethane	5	5	ND	5	ND	5	ND	5	ND	5	ND
1,1,2-Trichloroethane	5	5	ND	5	ND	5	ND	5	ND	5	ND
Trichloroethene	5	5	ND	5	ND	5	ND	5	ND	5	ND
Trichlorofluoromethane	5	5	ND	5	ND	5	ND	5	ND	5	ND
1,2,3-Trichloropropane	10	10	ND	10	ND	10	ND	10	ND	10	ND
1,2,4-Trimethylbenzene	5	5	ND	5	ND	5	ND	5	ND	5	ND
1,3,5-Trimethylbenzene	5	5	ND	5	ND	5	ND	5	ND	5	ND
Vinyl Chloride	5	5	ND	5	ND	5	ND	5	ND	5	ND
Xylenes (Total)	5	5	ND	5	ND	5	ND	5	ND	5	ND

EPA Method 8260 (additional analytes)

MTBE	5	5	ND								

MDL = Method Detection Limit  
 ND = Not Detected (Below DLR).  
 DLR = MDL X Dilution Factor  
 NA = Not Analyzed

Reviewed/Approved By: \_\_\_\_\_

*[Signature]*  
 Yuh Pan  
 Department Supervisor

Date \_\_\_\_\_

6/10/97

The cover letter is an integral part of this analytical report.



**CHAIN OF CUSTODY RECORD**



LABORATORY				LABORATORY LOCATION		DATE 4/30/97	FM JOB No. 91642-1218		
CLIENT POLA/DPW				PROJECT Fries Ave Sewer Main Replacement					
PROJECT MANAGER T. McNeilan				SAMPLER (Signature) Craig Prentice					
Laboratory No.	Sample No.	Location and Description	Date	Time	Vessel Type	No. of Vessels	Sample Matrix	Preservation Method	Tests Required
	1b	DPW-01 SA# 16 @ 2'	4/30/97		1	1	S	A	A
	2b	DPW-01 SA# 26 @ 5'	4/30		1	1	S	A	A D E
	4b	DPW-01 SA# 46 @ 11'	4/30		1	1	S	A	A B C
	5b	DPW-01 SA# 56 @ 14'	4/30		1	1	S	A	A F G H I
	16	DPW-01 SA# 16 @ 70'	4/30		1	1	S	A	F, G, H, I
	18b	DPW-01 SA# 186 @ 76'	4/30		1	1	S	A	A B C
	19b	DPW-01 SA# 196 @ 79'	4/30		1	1	S	A	D E
	24b	DPW-01 SA# 246 @ 112'	4/30		1	1	S	A	

VESSEL TYPE		SAMPLE MATRIX		TEST REQUIRED	
1	Brass or stainless steel sleeve, 2 1/2-inch diameter by 1, 3, 4, or 6 inches long	A	Air	A	418.1
2	Brass or stainless steel sleeve, 1 1/2-inch diameter by 4 inches long	S	Solid	B	8260 w/ BTEX & MTBE
3	Stainless steel sleeve, 1 inch diameter by 6 inches long	W	Water	C	8270
4	Amber glass bottle with Teflon lined screw cap, 1,000 milliliters	O	Other	D	8080
5	Amber glass bottle with Teflon lined screw cap, 280 milliliters	PRESERVATION METHOD		E	6010
6	Clear glass jar with Teflon lined screw cap, 4 or 6 ounces	A	Artificial ice	F	325.3
7	VOA vial, 40 milliliters	B	NaHSO <sub>4</sub>	G	375.4
8	Mason jar, 1 pint or 1 quart	C	HNO <sub>3</sub>	H	160.1
9	Plastic bottle, 1 liter	D	None	I	150.1
10	Other	E	Other	J	

RELINQUISHED BY: (Signature) <i>Craig Prentice</i>	RECEIVED BY: (Signature) <i>See below</i>	DATE: 5/2/97	TIME:
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE:	TIME:
RELINQUISHED BY: (Signature)	RECEIVED FOR LABORATORY BY: (Signature)	DATE:	TIME:

METHOD OF SHIPMENT: *California Overnight*      TURNAROUND TIME: \_\_\_\_\_

SAMPLE DISPOSAL:       Return to FM       Proper disposal by Lab after 60 days

SPECIAL INSTRUCTIONS:

HANDLING INFORMATION: *Samples placed in cooler w/ artificial ice & COC. Cooled to temp of custody sealed prior to pickup by California Overnight.*

White - FM Copy      Yellow - Laboratory Copy      Pink - Return to FM with Results

5855 Olivas Park Drive • Ventura, California 93003-7672 • (805) 650-7000, FAX (805) 650-7010



**CHAIN OF CUSTODY RECORD**



LABORATORY	LABORATORY LOCATION	DATE <b>4/28/97</b>	FM JOB No. <b>9642-1218</b>
CLIENT <b>POLA / DPW</b>	PROJECT <b>DPW - Fries Ave Forc Main</b>		
PROJECT MANAGER <b>T. McNeilan</b>	SAMPLER (Signature) <b>Craig Prentice</b>		

Laboratory No.	Sample No.	Location and Description	Date	Time	Vessel Type	No. of Vessels	Sample Matrix	Preservation Method	Tests Required
<del> </del>	<del> </del>	<del>DPW-02 SA# 5a-19.5</del>	<del>4-28-97</del>	<del>12:10</del>	<del>1</del>	<del>1</del>	<del>S</del>	<del>A</del>	<del> </del>
		DPW-02 SA# 7a-25.5	4-28-97	13:15	1	1	S	A	A
		DPW-02 SA# 8b-28.5	4-28-97	13:25	1	1	S	A	
<del> </del>	<del> </del>	<del>DPW-02 SA# 12a-69.5</del>	<del>4-28-97</del>	<del>16:20</del>	<del>1</del>	<del>1</del>	<del>S</del>	<del>A</del>	<del> </del>
		DPW-02 SA# 13a-166.5	4-28-97	16:40	1	1	S	A	<del> </del>
		DPW-02 SA# 14a-70.5	4-28-97	17:10	1	1	S	A	A
<del> </del>	<del> </del>	<del>DPW-02 SA# 15a-73.5</del>	<del>4-28-97</del>	<del>17:30</del>	<del>1</del>	<del>1</del>	<del>S</del>	<del>A</del>	<del> </del>
					X	X	S	A	

VESSEL TYPE	SAMPLE MATRIX	TEST REQUIRED
1 Brass or stainless steel sleeve, 2 1/2-inch diameter by 1, 3, 4, or 6 inches long	A Air	A <b>418.1</b>
2 Brass or stainless steel sleeve, 1 1/2-inch diameter by 4 inches long	S Solid	B
3 Stainless steel sleeve, 1 inch diameter by 6 inches long	W Water	C
4 Amber glass bottle with Teflon lined screw cap, 1,000 milliliters	O Other	D
5 Amber glass bottle with Teflon lined screw cap, 260 milliliters	PRESERVATION METHOD:	
6 Clear glass jar with Teflon lined screw cap, 4 or 6 ounces	A Artificial ice	F
7 VOA vial, 40 milliliters	B NaHSO <sub>4</sub>	G
8 Mason jar, 1 pint or 1 quart	C HNO <sub>3</sub>	H
9 Plastic bottle, 1 liter	D None	I
10 Other	E Other	J

RELINQUISHED BY: (Signature) <b>Craig Prentice</b>	RECEIVED BY: (Signature) <b>See Below Lep</b>	DATE <b>9/30/97</b>	TIME: <b>1400</b>
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE:	TIME:
RELINQUISHED BY: (Signature)	RECEIVED FOR LABORATORY BY: (Signature)	DATE:	TIME:

METHOD OF SHIPMENT: <b>California Overnight</b>	TURNAROUND TIME:	SAMPLE DISPOSAL: <input type="checkbox"/> Return to FM <input checked="" type="checkbox"/> Proper disposal by Lab after 60 days
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SPECIAL INSTRUCTIONS:

HANDLING INFORMATION: **Samples placed in cooler with artificial ice + COC record. Cooler taped up + custody sealed prior to pick up by California Overnight Lep**

White - FM Copy    Yellow - Laboratory Copy    Pink - Return to FM with Results

5855 Olivas Park Drive • Ventura, California 93003-7672 • (805) 650-7000, FAX (805) 650-7010

CHAIN OF CUSTODY RECORD



LABORATORY <b>ToxScan</b>	LABORATORY LOCATION	DATE <b>4/24/97</b>	FM JOB No. <b>9642-1218</b>
CLIENT <b>Dept. of Public Works</b>	PROJECT <b>Force Main Crossing</b>		
PROJECT MANAGER <b>T McNEILAN</b>	SAMPLER (Signature) <b>A. Bilaluni</b>		

Laboratory No.	Sample No.	Location and Description	Date	Time	Vessel Type	No. of Vessels	Sample Matrix	Preservation Method	Tests Required
<del>4a</del>	<del>DPW-03, 13 FT</del>	<del>4/24/97</del>	<del>0800 gm</del>	<del>1</del>	<del>1</del>	<del>S</del>	<del>A</del>		
5b	DPW-03, 16 FT		0825	1	1	S	A		
6a	DPW-03, 19 FT		0845	1	1	S	A	EFGH	
7a	DPW-03, 22 FT		0910	1	1	S	A	ABCD	
14a	DPW-03, 58 FT		1125	1	1	S	A		
15a	DPW-03, 61 FT		1200	1	1	S	A	ACD	
16a	DPW-03, 64 FT		1220	1	1	S	A	EFGH	
<del>17b</del>	<del>DPW-03, 67 FT</del>	<del>✓</del>	<del>1245</del>	<del>1</del>	<del>1</del>	<del>S</del>	<del>A</del>		

VESSEL TYPE	SAMPLE MATRIX	TEST REQUIRED
1 Brass or stainless steel sleeve, 2 1/2-inch diameter by 1, 3, 4, or 6 inches long	A Air	A 418.1
2 Brass or stainless steel sleeve, 1 1/2-inch diameter by 4 inches long	B Solid	B 8270
3 Stainless steel sleeve, 1 inch diameter by 6 inches long	W Water	C 8080
4 Amber glass bottle with Teflon lined screw cap, 1,000 milliliters	O Other	D 6010
5 Amber glass bottle with Teflon lined screw cap, 280 milliliters	PRESERVATION METHOD	
6 Clear glass jar with Teflon lined screw cap, 4 or 6 ounces	A Artificial ice	E <del>325.3</del> 325.3
7 VOA vial, 40 milliliters	B NaHSO <sub>4</sub>	F 375.4
8 Mason jar, 1 pint or 1 quart	C HNO <sub>3</sub>	G 160.1
9 Plastic bottle, 1 liter	D None	H 150.1
10 Other	E Other	I
		J

RELINQUISHED BY: (Signature) <b>A. Bilaluni</b>	RECEIVED BY: (Signature) <b>See Below GSR</b>	DATE: <b>4/29/97</b>	TIME: <b>1500</b>
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE:	TIME:
RELINQUISHED BY: (Signature)	RECEIVED FOR LABORATORY BY: (Signature)	DATE:	TIME:

METHOD OF SHIPMENT: **California Overnight**      TURNAROUND TIME:

SAMPLE DISPOSAL:       Return to FM       Proper disposal by Lab after 60 days

SPECIAL INSTRUCTIONS:

HANDLING INFORMATION: **Samples placed in cooler with artificial ice and COC Record. Cooler taped up and custody sealed prior to pick up by California Overnight. GSR**

White - FM Copy      Yellow - Laboratory Copy      Pink - Return to FM with Results

**CHAIN OF CUSTODY RECORD**



LABORATORY <b>Toxscan</b>				LABORATORY LOCATION		DATE <b>4/26/97</b>	FM JOB No. <b>9642-1218</b>	
CLIENT <b>Dept. of Public Works</b>				PROJECT <b>Force Main Crossings</b>				
PROJECT MANAGER <b>J McNEILAN</b>				SAMPLER (Signature) <b>[Signature]</b>				

Laboratory No.	Sample No.	Location and Description	Date	Time	Vessel Type	No. of Vessels	Sample Matrix	Preservation Method	Tests Required
<del>6a</del>	<del>6a</del>	<del>DPW-04A, 14.5 ft</del>	<del>4/26/97</del>	<del>1130</del>	<del>1</del>	<del>1</del>	<del>S</del>	<del>A</del>	<del></del>
7b	7b	DPW-04A, 18.5 ft		1155	1	1	S	A	
8a	8a	DPW-04A, 21 ft		1215	1	1	S	A	A
9a	9a	DPW-04A, 23.5 ft		1230	1	1	S	A	
15a	15a	DPW-04A, 60 ft		1415	1	1	S	A	
16a	16a	DPW-04A, 63 ft		1435	1	1	S	A	A
<del>17a</del>	<del>17a</del>	<del>DPW-04A, 66 ft</del>		<del>1500</del>	<del>1</del>	<del>1</del>	<del>S</del>	<del>A</del>	<del>A</del>

VESEL TYPE	SAMPLE MATRIX	TEST REQUIRED
1 Brass or stainless steel sleeve, 2 1/2-inch diameter by 1, 3, 4, or 6 inches long	A Air	A 418.1
2 Brass or stainless steel sleeve, 1 1/2-inch diameter by 4 inches long	<b>S</b> Solid	B
3 Stainless steel sleeve, 1 inch diameter by 6 inches long	W Water	C
4 Amber glass bottle with Teflon lined screw cap, 1,000 milliliters	O Other	D
5 Amber glass bottle with Teflon lined screw cap, 280 milliliters	PRESERVATION METHOD:	
6 Clear glass jar with Teflon lined screw cap, 4 or 6 ounces	A Artificial ice	F
7 VOA vial, 40 milliliters	B NaHSO <sub>4</sub>	G
8 Mason jar, 1 pint or 1 quart	C HNO <sub>3</sub>	H
9 Plastic bottle, 1 liter	D None	I
10 Other	E Other	J

RELINQUISHED BY: (Signature) <b>[Signature]</b>	RECEIVED BY: (Signature) <b>See Below GSR</b>	DATE: <b>4/29/97</b>	TIME: <b>1500</b>
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE:	TIME:
RELINQUISHED BY: (Signature)	RECEIVED FOR LABORATORY BY: (Signature)	DATE:	TIME:

METHOD OF SHIPMENT: <b>California Overnight</b>	TURNAROUND TIME:	SAMPLE DISPOSAL: <input type="checkbox"/> Return to FM <input checked="" type="checkbox"/> Proper disposal by Lab after 60 days
SPECIAL INSTRUCTIONS:		

HANDLING INFORMATION: <b>Samples placed in cooler with artificial ice and CXC Record. Cooler taped up and custody sealed prior to pick up by California Overnight. GSR</b>
--

White - FM Copy      Yellow - Laboratory Copy      Pink - Return to FM with Results

5855 Olivas Park Drive • Ventura, California 93003-7672 • (805) 650-7000, FAX (805) 650-7010

Location: Frig 8, Shelf 12

pg 6 of 6

Form: Vta.(7/93)

CHAIN OF CUSTODY RECORD

Soil Samples T-14666



LABORATORY	LABORATORY LOCATION	DATE 5/3/97	FM JOB No. 11673-1218
CLIENT TOLA / DITW	PROJECT Friess Ave Sewer Main Replacement		
PROJECT MANAGER T. McNeilan	SAMPLER (Signature) Chris Prentiss		

Laboratory No.	Sample No.	Location and Description	Date	Time	Vessel Type	No. of Vessels	Sample Matrix	Preservation Method	Tests Required
T-14666 -24-A	1b	DWP-05 @ 2'	5/3/97		1	1	S	A	ADE
-25-A <del>24</del>	2b	DWP-05 @ 5'	5/3/97		1	1	S	A	A
-26-A	3b	DWP-05 @ 8'	5/3/97		1	1	S	A	ABCDE
-27-A	4b	DWP-05 @ 11'	5/3/97		1	1	S	A	FGHI BC
-28-A	5b	DWP-05 @ 14'	5/3/97		1	1	S	A	A
-29-A	17b	DWP-05 @ 25'	5/3/97		1	1	S	A	FGHI
-30-A	19b	DWP-05 @ 31'	5/3/97		1	1	S	A	A
-31-A	25c	DWP-05 @ 117'	5/3/97		1	1	S	A	A

VESSEL TYPE	SAMPLE MATRIX	TEST REQUIRED
1 Brass or stainless steel sleeve, 2 1/2-inch diameter by 1, 3, 4, or 6 inches long	A Air	A 418.1
2 Brass or stainless steel sleeve, 1 1/2-inch diameter by 4 inches long	S Solid	B 8260 w/ BTEX & MTBE
3 Stainless steel sleeve, 1 inch diameter by 6 inches long	W Water	C 8270
4 Amber glass bottle with Teflon lined screw cap, 1,000 milliliters	O Other	D 8080
5 Amber glass bottle with Teflon lined screw cap, 280 milliliters	PRESERVATION METHOD	
6 Clear glass jar with Teflon lined screw cap, 4 or 6 ounces	A Artificial ice	E 6010
7 VOA vial, 40 milliliters	B NaHSO <sub>4</sub>	F 325.37
8 Mason jar, 1 pint or 1 quart	C HNO <sub>3</sub>	G 375.4 - PURE
9 Plastic bottle, 1 liter	D None	H 160.1 WATER
10 Other	E Other	I 150.1 EXTRACTIONS
		J

RELINQUISHED BY: (Signature) Chris Prentiss	RECEIVED BY: (Signature)	DATE: 5/7/97	TIME:
RELINQUISHED BY: (Signature) Via Calif. Overnight	RECEIVED BY: (Signature) Douglas Clark	DATE: 08 May 97	TIME: 0940
RELINQUISHED BY: (Signature)	RECEIVED FOR LABORATORY BY: (Signature)	DATE:	TIME:

METHOD OF SHIPMENT: TURNAROUND TIME: SAMPLE DISPOSAL:  Return to FM  Proper disposal by Lab after 60 days

SPECIAL INSTRUCTIONS: TOXSCAN COMMENTS: An additional sample, not listed on COC, was received. For Sample label T-14666-25c (DWP-05 @ 117' 25b (T-14666-28-A). Per taken via Tim M. 08 May 97 DO NOT ANALYZE

HANDLING INFORMATION: Samples placed in cooler with artificial ice and chain of custody record folder taped and placed in a sturdy container for transport to lab and returned prior to pickup in California Overnight.

White - FM Copy Yellow - Laboratory Copy Pink - Return to FM with Results

5855 Olivas Park Drive • Ventura, California 93003-7672 • (805) 650-7000, FAX (805) 650-7010

Each sample received intact in 1-2.5" x 6" SS Liner

**APPENDIX C**  
**CAPCO ANALYTICAL REPORT**

Capco Analytical Services Incorporated (CAS)  
1536 Eastman Avenue, Suite B  
Ventura, CA. 93003  
(805) 644-1095

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Prepared For: Fugro (9642-1217) May 14, 1997  
5855 Olivas Park Drive  
Ventura, CA 93003-7672

ATTENTION: T. McNeilan

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Laboratory No: 970743 Job No: B01295  
Date Received: 07-MAY-97 Sampled By: Client  
Project: Frier Ave. Sewer Main Sample ID: See Below  
Replacement-9642-1217

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RESULTS

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On May 7, 1997, seven (7) samples were received for analysis by Capco Analytical Services Inc. The samples were identified and assigned the lab numbers listed below. Samples with Lab Numbers 97074303, 97074304 and 97074306 were removed from hold and analyzed for TDS, Sulfate, Chloride and pH. This report consists of 10 pages excluding the cover letter, and the Chain of Custody.

<u>SAMPLE DESCRIPTION</u>	<u>CAS LAB NUMBER</u>
DPW-01 1310	97074301
DPW-01 1320	97074302
DPW-01 1258	97074303
DPW-01 1300	97074304
DPW-01 1302	97074305
DPW-01 1304	97074306
TRIP BLANK	97074307

  
\_\_\_\_\_  
Dan A. Farah, Ph.D.  
Director - Analytical Operations

This report shall not be reproduced except in full without the written approval of Capco Analytical Services Inc.  
The test results reported represent only the items being tested and may not represent the entire material from which the sample was taken.

Capco Analytical Services INC. (CAS)  
1536 Eastman Avenue, Suite B  
Ventura CA 93003  
(805) 644-1095

Client: Fugro( 9642-1217)  
Sample ID: DPW-01  
Date Received: 5/07/97  
Date Sampled: 5/02/97

Sample Matrix: Water  
CAS LAB NO: 970743  
Time Sampled: 1310

WET CHEMISTRY ANALYSIS SUMMARY

CAS LAB NO	COMPOUND	RESULT	UNITS	DF	PQL	METHOD	ANALYZED
97074303	pH	6.9	S.U.	----	----	150.1	5/13/97
97074304	Chloride	46000	mg/L	5000	5000	300.0	5/13/97
97074304	Sulfate	6100	mg/L	500	500	300.0	5/13/97
97074306	T.D.S.	43000	mg/L	1	40	160.1	5/13/96

T.D.S.: Total Dissolved Solids

PQL: Practical Quantitation Limit

BQL: Below Practical Quantitation Limit

*Diana Klionsky*  
Principal Analyst

Capco Analytical Services INC. (CAS)  
1536 Eastman Avenue, Suite B  
Ventura CA 93003  
(805) 644-1095

Client: Fugro( 9642-1217)  
Sample ID: Method Blank

CAS LAB NO: 970743-MB  
Sample Matrix: Water

WET CHEMISTRY BLANK ANALYSIS SUMMARY

CAS LAB NO	COMPOUND	RESULT	UNITS	DF	PQL	METHOD ANALYZED	
97074304	Chloride	BQL	mg/L	1.0	1	300.0	5/13/97
97074304	Sulfate	BQL	mg/L	1.0	1	300.0	5/13/97
97074306	T.D.S.	BQL	mg/L	1.0	40	160.1	5/13/96

T.D.S.: Total Dissolved Solids

PQL: Practical Quantitation Limit

BQL: Below Practical Quantitation Limit

*Diane Klionsky*  
Principal Analyst

Capco Analytical Services INC. (CAS)  
 1536 Eastman Avenue, Suite B  
 Ventura CA 93003  
 (805) 644-1095

Client: Fugro( 9642-1217)  
 Sample ID: DPW-01 1320  
 Date Received: 5/07/97  
 Date Sampled: 5/02/97

Sample Matrix: Water  
 CAS LAB NO: 97074302  
 Date Analyzed: 5/13/97

**CAM 17 METALS ANALYSIS**

METALS	TTLC		STLC		CAM LIMITS		EPA METHOD
	TTLC (mg/L)	PQL (mg/L)	STLC (mg/L)	PQL (mg/L)	TTLC (mg/L)	STLC (mg/L)	
Antimony	BQL	0.1			500	15	6010
Arsenic	0.040	0.02			500	5	7060
Barium	0.84	0.06			10000	100	6010
Beryllium	BQL	0.1			75	0.75	6010
Cadmium	BQL	0.03			100	1	6010
Chromium	1.1	0.04			2500	560	6010
Cobalt	0.09	0.05			8000	80	6010
Copper	0.17	0.03			2500	25	6010
Lead	BQL	0.09			1000	5	6010
Mercury	BQL	0.0005			20	0.2	7471
Molybdenum	0.17	0.08			3500	350	6010
Nickel	0.26	0.08			2000	20	6010
Selenium	BQL	0.04*			100	1	7740
Silver	BQL	0.06			500	5	6010
Thallium	BQL	0.2			700	7	7841
Vanadium	3.8	0.07			2400	24	6010
Zinc	0.74	0.06			5000	250	6010

\*PQL raised due to high background  
 BQL: Below Practical Quantitation Limit  
 PQL: Practical Quantitation Limit

*Diana Klionsky*  
 Principal Analyst

**Capco Analytical Services INC. (CAS)**  
 1536 Eastman Avenue, Suite B  
 Ventura CA 93003  
 (805) 644-1095

Client: Fugro( 9642-1217)  
 Sample ID: Method Blank  
 CAS LAB NO: 970743-MB

Sample Matrix: Water  
 Analyst: M.J.  
 Date Analyzed: 5/13/97

**CAM 17 METALS - METHOD BLANK ANALYSIS**

METALS	TTLIC		STLIC		CAM LIMITS		EPA METHOD
	TTLIC (mg/L)	PQL (mg/L)	STLIC (mg/L)	PQL (mg/L)	TTLIC (mg/L)	STLIC (mg/L)	
Antimony	BQL	0.1			500	15	6010
Arsenic	BQL	0.02			500	5	7060
Barium	BQL	0.06			10000	100	6010
Beryllium	BQL	0.1			75	0.75	6010
Cadmium	BQL	0.03			100	1	6010
Chromium	BQL	0.04			2500	560	6010
Cobalt	BQL	0.05			8000	80	6010
Copper	BQL	0.03			2500	25	6010
Lead	BQL	0.09			1000	5	6010
Mercury	BQL	0.0005			20	0.2	7471
Molybdenum	BQL	0.08			3500	350	6010
Nickel	BQL	0.08			2000	20	6010
Selenium	BQL	0.01			100	1	7740
Silver	BQL	0.06			500	5	6010
Thallium	BQL	0.2			700	7	7841
Vanadium	BQL	0.07			2400	24	6010
Zinc	BQL	0.06			5000	250	6010

BQL: Below Practical Quantitation Limit  
 PQL: Practical Quantitation Limit

*Diane Klionsky*  
 Principal Analyst

Capco Analytical Services INC. (CAS)  
 1536 Eastman Avenue, Suite B  
 Ventura CA 93003  
 (805) 644-1095

Client: Fugro( 9642-1217)	Date Analyzed: 5/08/97
Sample ID: DPW-01 1302	Analyst: JAC
CAS LAB NO: 97074305	Sample Matrix: Water
Date Received: 5/07/97	Date Extracted: N/A
Date Sampled: 5/02/97	Time Sampled: 1302

VOLATILE ORGANIC COMPOUNDS - EPA Method 624

Compound	Concentration ug/L	Dilution Factor	PQL ug/L
Benzene	BQL	1.0	0.5
Bromodichloromethane	BQL	1.0	1.0
Bromoform	BQL	1.0	1.0
Bromomethane	BQL	1.0	0.5
Carbon tetrachloride	BQL	1.0	0.5
Chlorobenzene	BQL	1.0	1.0
Chloroethane	BQL	1.0	1.0
2-Chloroethyl vinyl ether	BQL	1.0	6.0
Chloroform	BQL	1.0	1.0
Chloromethane	BQL	1.0	1.0
Dibromochloromethane	BQL	1.0	1.0
1,2-Dichlorobenzene	BQL	1.0	0.5
1,3-Dichlorobenzene	BQL	1.0	0.5
1,4-Dichlorobenzene	BQL	1.0	1.0
1,1-Dichloroethane	BQL	1.0	0.5
cis-1,2-Dichloroethene	BQL	1.0	0.5
1,2-Dichloroethane	BQL	1.0	1
1,1-Dichloroethene	BQL	1.0	0.5
trans-1,2-Dichloroethene	BQL	1.0	0.5
1,2-Dichloropropane	BQL	1.0	0.5
cis-1,3-Dichloropropene	BQL	1.0	1.0
trans-1,3-Dichloropropene	BQL	1.0	1
Ethylbenzene	BQL	1.0	1
Methylene chloride	BQL	1.0	2.0
Styrene	BQL	1.0	1.0
1,1,2,2-Tetrachloroethane	BQL	1.0	1
Tetrachloroethene	BQL	1.0	1.0
Toluene	BQL	1.0	1
total Xylenes	BQL	1.0	2
1,1,1-Trichloroethane	BQL	1.0	1.0
1,1,2-Trichloroethane	BQL	1.0	1
Trichloroethylene	BQL	1.0	1
Trichlorofluoromethane	BQL	1.0	1.0
Vinyl chloride	BQL	1.0	1.0

N. Aban  
Principal Analyst

Client: Fugro( 9642-1217)  
Sample ID: DPW-01 1302  
CAS LAB NO: 97074305  
Date Received: 5/07/97  
Date Sampled: 5/02/97

Date Analyzed: 5/08/97  
Analyst: JAC  
Sample Matrix: Water  
Date Extracted: N/A  
Time Sampled: 1302

**SURROGATE RECOVERY**  
**EPA Method 624**

<u>Surrogate</u>	<u>% Recovery</u>	<u>Control Limits</u>
Dibromofluoromethane	112	86-118%
Toluene-d8	98	88-110%
4-Bromofluorobenzene	88	86-115%

BQL: Below Practical Quantitation Limit  
PQL: Practical Quantitation Limit

N. Abad  
Principal Analyst

**Capco Analytical Services INC. (CAS)**  
**1536 Eastman Avenue, Suite B**  
**Ventura CA 93003**  
**(805) 644-1095**

Client: Fugro( 9642-1217)	Date Analyzed: 5/08/97
Sample ID: Trip Blank	Analyst: JAC
CAS LAB NO: 97074307	Sample Matrix: Water
Date Received: 5/07/97	Date Extracted: N/A
Date Sampled: 5/02/97	Time Sampled:

**VOLATILE ORGANIC COMPOUNDS - EPA Method 624**

Compound	Concentration ug/L	Dilution Factor	PQL ug/L
Benzene	BQL	1.0	0.5
Bromodichloromethane	BQL	1.0	1.0
Bromoform	BQL	1.0	1.0
Bromomethane	BQL	1.0	0.5
Carbon tetrachloride	BQL	1.0	0.5
Chlorobenzene	BQL	1.0	1.0
Chloroethane	BQL	1.0	1.0
2-Chloroethyl vinyl ether	BQL	1.0	6.0
Chloroform	BQL	1.0	1.0
Chloromethane	BQL	1.0	1.0
Dibromochloromethane	BQL	1.0	1.0
1,2-Dichlorobenzene	BQL	1.0	0.5
1,3-Dichlorobenzene	BQL	1.0	0.5
1,4-Dichlorobenzene	BQL	1.0	1.0
1,1-Dichloroethane	BQL	1.0	0.5
cis-1,2-Dichloroethene	BQL	1.0	0.5
1,2-Dichloroethane	BQL	1.0	1
1,1-Dichloroethene	BQL	1.0	0.5
trans-1,2-Dichloroethene	BQL	1.0	0.5
1,2-Dichloropropane	BQL	1.0	0.5
cis-1,3-Dichloropropene	BQL	1.0	1.0
trans-1,3-Dichloropropene	BQL	1.0	1
Ethylbenzene	BQL	1.0	1
Methylene chloride	BQL	1.0	2.0
Styrene	BQL	1.0	1.0
1,1,2,2-Tetrachloroethane	BQL	1.0	1
Tetrachloroethene	BQL	1.0	1.0
Toluene	BQL	1.0	1
total Xylenes	BQL	1.0	2
1,1,1-Trichloroethane	BQL	1.0	1.0
1,1,2-Trichloroethane	BQL	1.0	1
Trichloroethylene	BQL	1.0	1
Trichlorofluoromethane	BQL	1.0	1.0
Vinyl chloride	BQL	1.0	1.0

*N. Aba*  
 \_\_\_\_\_  
 Principal Analyst

Client: Fugro( 9642-1217)  
Sample ID: Trip Blank  
CAS LAB NO: 97074307  
Date Received: 5/07/97  
Date Sampled: 5/02/97

Date Analyzed: 5/08/97  
Analyst: JAC  
Sample Matrix: Water  
Date Extracted: N/A  
Time Sampled:

**SURROGATE RECOVERY**  
**EPA Method 624**

<u>Surrogate</u>	<u>% Recovery</u>	<u>Control Limits</u>
Dibromofluoromethane	102	86-118%
Toluene-d8	100	88-110%
4-Bromofluorobenzene	94	86-115%

BQL: Below Practical Quantitation Limit  
PQL: Practical Quantitation Limit

*N. Abu*  
Principal Analyst

Capco Analytical Services INC. (CAS)  
 1536 Eastman Avenue, Suite B  
 Ventura CA 93003  
 (805) 644-1095

Client: Fugro( 9642-1217) Date Analyzed: 5/08/97  
 Sample ID: Method Blank Analyst: JAC  
 CAS LAB NO: 970743-MB Sample Matrix: Water  
 Date Extracted: N/A

VOLATILE ORGANIC COMPOUNDS - EPA Method 624

Compound	Concentration ug/L	Dilution Factor	PQL ug/L
Benzene	BQL	1.0	0.5
Bromodichloromethane	BQL	1.0	1.0
Bromoform	BQL	1.0	1.0
Bromomethane	BQL	1.0	0.5
Carbon tetrachloride	BQL	1.0	0.5
Chlorobenzene	BQL	1.0	1.0
Chloroethane	BQL	1.0	1.0
2-Chloroethyl vinyl ether	BQL	1.0	6.0
Chloroform	BQL	1.0	1.0
Chloromethane	BQL	1.0	1.0
Dibromochloromethane	BQL	1.0	1.0
1,2-Dichlorobenzene	BQL	1.0	0.5
1,3-Dichlorobenzene	BQL	1.0	0.5
1,4-Dichlorobenzene	BQL	1.0	1.0
1,1-Dichloroethane	BQL	1.0	0.5
cis-1,2-Dichloroethene	BQL	1.0	0.5
1,2-Dichloroethane	BQL	1.0	1
1,1-Dichloroethene	BQL	1.0	0.5
trans-1,2-Dichloroethene	BQL	1.0	0.5
1,2-Dichloropropane	BQL	1.0	0.5
cis-1,3-Dichloropropene	BQL	1.0	1.0
trans-1,3-Dichloropropene	BQL	1.0	1
Ethylbenzene	BQL	1.0	1
Methylene chloride	BQL	1.0	2.0
Styrene	BQL	1.0	1.0
1,1,2,2-Tetrachloroethane	BQL	1.0	1
Tetrachloroethene	BQL	1.0	1.0
Toluene	BQL	1.0	1
total Xylenes	BQL	1.0	2
1,1,1-Trichloroethane	BQL	1.0	1.0
1,1,2-Trichloroethane	BQL	1.0	1
Trichloroethylene	BQL	1.0	1
Trichlorofluoromethane	BQL	1.0	1.0
Vinyl chloride	BQL	1.0	1.0

*N. Abac*  
 Principal Analyst

Client: Fugro( 9642-1217)  
Sample ID: Method Blank  
CAS LAB NO: 970743-MB  
Date Extracted: N/A

Date Analyzed: 5/08/97  
Analyst: JAC  
Sample Matrix: Water

**SURROGATE RECOVERY**  
**EPA Method 624**

<u>Surrogate</u>	<u>% Recovery</u>	<u>Control Limits</u>
Dibromofluoromethane	116	86-118%
Toluene-d8	100	88-110%
4-Bromofluorobenzene	114	86-115%

BQL: Below Practical Quantitation Limit  
PQL: Practical Quantitation Limit

N. Aba  
Principal Analyst

Water Samples



970748-

LABORATORY				LABORATORY LOCATION		DATE 5/2/97	FM JOB No. 9642-1217		
CLIENT POLA / DWP				PROJECT Eries Ave Sewer Main Replacement					
PROJECT MANAGER T. McNeilan				SAMPLER (Signature) Craig Prentice					
Laboratory No.	Sample No.	Location and Description	Date	Time	Vessel Type	No. of Vessels	Sample Matrix	Preservation Method	Tests Required
	1	DPW-01	5/2/97	1310	9	1	W	HNO <sub>3</sub>	Hold
	2	DPW-01	5/2/97	1320	9	1	W	HNO <sub>3</sub>	B
	3	DPW-01	5/2/97	1258	7	1	W	A	Hold
	4	DPW-01	5/2/97	1300	7	1	W	A	Hold
	5	DPW-01	5/2/97	1302	7	1	W	A	A
	6	DPW-01	5/2/97	1304	7	1	W	A	Hold
		Trip Blank					W	A	A

VESSEL TYPE		SAMPLE MATRIX		TEST REQUIRED	
1	Brass or stainless steel sleeve, 2 1/2-inch diameter by 1, 3, 4, or 6 inches long	A	Air	A	624
2	Brass or stainless steel sleeve, 1 1/2-inch diameter by 4 inches long	S	Solid	B	6010/7470
3	Stainless steel sleeve, 1 inch diameter by 6 inches long	W	Water	C	
4	Amber glass bottle with Teflon lined screw cap, 1,000 milliliters	O	Other	D	
5	Amber glass bottle with Teflon lined screw cap, 260 milliliters	PRESERVATION METHOD		E	
6	Clear glass jar with Teflon lined screw cap, 4 or 6 ounces	A	Artificial ice	F	
7	VOA vial, 40 milliliters	B	NaHSO <sub>4</sub>	G	
8	Mason jar, 1 pint or 1 quart	C	HNO <sub>3</sub>	H	
9	Plastic bottle, 1 liter	D	None	I	
10	Other	E	Other	J	

RELINQUISHED BY: (Signature) <i>Craig Prentice</i>	RECEIVED BY: (Signature) <i>[Signature]</i>	DATE 5/7/97	TIME 3 PM
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE:	TIME:
RELINQUISHED BY: (Signature)	RECEIVED FOR LABORATORY BY: (Signature)	DATE:	TIME:
METHOD OF SHIPMENT:	TURNAROUND TIME: <i>Normal</i>	SAMPLE DISPOSAL: <input type="checkbox"/> Return to FM <input type="checkbox"/> Proper disposal by Lab after 60 days	
SPECIAL INSTRUCTIONS:			
HANDLING INFORMATION			

White - FM Copy      Yellow - Laboratory Copy      Pink - Return to FM with Results

5855 Olivas Park Drive • Ventura, California 93003-7672 • (805) 650-7000, FAX (805) 650-7010

18°C

Capco Analytical Services Incorporated (CAS)  
1536 Eastman Avenue, Suite B  
Ventura, CA. 93003  
(805) 644-1095

---

Prepared For: Fugro (9642-1217) May 14, 1997  
5855 Olivas Park Drive  
Ventura, CA 93003-7672

**ATTENTION: T. McNeilan**

---

Laboratory No: 970744 Job No: B01295  
Date Received: 07-MAY-97 Sampled By: Client  
Project: Frier Ave. Sewer Main Sample ID: See Below  
Replacement-9642-1217

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**RESULTS**

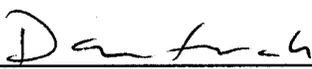
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On May 7, 1997, seven (7) samples were received for analysis by Capco Analytical Services Inc. The samples were identified and assigned the lab numbers listed below. Samples with Lab Numbers 97074402, 97074403 and 97074406 were removed from hold and analyzed for TDS, Sulfate, Chloride and pH. This report consists of 8 pages excluding the cover letter, and the Chain of Custody.

<u>SAMPLE DESCRIPTION</u>	<u>CAS LAB NUMBER</u>
DPW-05 15:50	97074401
DPW-05 15:52	97074402
DPW-05 15:54	97074403
DPW-05 15:56	97074404
DPW-05 16:10	97074405
DPW-05 16:25	97074406

**RECEIVED**  
MAY 16 1997

**FUGRO - WEST, INC.**

  
\_\_\_\_\_  
Dan A. Farah, Ph.D.  
Director - Analytical Operations

This report shall not be reproduced except in full without the written approval of Capco Analytical Services Inc.  
The test results reported represent only the items being tested and may not represent the entire material from which the sample was taken.

Capco Analytical Services INC. (CAS)  
1536 Eastman Avenue, Suite B  
Ventura CA 93003  
(805) 644-1095

Client: Fugro( 9642-1217)  
Sample ID: DPW-05  
Date Received: 5/07/97  
Date Sampled: 5/02/97

Sample Matrix: Water  
CAS LAB NO: 970744  
Time Sampled: 1550

WET CHEMISTRY ANALYSIS SUMMARY

CAS LAB NO	COMPOUND	RESULT	UNITS	DF	PQL	METHOD	ANALYZED
97074302	pH	7.4	S.U.	----	----	150.1	5/13/97
97074303	Chloride	19000	mg/L	1000	1000	300.0	5/13/97
97074303	Sulfate	2100	mg/L	500	500	300.0	5/13/97
97074306	T.D.S.	30000	mg/L	1.0	40	160.1	5/13/96

T.D.S.: Total Dissolved Solids

PQL: Practical Quantitation Limit

BQL: Below Practical Quantitation Limit

*Diana Klionsky*  
Principal Analyst

Capco Analytical Services INC. (CAS)  
1536 Eastman Avenue, Suite B  
Ventura CA 93003  
(805) 644-1095

Client: Fugro( 9642-1217)  
Sample ID: Method Blank

CAS LAB NO: 970744-MB  
Sample Matrix: Water

WET CHEMISTRY BLANK ANALYSIS SUMMARY

CAS LAB NO	COMPOUND	RESULT	UNITS	DF	PQL	METHOD ANALYZED	
97074303	Chloride	BQL	mg/L	1.0	1	300.0	5/13/97
97074303	Sulfate	BQL	mg/L	1.0	1	300.0	5/13/97
97074306	T.D.S.	BQL	mg/L	1.0	40	160.1	5/13/96

T.D.S.: Total Dissolved Solids

PQL: Practical Quantitation Limit

BQL: Below Practical Quantitation Limit

*Diana Kliouisky*  
Principal Analyst

**Capco Analytical Services INC. (CAS)**  
**1536 Eastman Avenue, Suite B**  
**Ventura CA 93003**  
**(805) 644-1095**

Client: Fugro( 9642-1217)  
Sample ID: DPW-05 1556  
CAS LAB NO: 97074404  
Date Received: 5/07/97  
Date Sampled: 5/02/97

Date Analyzed: 5/08/97  
Analyst: JAC  
Sample Matrix: Water  
Date Extracted: N/A  
Time Sampled: 1556

**VOLATILE ORGANIC COMPOUNDS - EPA Method 624**

Compound	Concentration ug/L	Dilution Factor	PQL ug/L
Benzene	BQL	1.0	0.5
Bromodichloromethane	BQL	1.0	0.5
Bromoform	BQL	1.0	10
Bromomethane	BQL	1.0	0.5
Carbon tetrachloride	BQL	1.0	0.5
Chlorobenzene	BQL	1.0	1
Chloroethane	BQL	1.0	0.5
2-Chloroethyl vinyl ether	BQL	1.0	0.5
Chloroform	BQL	1.0	0.5
Chloromethane	BQL	1.0	0.5
Dibromochloromethane	BQL	1.0	5
1,2-Dichlorobenzene	BQL	1.0	0.5
1,3-Dichlorobenzene	BQL	1.0	0.5
1,4-Dichlorobenzene	BQL	1.0	0.5
1,1-Dichloroethane	BQL	1.0	0.5
cis-1,2-Dichloroethene	BQL	1.0	0.5
1,2-Dichloroethane	BQL	1.0	1
1,1-Dichloroethene	BQL	1.0	0.5
trans-1,2-Dichloroethene	BQL	1.0	0.5
1,2-Dichloropropane	BQL	1.0	0.5
cis-1,3-Dichloropropene	BQL	1.0	0.5
trans-1,3-Dichloropropene	BQL	1.0	1
Ethylbenzene	BQL	1.0	1
Methylene chloride	BQL	1.0	1
Styrene	BQL	1.0	0.5
1,1,2,2-Tetrachloroethane	BQL	1.0	1
Tetrachloroethene	BQL	1.0	0.5
Toluene	BQL	1.0	1
total Xylenes	BQL	1.0	2
1,1,1-Trichloroethane	BQL	1.0	0.5
1,1,2-Trichloroethane	BQL	1.0	1
Trichloroethylene	BQL	1.0	1
Trichlorofluoromethane	BQL	1.0	0.5
Vinyl chloride	BQL	1.0	0.5

  
Principal Analyst

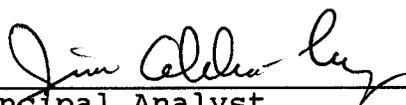
Client: Fugro( 9642-1217)  
Sample ID: DPW-05 1556  
CAS LAB NO: 97074404  
Date Received: 5/07/97  
Date Sampled: 5/02/97

Date Analyzed: 5/08/97  
Analyst: JAC  
Sample Matrix: Water  
Date Extracted: N/A  
Time Sampled: 1556

**SURROGATE RECOVERY**  
**EPA Method 624**

<u>Surrogate</u>	<u>% Recovery</u>	<u>Control Limits</u>
Dibromofluoromethane	112	86-118%
Toluene-d8	103	88-110%
4-Bromofluorobenzene	88	86-115%

BQL: Below Practical Quantitation Limit  
PQL: Practical Quantitation Limit

  
Principal Analyst

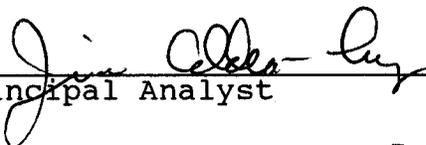
Capco Analytical Services INC. (CAS)  
 1536 Eastman Avenue, Suite B  
 Ventura CA 93003  
 (805) 644-1095

Client: Fugro( 9642-1217)  
 Sample ID: Method Blank  
 CAS LAB NO: 970744-MB  
 Date Extracted: N/A

Date Analyzed: 5/08/97  
 Analyst: JAC  
 Sample Matrix: Liquid

METHOD BLANK ANALYSIS - EPA Method 624

Compound	Concentration ug/L	Dilution Factor	PQL ug/L
Benzene	BQL	1.0	0.5
Bromodichloromethane	BQL	1.0	0.5
Bromoform	BQL	1.0	10
Bromomethane	BQL	1.0	0.5
Carbon tetrachloride	BQL	1.0	0.5
Chlorobenzene	BQL	1.0	1
Chloroethane	BQL	1.0	0.5
2-Chloroethyl vinyl ether	BQL	1.0	0.5
Chloroform	BQL	1.0	0.5
Chloromethane	BQL	1.0	0.5
Dibromochloromethane	BQL	1.0	5
1,2-Dichlorobenzene	BQL	1.0	0.5
1,3-Dichlorobenzene	BQL	1.0	0.5
1,4-Dichlorobenzene	BQL	1.0	0.5
1,1-Dichloroethane	BQL	1.0	0.5
cis-1,2-Dichloroethene	BQL	1.0	0.5
1,2-Dichloroethane	BQL	1.0	1
1,1-Dichloroethene	BQL	1.0	0.5
trans-1,2-Dichloroethene	BQL	1.0	0.5
1,2-Dichloropropane	BQL	1.0	0.5
cis-1,3-Dichloropropene	BQL	1.0	0.5
trans-1,3-Dichloropropene	BQL	1.0	1
Ethylbenzene	BQL	1.0	1
Methylene chloride	BQL	1.0	1
Styrene	BQL	1.0	0.5
1,1,2,2-Tetrachloroethane	BQL	1.0	1
Tetrachloroethene	BQL	1.0	0.5
Toluene	BQL	1.0	1
total Xylenes	BQL	1.0	2
1,1,1-Trichloroethane	BQL	1.0	0.5
1,1,2-Trichloroethane	BQL	1.0	1
Trichloroethylene	BQL	1.0	1
Trichlorofluoromethane	BQL	1.0	0.5
Vinyl chloride	BQL	1.0	0.5

  
 Principal Analyst

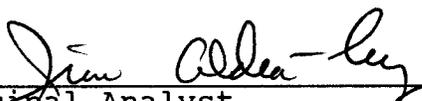
Client: Fugro( 9642-1217)  
Sample ID: Method Blank  
CAS LAB NO: 970744-MB  
Date Extracted: N/A

Date Analyzed: 5/08/97  
Analyst: JAC  
Sample Matrix: Liquid

**SURROGATE RECOVERY**  
**EPA Method .624**

<u>Surrogate</u>	<u>% Recovery</u>	<u>Control Limits</u>
Dibromofluoromethane	116	86-118%
Toluene-d8	100	88-110%
4-Bromofluorobenzene	114	86-115%

BQL: Below Practical Quantitation Limit  
PQL: Practical Quantitation Limit

  
Principal Analyst

**Capco Analytical Services INC. (CAS)**  
 1536 Eastman Avenue, Suite B  
 Ventura CA 93003  
 (805) 644-1095

Client: Fugro( 9642-1217)  
 Sample ID: DPW-05 1610  
 Date Received: 5/07/97  
 Date Sampled: 5/02/97

Sample Matrix: Water  
 CAS LAB NO: 97074405  
 Date Analyzed: 5/13/97

**CAM 17 METALS ANALYSIS**

METALS	TTLC		STLC		CAM LIMITS		EPA METHOD
	TTLC (mg/L)	PQL (mg/L)	STLC (mg/L)	PQL (mg/L)	TTLC (mg/L)	STLC (mg/L)	
Antimony	BQL	0.1			500	15	6010
Arsenic	0.16	0.02			500	5	7060
Barium	0.96	0.06			10000	100	6010
Beryllium	BQL	0.1			75	0.75	6010
Cadmium	BQL	0.03			100	1	6010
Chromium	1.2	0.04			2500	560	6010
Cobalt	0.08	0.05			8000	80	6010
Copper	0.90	0.03			2500	25	6010
Lead	1.2	0.09			1000	5	6010
Mercury	BQL	0.0005			20	0.2	7471
Molybdenum	0.16	0.08			3500	350	6010
Nickel	0.26	0.08			2000	20	6010
Selenium	BQL	0.04*			100	1	7740
Silver	BQL	0.06			500	5	6010
Thallium	BQL	0.2			700	7	7841
Vanadium	4.3	0.07			2400	24	6010
Zinc	3.3	0.06			5000	250	6010

\*PQL raised due to high background  
 BQL: Below Practical Quantitation Limit  
 PQL: Practical Quantitation Limit

*Diana Klioucky*  
 Principal Analyst

**Capco Analytical Services INC. (CAS)**  
 1536 Eastman Avenue, Suite B  
 Ventura CA 93003  
 (805) 644-1095

Client: Fugro( 9642-1217)  
 Sample ID: Method Blank  
 CAS LAB NO: 970744-MB

Sample Matrix: Water  
 Analyst: DK  
 Date Analyzed: 5/13/97

**CAM 17 METALS - METHOD BLANK ANALYSIS**

METALS	TTLIC		STLIC		CAM LIMITS		EPA METHOD
	TTLIC (mg/L)	PQL (mg/L)	STLIC (mg/L)	PQL (mg/L)	TTLIC (mg/L)	STLIC (mg/L)	
Antimony	BQL	0.1			500	15	6010
Arsenic	BQL	0.02			500	5	7060
Barium	BQL	0.06			10000	100	6010
Beryllium	BQL	0.1			75	0.75	6010
Cadmium	BQL	0.03			100	1	6010
Chromium	BQL	0.04			2500	560	6010
Cobalt	BQL	0.05			8000	80	6010
Copper	BQL	0.03			2500	25	6010
Lead	BQL	0.09			1000	5	6010
Mercury	BQL	0.0005			20	0.2	7471
Molybdenum	BQL	0.08			3500	350	6010
Nickel	BQL	0.08			2000	20	6010
Selenium	BQL	0.01			100	1	7740
Silver	BQL	0.06			500	5	6010
Thallium	BQL	0.2			700	7	7841
Vanadium	BQL	0.07			2400	24	6010
Zinc	BQL	0.06			5000	250	6010

BQL: Below Practical Quantitation Limit  
 PQL: Practical Quantitation Limit

*Diana Klioucky*  
 Principal Analyst

**CHAIN OF CUSTODY RECORD**

*Water Samples*



LABORATORY				LABORATORY LOCATION		DATE <i>5/2/97</i>	FM JOB No. <i>97042-1217</i>		
CLIENT <i>POCA / DWP</i>				PROJECT <i>Frier Ave Sewer Main Replacement</i>					
PROJECT MANAGER <i>T. McNeilan</i>				SAMPLER (Signature) <i>Craig Prentice</i>					

Laboratory No.	Sample No.	Location and Description	Date	Time	Vessel Type	No. of Vessels	Sample Matrix	Preservation Method	Tests Required
	<i>1</i>	<i>DPW-05</i>	<i>5/2/97</i>	<i>15:50</i>	<i>7</i>	<i>1</i>	<i>W</i>	<i>A</i>	<i>Hold</i>
	<i>2</i>	<i>DPW-05</i>	<i>5/2/97</i>	<i>15:52</i>	<i>7</i>	<i>1</i>	<i>W</i>	<i>A</i>	<i>Hold</i>
	<i>3</i>	<i>DPW-05</i>	<i>5/2/97</i>	<i>15:54</i>	<i>7</i>	<i>1</i>	<i>W</i>	<i>A</i>	<i>Hold</i>
	<i>4</i>	<i>DPW-05</i>	<i>5/2/97</i>	<i>15:56</i>	<i>7</i>	<i>1</i>	<i>W</i>	<i>A</i>	<i>A</i>
	<i>5</i>	<i>DPW-05</i>	<i>5/2/97</i>	<i>16:10</i>	<i>9</i>	<i>1</i>	<i>W</i>	<i>A</i>	<i>B</i>
	<i>6</i>	<i>DPW-05</i>	<i>5/2/97</i>	<i>16:25</i>	<i>9</i>	<i>1</i>	<i>W</i>	<i>A</i>	<i>Hold</i>
	<i>7</i>	<i>DPW-05</i>							
							<i>97074</i>		

VESSEL TYPE	SAMPLE MATRIX	TEST REQUIRED
<i>1</i> Brass or stainless steel sleeve, 2 1/2-inch diameter by 1, 3, 4, or 6 inches long	<i>A</i> Air	<i>A</i> <i>624</i>
<i>2</i> Brass or stainless steel sleeve, 1 1/2-inch diameter by 4 inches long	<i>S</i> Solid	<i>B</i> <i>6010 17470</i>
<i>3</i> Stainless steel sleeve, 1 inch diameter by 6 inches long	<i>W</i> <u>Water</u>	<i>C</i>
<i>4</i> Amber glass bottle with Teflon lined screw cap, 1,000 milliliters	<i>O</i> Other	<i>D</i>
<i>5</i> Amber glass bottle with Teflon lined screw cap, 260 milliliters	<b>PRESERVATION METHOD</b>	
<i>6</i> Clear glass jar with Teflon lined screw cap, 4 or 6 ounces	<i>A</i> Artificial ice	<i>F</i>
<i>7</i> VOA vial, 40 milliliters	<i>B</i> NaHSO <sub>4</sub>	<i>G</i>
<i>8</i> Mason jar, 1 pint or 1 quart	<i>C</i> HNO <sub>3</sub>	<i>H</i>
<i>9</i> Plastic bottle, 1 liter	<i>D</i> None	<i>I</i>
<i>10</i> Other	<i>E</i> Other	<i>J</i>

RELINQUISHED BY: (Signature) <i>Craig Prentice</i>		RECEIVED BY: (Signature) <i>Dan Ferch</i>		DATE: <i>5/7/97</i>	TIME: <i>3 PM</i>
RELINQUISHED BY: (Signature)		RECEIVED BY: (Signature)		DATE:	TIME:
RELINQUISHED BY: (Signature)		RECEIVED FOR LABORATORY BY: (Signature)		DATE:	TIME:
METHOD OF SHIPMENT:	TURNAROUND TIME: <i>Normal</i>	SAMPLE DISPOSAL: <input type="checkbox"/> Return to FM <input type="checkbox"/> Proper disposal by Lab after 60 days			
SPECIAL INSTRUCTIONS: <i>18°C</i>					
HANDLING INFORMATION					

White - FM Copy

Yellow - Laboratory Copy

Pink - Return to FM with Results

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**APPENDIX D**  
**NEARBY VIBROCORES AND CPT'S**



ELEV. ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE	SAMPLE NUMBER	LOCATION: N 4,022,313 E 4,206,816 ELEVATION: -44.0 ft (re: MLLW; based on water depth of -46.9 ft and tide of 2.9 ft)	CORE RATE, ft/min				WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %
						5	10	15	20				
					<b>MATERIAL DESCRIPTION</b>								
-46	2			1	Clayey SAND (SC) to Sandy CLAY (CL): dark olive gray to black					34	42	29	15
-48	4			2	Silty fine SAND (SM): olive gray, with mica and shell fragments - clay seam at 5.5' - becomes light olive gray at 6' to 6.5'						21		
-50	6			3	Fine SAND with silt (SP-SM) to Silty fine SAND (SM): yellowish red to light gray, with limited iron staining - abundant shell fragments at 9'								
-52	8												
-54	10												
-56	12												
-58	14			4							8		
-60	16				- with clay seams at 15.75' to 16.25'								
-62	18			5									
-64	20												
PENETRATION DEPTH: 20.0 ft RECOVERY LENGTH: 20 ft DATE OF EXPLORATION: April 19, 1997						VESSEL: D/W Hood VIBROCORE TYPE: Environmental REVIEWED BY: FJArnold							
<b>LOG OF VIBROCORE NO. CG4-3</b>						UGIS ID: FD97V030							

ELEV. ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE	SAMPLE NUMBER	LOCATION: N 4,022,085 E 4,207,204 ELEVATION: -45.1 ft (re: MLLW; based on water depth of -45.9 ft and tide of 0.8 ft)	CORE RATE, ft/min				WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %
						5	10	15	20				
					<b>MATERIAL DESCRIPTION</b>								
-46	2			1	CLAY with sand (CL): very soft, black to olive gray					53	82		
-48	4			2	Silty fine SAND (SM): dark olive gray, with mica, shells, and occasional black silt patches						20		
-50	6												
-52	8												
-54	10			3	- abundant shell fragments at 9.25' to 9.75' Silty fine SAND (SM) to Sandy SILT (ML): yellowish red, with mica and some shells - brown stiff clay seam at 9.75' - abundant shells at 12.25'						52		
-56	12												
-58	14												
-60	16			4									
-62	18			5	- becomes medium grained, with iron staining, below 17'								
-64	20												
PENETRATION DEPTH: 19.5 ft RECOVERY LENGTH: 19.5 ft DATE OF EXPLORATION: April 20, 1997						VESSEL: D/W Hood VIBROCORE TYPE: Environmental REVIEWED BY: FJArnold							
<b>LOG OF VIBROCORE NO. CG4-6</b>						UGIS ID: FD97V033							

**LOGS OF VIBROCORES**  
Channel Deepening Program  
Port of Los Angeles





ELEV. ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE	SAMPLE NUMBER	LOCATION: N 4,022,596 E 4,207,439 ELEVATION: -46.8 ft (re: MLLW; based on water depth of -47.4 ft and tide of 0.6 ft)	CORE RATE, ft/min 5 10 15 20	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %
-48	2			1	Fine SAND with silt (SP-SM): dark olive gray, with mica and some shells  - abundant shell fragments at 6.45' Silty fine SAND (SM): yellowish red, with mica - abundant shells at 8' to 13'  - iron staining below 12' - becomes fine to medium grained below 13.5' - light gray, with abundant shells, below 15'			7		
-50	4									
-52	6									
-54	8			2					18	
-56	10									
-58	12									
-60	14			3						
-62	16			4						
-64	18									
-66	20									

PENETRATION DEPTH: 18.0 ft  
 RECOVERY LENGTH: 18 ft  
 DATE OF EXPLORATION: April 20, 1997

VESSEL: D/W Hood  
 VIBROCORE TYPE: Environmental  
 REVIEWED BY: FJArnold

**LOG OF VIBROCORE NO. CG4-7**

UGIS ID: FD97V034

ELEV. ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE	SAMPLE NUMBER	MATERIAL DESCRIPTION	CORE RATE, ft/min 5 10 15 20	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %

**LOGS OF VIBROCORES**  
 Channel Deepening Program  
 Port of Los Angeles





ELEV. ft	DEPTH. ft	MATERIAL SYMBOL	SAMPLE	SAMPLE NUMBER	LOCATION: N 4,022,806 E 4,207,490 ELEVATION: -43.9 ft (re: MLLW; based on water depth of -45.6 ft and tide of 1.7 ft)	CORE RATE, ft/min	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %
-46	2			1	<b>MATERIAL DESCRIPTION</b> Silty fine SAND (SM) to SAND with silt (SP-SM): yellow to olive gray, with mica and scattered pockets of dark gray silt  Fine SAND with silt (SP-SM): yellowish brown, with mica and few shell fragments  - iron staining at 15'  Silty fine SAND (SM): yellowish brown, with mica and 1" to 2" clay seams			13		
-48	4			2						
-50	6			3					8	
-52	8			4					5	
-54	10			5						
-56	12			6						
-58	14			6					4	
-60	16			7						
-62	18			7						
-64	20									

PENETRATION DEPTH: 20.0 ft  
 RECOVERY LENGTH: 20 ft  
 DATE OF EXPLORATION: April 23, 1997

VESSEL: R/W Hood  
 VIBROCORE TYPE: Geotechnical  
 REVIEWED BY: SGSukiasian

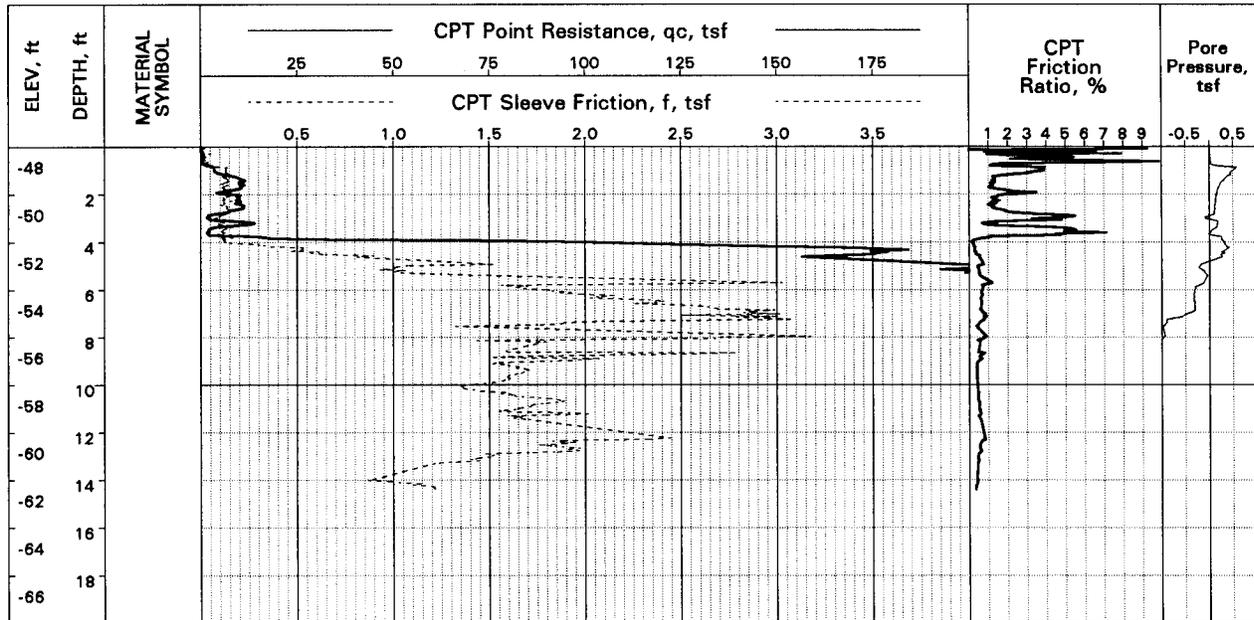
**LOG OF VIBROCORE NO. GT-13**

UGIS ID: FD97V095

ELEV. ft	DEPTH. ft	MATERIAL SYMBOL	SAMPLE	SAMPLE NUMBER	MATERIAL DESCRIPTION	CORE RATE, ft/min	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX, %

**LOGS OF VIBROCORES**  
 Channel Deepening Program  
 Port of Los Angeles



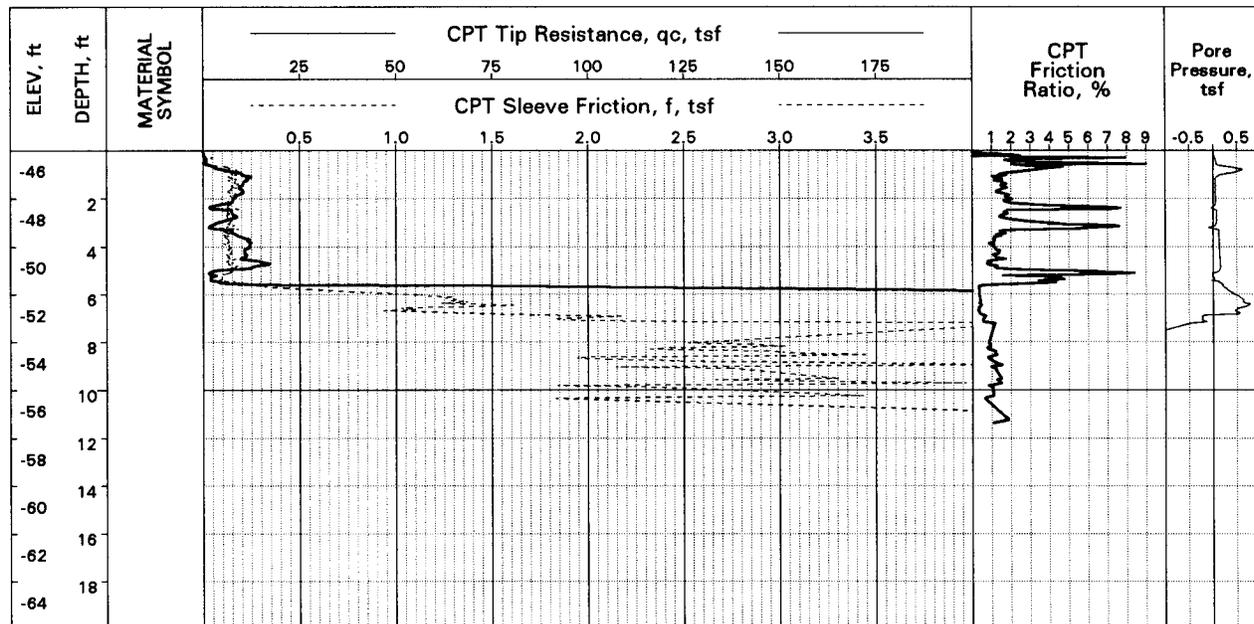


LOCATION: N 4,022,103 E 4,207,040  
 ELEVATION: -48.9 ft (re: MLLW; based on water depth of 52 ft and tide of 5.1 ft)  
 COMPLETION DEPTH: 14.4 ft  
 DATE OF EXPLORATION: August 6, 1996

VESSEL: M/V Ranger  
 TESTING METHOD: Seascout CPT  
 REVIEWED BY: GSResnick/TWMcNeilan

**LOG OF CPT NO. CB-23**

UGIS ID: FB96CB23



LOCATION: N 4,022,572 E 4,207,694  
 ELEVATION: -44.9 ft (re: MLLW; based on water depth of 50 ft and tide of 5.1 ft)  
 COMPLETION DEPTH: 11.5 ft  
 DATE OF EXPLORATION: August 6, 1996

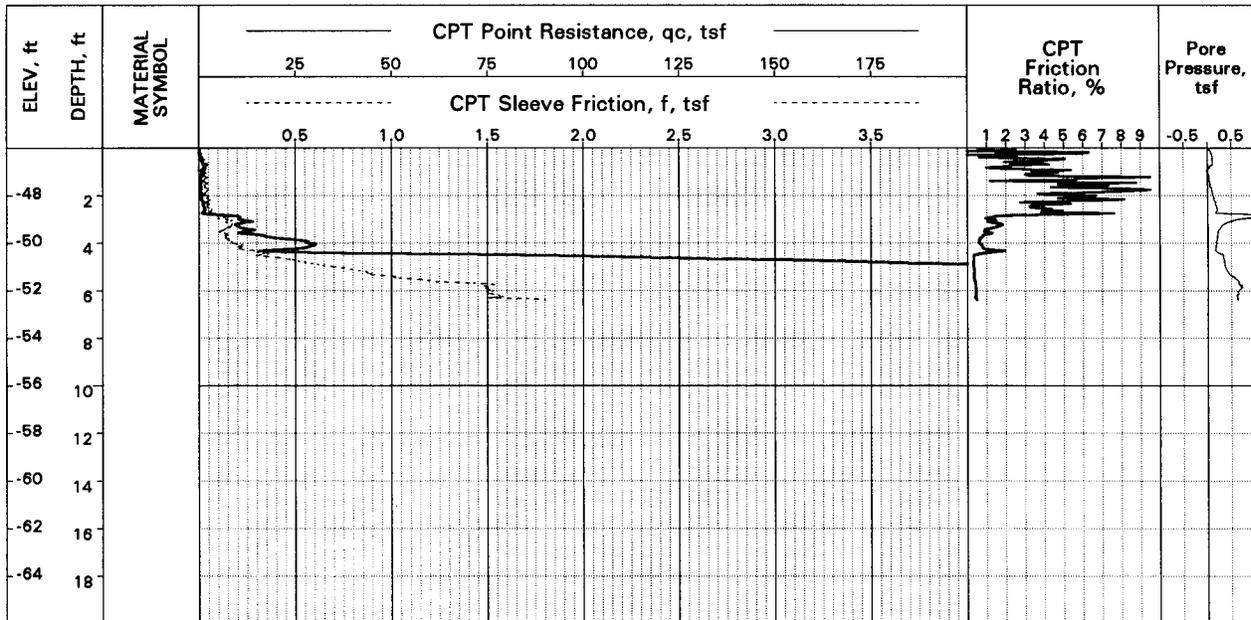
VESSEL: M/V Ranger  
 TESTING METHOD: Seascout CPT  
 REVIEWED BY: GSResnick/TWMcNeilan

**LOG OF CPT NO. CB-37**

UGIS ID: FB96CB37

**LOGS OF CPTs  
 CHANNEL DEEPENING PROGRAM**





LOCATION: N 4,022,676 E 4,207,417  
 ELEVATION: -45.9 ft (re: MLLW; based on water depth of 51 ft and tide of 5.1 ft)  
 COMPLETION DEPTH: 6.6 ft  
 DATE OF EXPLORATION: August 6, 1996

VESSEL: M/V Ranger  
 TESTING METHOD: Seascout CPT  
 REVIEWED BY: GSResnick/TWMcNeilan

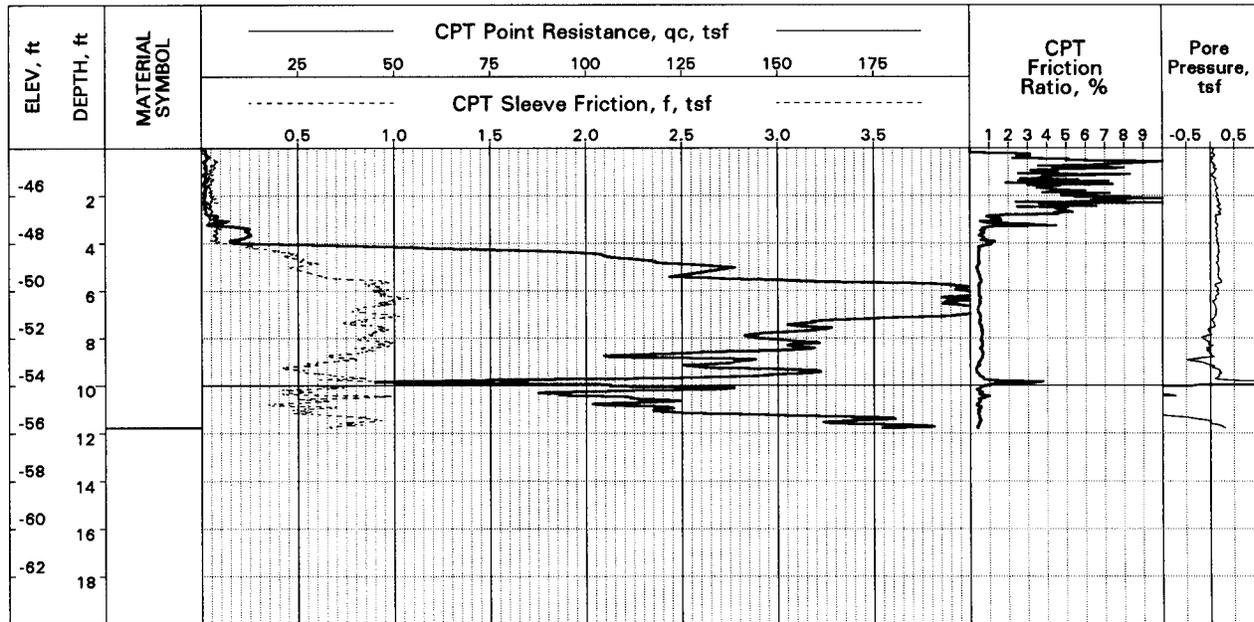
**LOG OF CPT NO. CB-38**

UGIS ID: FB96CB38

ELEV. ft DEPTH, ft	MATERIAL SYMBOL	CPT Tip Resistance, $q_c$ , tsf							CPT Friction Ratio, %	Pore Pressure, tsf										
		25	50	75	100	125	150	175		1	2	3	4	5	6	7	8	9	-0.5	0.5
		CPT Sleeve Friction, $f$ , tsf																		
							0.5	1.0	1.5	2.0	2.5	3.0	3.5							
		[Empty grid for CPT data]							[Empty grid for CPT data]											

**LOGS OF CPTs  
 CHANNEL DEEPENING PROGRAM**



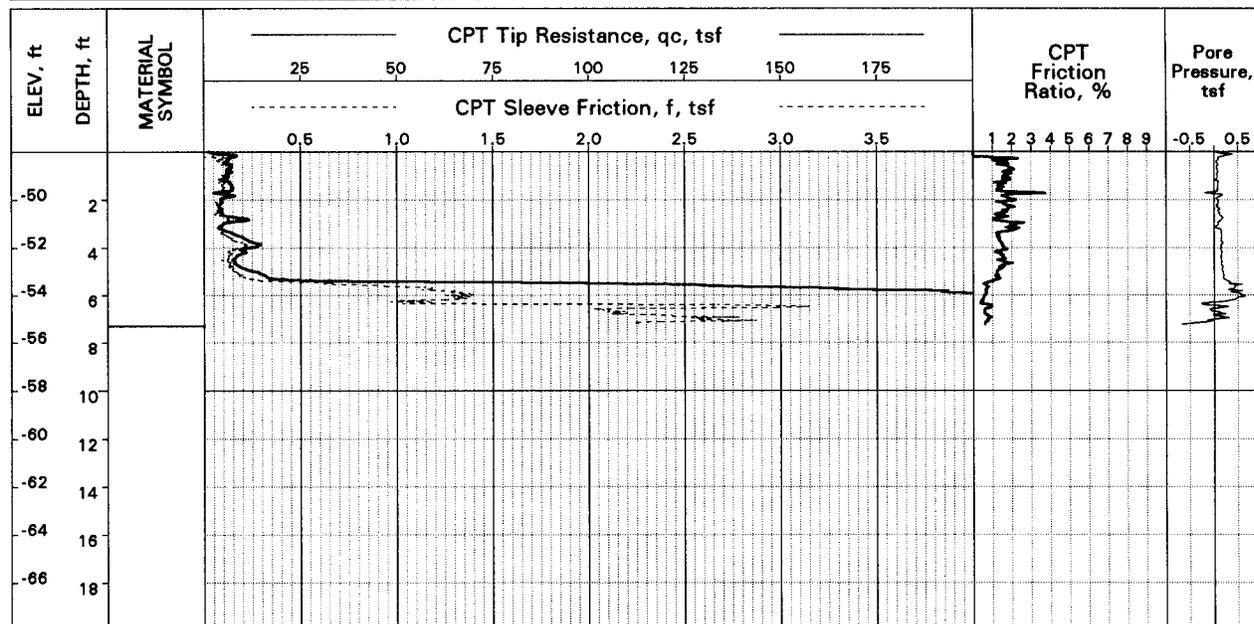


LOCATION: N 4,022,265 E 4,207,649  
 ELEVATION: -44.2 ft (re: MLLW; based on water depth of 48.4 ft and tide of 4.2 ft)  
 COMPLETION DEPTH: 11.8 ft  
 DATE OF EXPLORATION: April 21, 1997

VESSEL: M/V Ranger  
 TESTING METHOD: Seascout CPT  
 REVIEWED BY: GSResnick/TWMcNeilan

**LOG OF CPT NO. CPT-74**

UGIS ID: FD97C074



LOCATION: N 4,022,252 E 4,207,257  
 ELEVATION: -48.0 ft (re: MLLW; based on water depth of 49.2 ft and tide of 1.2 ft)  
 COMPLETION DEPTH: 7.3 ft  
 DATE OF EXPLORATION: April 26, 1997

VESSEL: M/V Ranger  
 TESTING METHOD: Seascout CPT  
 REVIEWED BY: GSResnick/TWMcNeilan

**LOG OF CPT NO. CPT-92**

UGIS ID: FD97C092

**LOGS OF CPTs  
 CHANNEL DEEPENING PROGRAM**

