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DATE: February 12, 2002
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SUBJECT: Station 4186

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GETTLER-RYAN Inc.

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**GROUNDWATER MONITORING WELL AND
OZONE MICROSPARGE SYSTEM INSTALLATION REPORT**

for
Tosco (76) Service Station No. 4186
1771 First Street
Livermore, California


Report No. 140175.07

Prepared for:

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February 6, 2002

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1.0 INTRODUCTION

At the request of Tosco Corporation (Tosco), a subsidiary of Phillips Petroleum Company, Gettler-Ryan Inc. (GR), has prepared this report documenting the installation of two groundwater monitoring wells and an ozone microsparge remedial measure to address impacted groundwater at the subject site. The scope of work included: obtaining the necessary well installation permits from the Zone 7 Water Agency; preparing a site specific health and safety plan; drilling ten soil borings and installing monitoring wells in two borings and ten ozone microsparge points in remaining eight borings; surveying the wellhead elevations; developing and sampling the wells; collecting and submitting selected soil and groundwater samples to a certified analytical laboratory for chemical analysis; coordinating Tosco's contractor to dispose of the soil cuttings; installation of an ozone microsparge system; and preparing a report which presents the findings of the investigation. This work was originally proposed in GR's *Work Plan for Installation of Monitoring Wells and Ozone Microsparging System*, dated November 27, 2001, and approved by Ms. Eva Chu of the Alameda County Environmental Health Services (ACEHS) on November 29, 2001.

2.0 SITE DESCRIPTION

The subject site is an operating service station located on the southwest corner of the intersection of First Street (State Highway 84) and N Street in Livermore, California (Figure 1). The site is bounded to the north by First Street, to the east by N Street, and to the south and west by commercial buildings. Properties in the immediate site vicinity are used for a mix of commercial purposes that include restaurants, automobile repair shops, and shopping facilities. The site is located at an approximate elevation of 480 feet above mean sea level (MSL).

Current aboveground site facilities consist of four dispenser islands, a canopy and a station building/convenience store. Two 10,000-gallon gasoline USTs are located in a common pit on the east side of the site. Prior to this investigation, five groundwater monitoring wells were present at and in the site vicinity. Pertinent site features are shown on Figure 2.

3.0 PREVIOUS ENVIRONMENTAL WORK

On June 6, 1996, GeoStrategies, Inc. (GSI) collected six soil samples from beneath the fuel dispensers and along the product delivery piping during dispenser and piping replacement activities. A total of 25 cubic yards of soils was excavated and transported to Forward Landfill located in Manteca, California. Analytical results were reported as not detected (ND) for Total Petroleum Hydrocarbons as gasoline (TPHg) and benzene, toluene, ethylbenzene and xylenes (BTEX) for all samples collected beneath the dispenser islands and product delivery piping (GSI, 1996).

On September 10, 1997, Pacific Environmental Group (PEG) conducted a soil gas survey as part of a baseline site evaluation associated with the property transfer from Unocal Corporation to Tosco. Six soil gas probes were advanced and samples collected at 3 or 15 feet bgs in the vicinity of the UST complex, dispenser islands, and product lines. Analytical results ranged from 41 to 4,500 parts per billion by volume (ppbv) of TPHg, ND to 110 ppbv of benzene and ND to 8,000 ppbv of MtBE. Field data sheets indicate that no petroleum hydrocarbon odors were noted. The area of highest soil vapor concentration appeared to be localized around the UST complex (PEG, 1997).

On April 8, 1998, GR reviewed files at the Alameda County Zone 7 Water Agency to identify water supply wells located within a one half mile radius from the site. Two municipal wells were identified approximately 1,500 and 1,800 feet northwest of the site, and two domestic wells were located approximately 1,900 and 2,800 feet southwest and west of the site.

On June 16, 1998, GR installed three 2-inch diameter groundwater monitoring wells designated as U-1 through U-3. The wells were installed to a depth of approximately 34 feet bgs. Soil samples collected from the three wells were reported as ND for TPHg, benzene, and MtBE.

In May of 2000, GR submitted a site conceptual model (SCM) for the site. In the SCM, GR calculated a groundwater flow velocity in order to determine the plume travel time to the nearest receptor. Groundwater velocity was calculated at 46 feet per year. Based on this calculation, the MtBE plume would be expected to reach the vicinity of the nearest sensitive receptor (municipal well) in approximately 33 years. The SCM concluded that hydrocarbon impact to groundwater appears to fluctuate with the historical rise and fall of the groundwater surface beneath the site.

On February 21, 2001, GR installed two 2-inch diameter offsite groundwater monitoring wells (U-4 and U-5) at the locations shown on Figure 2. The wells were installed to a depth of approximately 47 feet bgs. TPHg, BTEX or MtBE were not detected in any of the soil samples analyzed. TPHg or benzene were nondetectable in the groundwater samples analyzed from wells U-4 and U-5. Other than MtBE, fuel oxygenates were also nondetectable. MtBE was detected in groundwater

samples from both wells U-4 and U-5 at concentrations of 38.2 and 55.4 ppb, respectively, as analyzed by EPA Method 8260.

Groundwater monitoring and sampling of the wells was initiated in July of 1998, and has continued on a quarterly basis to the present time. Historically, groundwater flow directions have varied from north to southwest. However, according to Eva Chu of the ACEHS, based on monitoring conducted at other sites in the area, predominant groundwater flow for the site vicinity is toward the northwest. Depth to groundwater has varied from approximately 23 to 46 feet below top of casing. During the groundwater monitoring and sampling event performed on October 8, 2001, groundwater was reported to flow toward the northwest at a gradient of approximately 0.2 ft/ft.

Step gradient

4.0 FIELD WORK

Field work was conducted in accordance with GR's Field Methods and Procedures (Appendix A) and the Site Safety Plan dated November 29, 2001. A drilling permit was obtained from the Zone 7 Water Agency (permit No. 21201). Underground Service Alert was notified as required prior to drilling at the site (reference No. 370598). In addition, Cruz Brothers, Inc., a private utility locating service, visited the site prior to drilling to check and clear the proposed boring locations.

4.1 Drilling Activities

On December 5 to 7, 2001, a GR geologist observed Cascade Drilling (C-57 #717510) advance ten onsite soil borings (U-6, U-7 and SP-1 through SP-8) at the locations shown on Figure 2. The two monitoring wells and eight of the ozone microsparge points were drilled to a depth of 45 feet bgs, and two of the sparge points were drilled to a depth of 25 feet bgs, using 8-inch hollow-stem augers driven by a truck-mounted drill rig. Soil samples were collected every 5 feet from the well borings. The remainder of the borings were drilled with a wooden plug installed in the auger bit. The GR geologist prepared a log of each boring and field screened the soil samples for the presence of volatile organic compounds utilizing a photoionization detector (PID). Field screening data are presented on the boring logs (Appendix B).

Upon completion of soil sampling, the well borings were converted to groundwater monitoring wells by the installation of 2-inch diameter poly-vinyl chloride (PVC) well casing through the hollow-stem augers. The well casing consisted of blank PVC casing from the ground surface to 35 feet bgs, and 0.020-inch machine slotted PVC well screen from 35 feet to 45 feet bgs. Lonestar # 3 sand was installed in the annular space from the bottom of the boring to two feet above the top of the screened interval (33 feet bgs). The well was then sealed with hydrated bentonite followed by neat cement containing approximately 5% bentonite to a depth of 1.5 feet bgs. The remainder of the annular space was filled with concrete and a steel, water-resistant, traffic-rated well box. An

U-6 and
U-7

expandable locking well cap was placed on the top of the PVC casing and secured with a lock. Well construction details are presented on the boring logs in Appendix B.

Borings SP-1 through SP-8 were completed as sparge points with the installation of 2-inch diameter KVA sparge points attached to ¾-inch blank schedule 80 PVC casing through the hollow-stem augers. The sparge points are composed of 30-inch long microporous plastic. Sparge points SP-1 through SP-4 were installed to a depth of 45 feet bgs. Sparge points SP-6S and SP-7S were installed to a depth of 25 feet bgs. The remaining two sparge locations contained nested sparge points (SP-5, SP-5S) (SP-8 and SP-8S) installed to 25 and 45 feet bgs in each boring, respectively. The nested sparge points were separated vertically by approximately 14 feet of bentonite. Lonestar # 2/16 sand was installed in the annular space from the bottom of the boring to one foot above the top of the sparge point. The remainder of the annular space in each boring was then sealed with hydrated bentonite followed by neat cement to a depth of approximately 1 foot bgs. A steel, waterproof, traffic-rated well box was set into the ground around each well head with concrete. Sparge point construction details are presented on the boring logs in Appendix B.

Drill cuttings were placed in a closed-top roll-off soil bin, and transported by Onyx Industrial Services Inc. (Onyx) to Allied Waste's Forward Landfill in Manteca, California, on December 8, 2001. The soil cuttings were accepted at the landfill under a previous profile number, obtained during the monitoring well installation performed in February of 2001.

4.2 Well Monitoring, Development, and Sampling

Monitoring, development, and sampling of the two newly installed wells was performed by GR personnel during the regularly scheduled quarterly monitoring and sampling event at the site. Copies of the well development and field monitoring data sheets are included in Appendix C. Monitoring data for the two new wells are summarized in Table 1.

Wells U-6 and U-7 were developed and sampled on January 3, 2002. Depth to groundwater in the wells were measured and each well checked for the presence of floating product prior to development. Floating product was not observed in the two wells. None of the wells dewatered during development and each yielded a minimum of 10 well volumes. Immediately after the wells were properly developed, groundwater samples were collected in appropriate containers supplied by the laboratory. Groundwater samples were submitted for chemical analysis under chain-of-custody documentation to Sequoia Analytical in Walnut Creek, California.

4.3 Wellhead Survey

Following installation of the wells, the well casing elevations were surveyed by Virgil Chavez Land Surveying of Vallejo, California (California Land Surveyor No. 6323). Top of casing and vault box elevations were measured relative to MSL, and the horizontal locations of the wells were measured by global positioning system (GPS). Well casing elevation data are presented in Table 1. A copy of the surveyor's report is included in Appendix D.

4.4 Interim Remedial Action

As an interim remedial action measure GR installed a K-V Associates, Inc. (KVA) "C-Sparge™" ozone microsparging system. Ozone microsparging is a process where ozone in air is introduced into the groundwater at low flow rates (2-6 cubic feet per minute) through specially designed spargers to create small "microbubbles." As these microbubbles rise within the column of water, the VOCs are rapidly oxidized.

Ten KVA sparge points were installed at locations shown on Figure 2. Four sparge points were installed to a depth of 25 feet bgs, and six sparge points were installed to a depth of 45 feet bgs. Sparge point construction details are presented on the boring logs in Appendix B.

The C-Sparge™ panel was mounted on the trash enclosure. The panel includes an ozone generator, air compressor, and a programmable timer/controller. Sparge points are connected to the panel by 3/8" LDPE tubing. Each sparge point has a dedicated line. The tubing was run through schedule 80 PVC conveyance piping for added protection. The process flow diagram is presented as Figure 5.

4.5 Ozone Microsparge System Startup

The system was placed into operation in December of 2001. The system cycles ozone/air injection between the ten sparge points. The schedule is currently set to cycle through each point 16 times per day, for between 5 and 15 minutes per point per cycle. The schedule can be varied as part of the system evaluation process.

4.6 Ozone Microsparge System Operation and Maintenance and Reporting

System operation and maintenance (O&M) will be performed weekly for the first month, then twice monthly. A system status report will be issued after the first six months of operation, presenting the results of the sampling program. At that time, the effectiveness of the system will be evaluated. The routine groundwater monitoring and sampling data will be utilized to prepare the system evaluation.

5.0 RESULTS

5.1 Subsurface Conditions

Detailed descriptions of the subsurface materials encountered during drilling are presented on the boring logs in Appendix B. In general, the first 25 feet bgs were composed of gravel and sand, underlain by clay to a depth of approximately 35 feet bgs. The clay was underlain by sand and gravel to approximately 41 feet bgs, where clay was again encountered to the maximum explored depth of 46.5 feet bgs. Groundwater was first encountered at 20 feet bgs, and again at 31 feet bgs. The first encountered groundwater at 20 feet bgs was only observed in one boring (U-7), and may represent a localized perched zone.

5.2 Laboratory Analysis

The discrete soil samples collected from the two well borings and the groundwater samples collected from the developed wells were analyzed by Sequoia Analytical in Walnut Creek, (ELAP No. 1271) and San Carlos, California (ELAP No. 2360). The soil and groundwater samples were analyzed for: TPHg by EPA Method 8015 modified; BTEX and MtBE by EPA Method 8021; the fuel oxygenates tertiary butyl alcohol (TBA), ethyl tertiary-butyl ether (ETBE), tertiary-amyl methyl ether (TAME), di-isopropyl ether (DIPE), MtBE, and lead scavengers 1,2-dichloroethane (1,2-DCA) and 1,2-dibromoethane (EDB) by EPA Method 8260B. Copies of laboratory analytical reports and chain-of-custody records are included in Appendix E.

5.3 Groundwater Analytical Results

TPHg and benzene were detected in both of the groundwater samples analyzed from the two new wells, at concentrations of 5,000 ppb and 36 ppb (U-6) and 3,100 ppb and 93 ppb (U-7), respectively. The laboratory reported that the detected TPHg is weathered gasoline in the C6-C12 range. MtBE and the other fuel oxygenates were nondetectable in well U-6. MtBE and TBA were the only fuel oxygenates detected in the groundwater sample from well U-7 at concentrations of 130 and 30 ppb, respectively, as analyzed by EPA Method 8260. Groundwater chemical data are summarized in Table 1.

5.4 Soil Analytical Results

The laboratory reported that all analytes were below the laboratories reporting limits. Soil chemical data are summarized in Table 2.

5.5 Waste Disposal

Approximately 55 gallons of waste water generated by cleaning the drilling equipment and well development and sampling procedures were removed from the site by GR on January 3, 2002, and transported to the Tosco Refinery in Rodeo, California, for treatment and disposal. On December 8, 2001, Onyx Industrial Services of Benicia, California transported 9.87 tons of soil (drill cuttings) to the Allied Waste Inc. (Allied) Forward landfill facility in Manteca, California for disposal.

6.0 CONCLUSIONS AND RECOMMENDATIONS

This work was performed to facilitate the installation of a petroleum hydrocarbon remediation system. The ozone microsparging system will be inspected on a twice monthly schedule to conduct operation and maintenance activities. The system operation will be enhanced and maintained as needed. The progress sampling will be coordinated with the regular scheduled quarterly monitoring and sampling program at the site. After the first six months of system operation (2nd quarter, 2002), a progress report will be issued, and future progress reports will be prepared on a semi-annual basis. The remedial system effectiveness will be evaluated after six months, and recommendations, if any, will be made at that time.

GR recommends that the two new monitoring wells be added to the quarterly monitoring and sampling program and sampled for the next four consecutive quarters. It is anticipated that the dissolved hydrocarbons detected in the two new wells will decrease with continued operation of the remediation system.

7.0 REFERENCES

- Gettler-Ryan Inc., 2001, Groundwater Monitoring and Sampling Report, Fourth Quarter - Event of October 8, 2001, Tosco (Unocal) Service Station #4186, 1771 First St., Livermore, California, dated November 26, 2001.
- ..., 2001, Monitoring Well Installation Report, Tosco (Unocal) Service Station No. 4186, 1771 First Street, Livermore, California, dated June 4, 2001.
- ..., 2000, Site Conceptual Model for Tosco (76) Service Station No. 4186, located at 1771 First Street, Livermore, California, dated May 12, 2000.
- ..., 1998, Well Installation Report, Tosco (Unocal) Service Station No. 4186, 1771 First Street, Livermore, California, dated November 23, 1998.
- ..., 1998, Well Search Unocal Service Station No. 4186, 1771 1st Street, Livermore, California, dated April 8, 1998.
- Pacific Environmental Group, 1997, Soil Gas Survey Results Report, Unocal Service Station No. 4186, 1771 1st Street, Livermore, California, dated October 29, 1997.
- GeoStrategies, Inc., 1996, Product Line Replacement Report, Unocal Service Station No. 4186, 1771 First Street, Livermore, California, dated August 7, 1996.
- U.S. Geological Survey, 1961, Livermore Quadrangle, California, 7.5 Minute Series (Topographic): Scale 1:24,000, photorevised 1980.

TABLE 1 - GROUNDWATER MONITORING AND CHEMICAL ANALYTICAL DATA

Tosco (76) Service Station No. 4186
 1771 First Street
 Livermore, California

Sample No.	Sample Date	Total Well	Well ¹	Depth to	Floating	Ground	TPHg (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl-benzene (ppb)	Total Xylenes (ppb)	MtBE ² (ppb)
		Depth (ft.)	Elev. (ft. MSL)	Water (ft.)	Product (ft.)	Water Elevation (ft. MSL)						
U-6	1/3/02	44.65	478.38	33.99	0.0	444.39	5,000 ⁴	36	<25	260	450	<250
U-7	1/3/02	44.45	478.74	32.43	0.0	446.31	3,100 ⁴	93	<10	35	73	140
		MTBE ³ (ppb)	TBA (ppb)	DIPE (ppb)	ETBE (ppb)	TAME (ppb)	1,2-DCA (ppb)	1,2-DBA (ppb)	Ethanol (ppb)			
U-6 ⁵	1/3/02	<10	<200	<10	<10	<10	<10	<10	<5000			
U-7	1/3/02	130	30	<1.0	<1.0	<1.0	<1.0	<1.0	<500			

EXPLANATION:

ft. = feet
 ft. MSL = feet relative to Mean Sea Level.
 ppb = parts per billion

ANALYTICAL LABORATORY:

Sequoia Analytical San Carlos, CA (ELAP #2360)

¹ Well elevations reported as top of casing (TOC) surveyed by Virgil Chavez, Licensed California Land Surveyor No. 6323.

² MtBE by EPA Method 8021

³ MtBE by EPA Method 8260

⁴ Chromatogram pattern: weathered gasoline C6-C12

⁵ The reporting limits for this sample have been raised due to high levels of non-target interferents (sic)

ANALYTICAL METHODS:

TPHg = Total Petroleum Hydrocarbons as gasoline according to EPA Method 8015 Modified

Benzene, Toluene, Ethylbenzene, and Total Xylenes according to EPA Method 8021

MtBE = Methyl tertiary butyl ether according to EPA Method 8021/8260

TBA = tertiary butyl alcohol according to EPA Method 8260

DIPE = di-isopropyl ether according to EPA Method 8260

ETBE = ethyl tertiary butyl ether according to EPA Method 8260

TAME = tertiary amyl methyl ether according to EPA Method 8260

1,2-DCA = 1,2-Dichloroethane according to EPA Method 8260

1,2-DBA = 1,2-Dibromoethane according to EPA Method 8260

Ethanol according to EPA Method 8260

TABLE 2 - SOIL CHEMICAL ANALYTICAL DATA

Tosco (76) Service Station No. 4186
1771 First Street
Livermore, CA

Sample ID	Sample Depth (feet)	Date Collected	TPHg (ppm)	Benzene (ppm)	Toluene (ppm)	Ethyl-benzene (ppm)	Total Xylenes (ppm)	MTBE by 8021 (ppm)	MTBE by 8260 (ppm)	TBA (ppb)	DIPE (ppb)	ETBE (ppb)	TAME (ppb)	1,2-DCA (ppb)	1,2-DBA (ppb)
U6-25	25	12/7/01	<1.00	<0.005	<0.005	<0.005	<0.005	<0.05	<0.20	<2.5	<0.10	<0.10	<0.10	<0.10	<0.20
U6-30	30	12/7/01	<1.00	<0.005	<0.005	<0.005	<0.005	<0.05	<0.20	<2.5	<0.10	<0.10	<0.10	<0.10	<0.20
U7-15	15	12/7/01	<1.00	<0.005	<0.005	<0.005	<0.005	<0.05	<0.20	<2.5	<0.10	<0.10	<0.10	<0.10	<0.20
U7-25	25	12/7/01	<1.00	<0.005	<0.005	<0.005	<0.005	<0.05	<0.20	<2.5	<0.10	<0.10	<0.10	<0.10	<0.20

EXPLANATION:

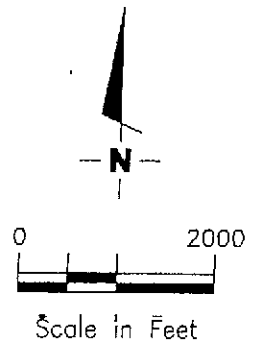
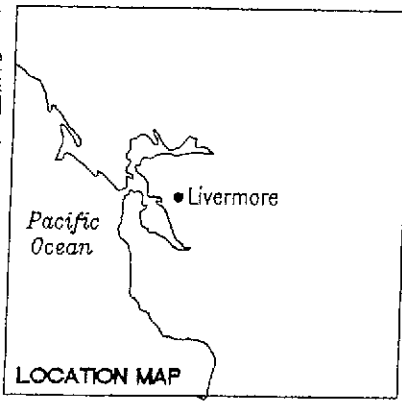
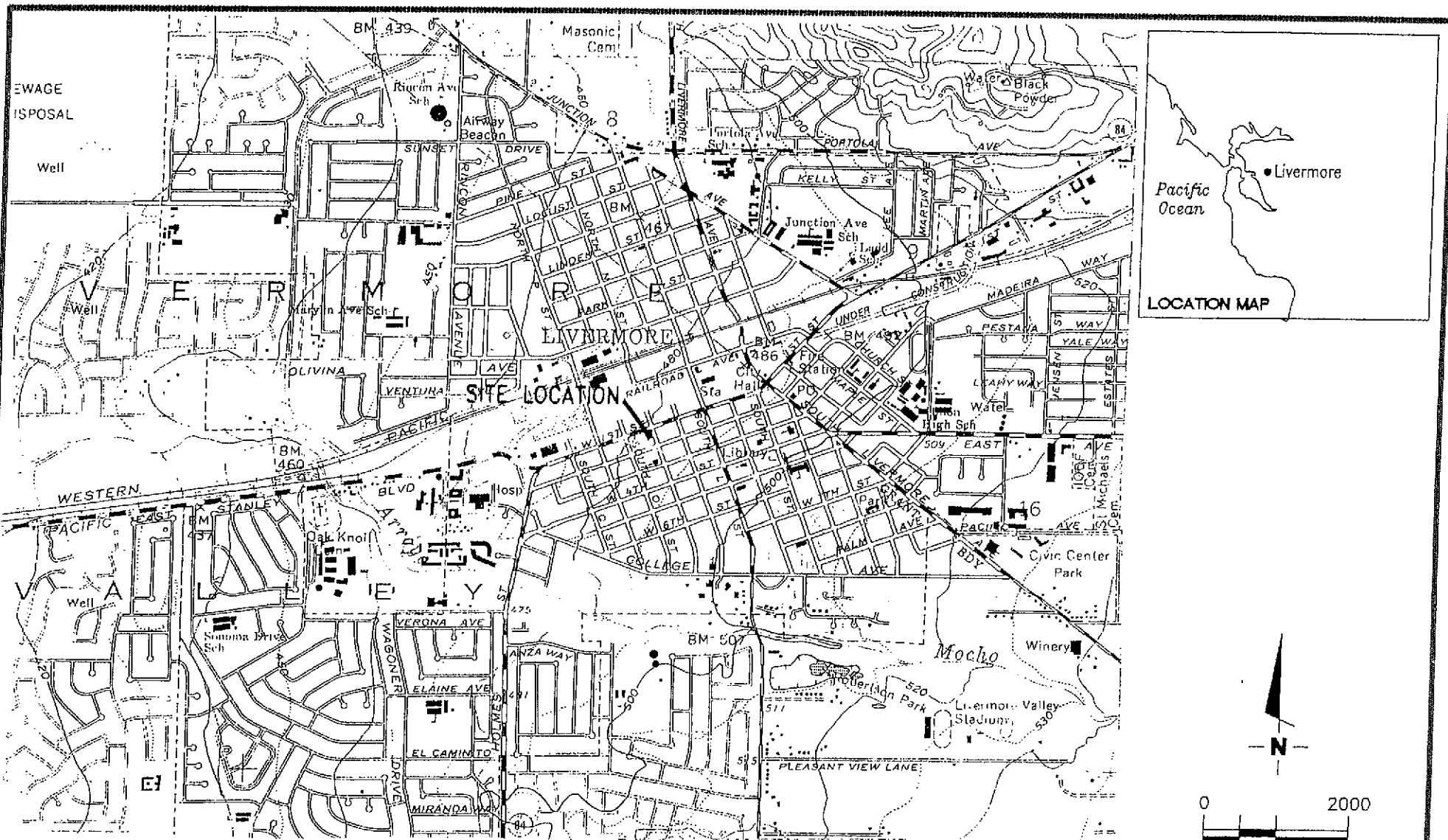
feet = feet below ground surface
ppm = parts per million
<1.00 = not detected at or below laboratories reporting limit

ANALYTICAL LABORATORY

Sequoia Analytical Walnut Creek, CA (ELAP No. 1271)

ANALYTICAL METHODS:

TPHg = Total Petroleum Hydrocarbons as gasoline according to EPA Method 8015 Modified
Benzene, Toluene, Ethylbenzene, and Total Xylenes according to EPA Method 8021
MtBE = Methyl tertiary butyl ether according to EPA Method 8021/8260
TBA = tertiary butyl alcohol according to EPA Method 8260
DIPE = di-isopropyl ether according to EPA Method 8260
ETBE = ethyl tertiary butyl ether according to EPA Method 8260
TAME = tertiary amyl methyl ether according to EPA Method 8260
1,2-DCA = 1,2-Dichloroethane according to EPA Method 8260
1,2-DBA = 1,2-Dibromoethane according to EPA Method 8260



Base Map: USGS Topographic Map



Gettler - Ryan Inc.

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VICINITY MAP
Tosco 76 Service Station No. 4186
1771 First Street
Livermore, California

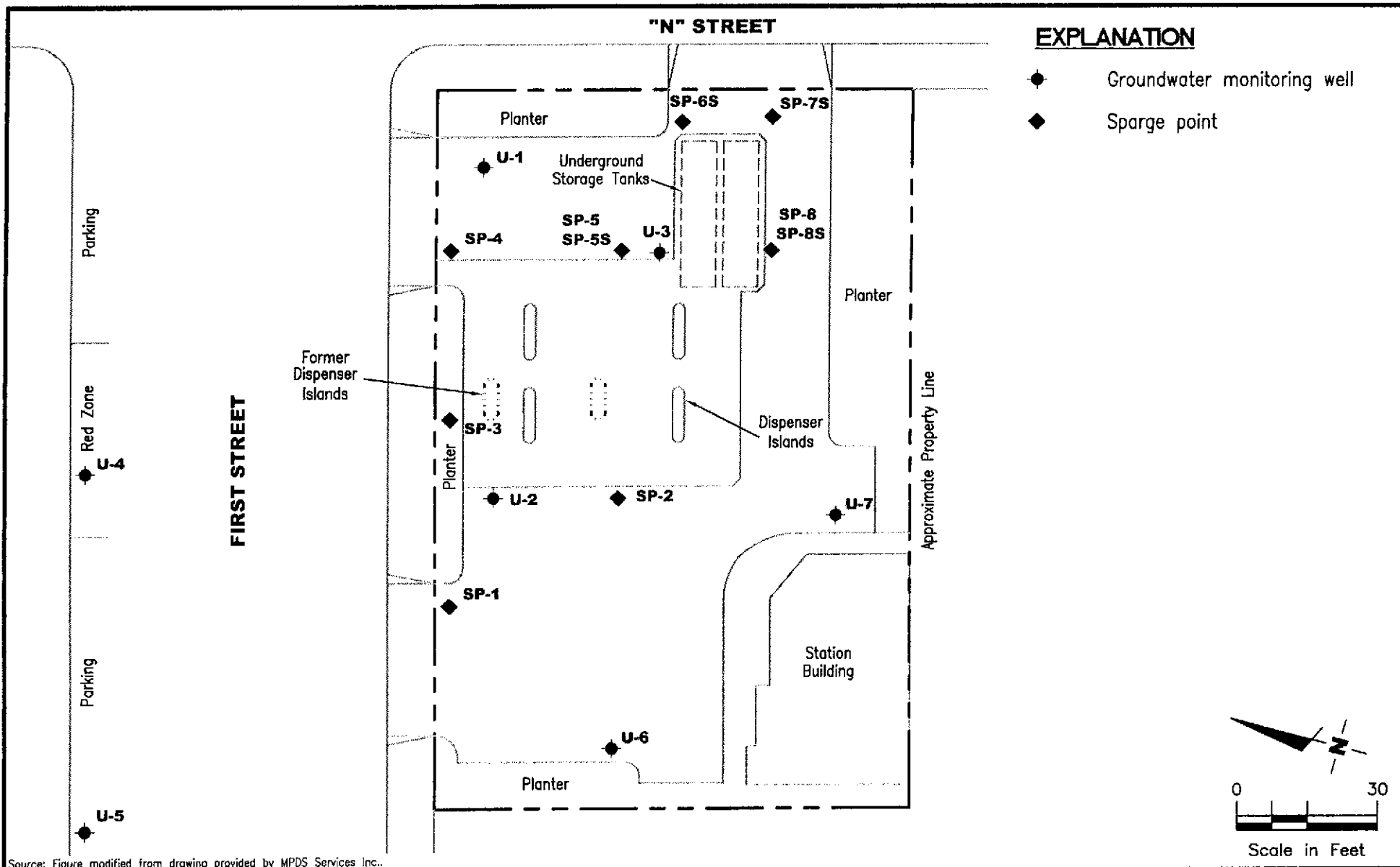
FIGURE
1

JOB NUMBER
140175

REVIEWED BY

DATE
4/00

REVISED DATE



GETTLER - RYAN INC.
 6747 Sierra Ct., Suite J
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SITE PLAN
 Tosco (76) Service Station No. 4186
 1771 First Street
 Livermore, California

FIGURE

2

PROJECT NUMBER
 140175

REVIEWED BY

DATE
 12/01

REVISED DATE

APPENDIX A
GR FIELD METHODS AND PROCEDURES

GETTLER-RYAN INC. FIELD METHODS AND PROCEDURES

Site Safety Plan

Field work performed by Gettler-Ryan Inc. (GR) is conducted in accordance with GR's Health and Safety Plan and the Site Safety Plan. GR personnel and subcontractors who perform work at the site are briefed on the contents of these plans prior to initiating site work. The GR geologist or engineer at the site when the work is performed acts as the Site Safety Officer. GR utilizes a photoionization detector (PID) to monitor ambient conditions as part of the Health and Safety Plan.

Collection of Soil Samples

Exploratory soil borings are drilled by a California-licensed well driller. A GR geologist is present to observe the drilling, collect soil samples for description, physical testing, and chemical analysis, and prepare a log of the exploratory soil boring. Soil samples are collected from the exploratory soil boring with a split-barrel sampler or other appropriate sampling device fitted with clean brass or stainless steel liners. The sampling device is driven approximately 18 inches with a 140-pound hammer falling 30 inches. The number of blows required to advance the sampler each successive 6 inches is recorded on the boring log. The encountered soil is described using the Unified Soil Classification System (ASTM 2488-84) and the Munsell Soil Color Chart.

After removal from the sampling device, soil samples for chemical analysis are covered on both ends with Teflon sheeting or aluminum foil, capped, labeled, and placed in a cooler with blue ice for preservation. A chain-of-custody form is initiated in the field and accompanies the selected soil samples to the analytical laboratory. Samples are selected for chemical analysis based on:

- a. depth relative to underground storage tanks and existing ground surface
- b. depth relative to known or suspected groundwater
- c. presence or absence of contaminant migration pathways
- d. presence or absence of discoloration or staining
- e. presence or absence of obvious gasoline hydrocarbon odors
- f. presence or absence of organic vapors detected by headspace analysis

Field Screening of Soil Samples

A PID is used to perform head-space analysis in the field for the presence of organic vapors from the soil sample. This test procedure involves removing some soil from one of the sample tubes not retained for chemical analysis and immediately covering the end of the tube with a plastic cap. The PID probe is inserted into the headspace inside the tube through a hole in the plastic cap. Head-space screening results are recorded on the boring log. Head-space screening procedures are performed and results recorded as reconnaissance data. GR does not consider field screening techniques to be verification of the presence or absence of hydrocarbons.

Stockpile Sampling

Stockpile samples consist of four individual sample liners collected from each 100 cubic yards (yd³) of stockpiled soil material. Four arbitrary points on the stockpiled material are chosen, and discrete soil sample is collected at each of these points. Each discrete stockpile sample is collected by removing the upper 3 to 6 inches of soil, and then driving the stainless steel or brass tube into the stockpiled material with a wooden mallet or hand driven soil sampling device. The sample tubes are then covered on both ends with Teflon sheeting, capped, labeled, placed in the cooler with blue ice for preservation. A chain-of-custody form is initiated in the field and accompanies the selected soil samples to the analytical laboratory. Stockpiled soils are covered with plastic sheeting after completion of sampling.

Construction of Monitoring Wells

Monitoring wells are constructed in the exploratory borings with Schedule 40 polyvinyl Chloride (PVC) casing. All joints are thread-joined; no glues, cements, or solvents are used in well construction. The screened interval is constructed of machine-slotted PVC well screen which generally extends from the total well depth to a point above the groundwater. An appropriately-sized sorted sand is placed in the annular space adjacent to the entire screened interval. A bentonite transition seal is placed in the annular space above the sand, and the remaining annular space is sealed with neat cement or cement grout.

Wellheads are protected with water-resistant traffic rated vault boxes placed flush with the ground surface. The top of the well casing is sealed with a locking cap. A lock is placed on the well cap to prevent vandalism and unintentional introduction of materials into the well.

Storing and Sampling of Drill Cuttings

Drill cuttings are stockpiled on plastic sheeting or stored in drums depending on site conditions and regulatory requirements. Stockpile samples are collected and analyzed on the basis of one composite sample per 50 cubic yards of soil. Stockpile samples are composed of four discrete soil samples, each collected from an arbitrary location on the stockpile. The four discrete samples are then composited in the laboratory prior to analysis.

Each discrete stockpile sample is collected by removing the upper 3 to 6 inches of soil, and then driving the stainless or brass sample tube into the stockpiled material with a hand, mallet, or drive sampler. The sample tubes are then covered on both ends with Teflon sheeting, capped, labeled, and placed in a cooler with blue ice for preservation. A chain-of-custody form is initiated in the field and accompanies the selected soil samples to the analytical laboratory. Stockpiled soils are covered with plastic sheeting after completion of sampling.

Wellhead Survey

The top of the newly-installed well casing is surveyed by a California-licensed Land Surveyor to mean sea level (MSL).

Well Development

The purpose of well development is to improve hydraulic communication between the well and surrounding aquifer. Prior to development, each well is monitored for the presence of separate-phase hydrocarbons and the depth-to-water is recorded. Wells are then developed by alternately surging the well with the bailer, then purging the well with a pump to remove accumulated sediments and draw groundwater into the well. Development continues until the groundwater parameters (temperature, pH, and conductivity) have stabilized.

Groundwater Monitoring and Sampling

Decontamination Procedures

All physical parameter measuring and sampling equipment are decontaminated prior to sample collection using Alconox or equivalent detergent followed by steam cleaning with deionized water. During field sampling, equipment placed in a well are decontaminated before purging or sampling the next well by cleaning with Alconox or equivalent detergent followed by steam cleaning with deionized water.

Water-Level Measurements

Prior to sampling each well, the static water level is measured using an electric sounder and/or calibrated portable oil-water interface probe. Both static water-level and separate-phase product thickness are measured to the nearest ± 0.01 foot. The presence of separate-phase product is confirmed using a clean, acrylic or polyvinylchloride (PVC) bailer, measured to the nearest ± 0.01 foot with a decimal scale tape. The monofilament line used to lower the bailer is replaced between borings with new line to preclude the possibility of cross-contamination. Field observations (e.g. product color, turbidity, water color, odors, etc.) are noted. Water-levels are measured in wells with known or suspected lowest dissolved chemical concentrations to the highest dissolved concentrations.

Sample Collection and Labeling

A temporary PVC screen is installed in the boring to facilitate a grab groundwater sample collection. Samples of groundwater are collected from the surface of the water in each well or boring using the Teflon bailer or a pump. The water samples are then gently poured into laboratory-cleaned containers and sealed with Teflon-lined caps, and inspected for air bubbles to check for headspace. The samples are then labeled by an adhesive label, noted in permanent ink, and promptly placed in an ice storage. A Chain-of-Custody Record is initiated and updated throughout handling of the samples, and accompanies the samples to the laboratory certified by the State of California for analyses requested.

APPENDIX B
PERMITS AND BORING LOGS



ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE PLEASANTON, CALIFORNIA 94588-5127 VOICE (925) 484-2600 X235
FAX (925) 462-3914

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

FOR OFFICE

LOCATION OF PROJECT Tosco 76 Station #4186
1771 First Street
Livermore, CA

California Coordinates Source _____ ft. Accuracy ± _____ ft.
CCN _____ ft. CCE _____ ft.
APN 97-10-1-1

CLIENT Name Tosco Corporation
Address 2000 Crow Canyon Pl. Phone 925-277-2384
City San Ramon Zip 94583

APPLICANT Name Gettler-Ryan Inc.
Jed Douglas Fax 707-789-3218
Address 1364 N. McDowell Blvd Phone 707-789-3255
City Petaluma CA Zip 94954

TYPE OF PROJECT
Well Construction
Cathodic Protection
Water Supply
Monitoring
Geotechnical Investigation
General
Contamination
Well Destruction

PROPOSED WATER SUPPLY WELL USE
New Domestic
Municipal
Industrial
Replacement Domestic
Irrigation
Other C-Sparge

DRILLING METHOD:
Mud Rotary Air Rotary Auger
Cable Other

DRILLER'S LICENSE NO. 717510

WELL PROJECTS
Drill Hole Diameter 8 in. Maximum _____
Casing Diameter 3/4 in. Depth 45 ft.
Surface Seal Depth 30 ft. Number 10

GEOTECHNICAL PROJECTS
Number of Borings _____ Maximum _____
Hole Diameter _____ in. Depth _____ ft.

ESTIMATED STARTING DATE 12-5-01
ESTIMATED COMPLETION DATE 12-7-01

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE [Signature] Date 11-5-01

PERMIT NUMBER 21201
WELL NUMBER 3S/2E 17A1 to 17A10
APN 097 0010 001 01

PERMIT CONDITIONS

Circled Permit Requirements Apply

- A. GENERAL
 1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
 2. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well projects, or drilling logs and location sketch for geotechnical projects.
 3. Permit is void if project not begun within 90 days of approval date.
- B. WATER SUPPLY WELLS
 1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
 2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved.
 3. An access port at least 0.5 inches in diameter is required on the wellhead for water level measurements.
 4. A sample port is required on the discharge pipe near the wellhead.
- C. GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
 1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
 2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.
- D. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.
- E. CATHODIC. Fill hole above anode zone with concrete placed by tremie.
- F. WELL DESTRUCTION. See attached.
- G. SPECIAL CONDITIONS

Approved [Signature] Date 11/14/01
Wyman Hong

MAJOR DIVISIONS			TYPICAL NAMES			
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES		GW	Well graded gravels with or without sand, little or no fines	
				GP	Poorly graded gravels with or without sand, little or no fines	
		GRAVELS WITH OVER 15% FINES		GM	Silty gravels, silty gravels with sand	
				GC	Clayey gravels, clayey gravels with sand	
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES		SW	Well graded sands with or without gravel, little or no fines	
				SP	Poorly graded sands with or without gravel, little or no fines	
		SANDS WITH OVER 15% FINES		SM	Silty sands with or without gravel	
				SC	Clayey sands with or without gravel	
			SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML	Inorganic silts and very fine sands, rock flour, silts with sands and gravels
					CL	Inorganic clays of low to medium plasticity, clays with sands and gravels, lean clays
SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		OL	Organic silts or clays of low plasticity			
		MH	Inorganic silts, micaceous or diatomaceous, fine sandy or silty soils, elastic silts			
		CH	Inorganic clays of high plasticity, fat clays			
		OH	Organic silts or clays of medium to high plasticity			
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils		

PID Volatile vapors in ppm
(2.5YR 6/2) Soil color according to Munsell Soil Color Charts (1993 Edition)

BLOWS/FT. Sample drive hammer weight - 140 pounds falling 30 inches. Blows required to drive sampler 1 foot are indicated on the logs.

- Observed contact
- Inferred contact
- No soil sample recovered
- "Undisturbed" sample
- First encountered groundwater level
- Static groundwater level

GETTLER - RYAN INC.
6747 Sierra Ct., Suite J
Dublin, CA 94568 (925) 551-7555

UNIFIED SOIL CLASSIFICATION
ASTM D 2488-85
AND
KEY TO SAMPLING DATA

Gettler-Ryan, Inc.

Log of Boring U-6

PROJECT: *Tosco (76) Service Station No. 4186*

LOCATION: *1771 First Street, Livermore, CA*

GR PROJECT NO.: *140175.07*

CASING ELEVATION: *478.38 Ft. (MSL)*

DATE STARTED: *12/06/01*

WL (ft. bgs): *31.5* DATE: *12/06/01* TIME: *04:40*

DATE FINISHED: *12/06/01*

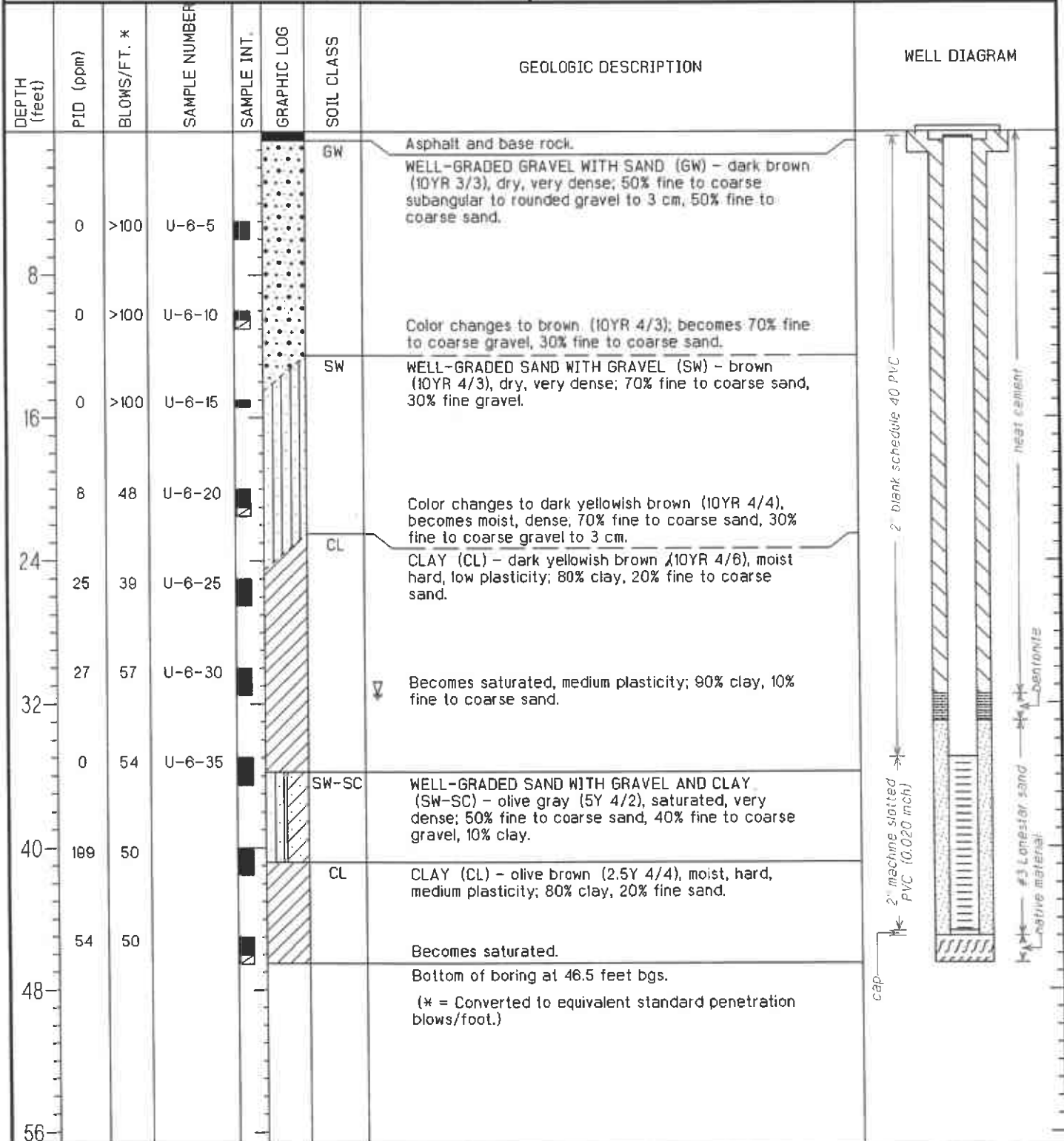
WL (ft. bgs): DATE: TIME:

DRILLING METHOD: *8 in. Hollow Stem Auger*

TOTAL DEPTH: *46.5 feet*

DRILLING COMPANY: *Cascade Drilling*

GEOLOGIST: *Jed Douglas*



Gettler-Ryan, Inc.

Log of Boring U-7

PROJECT: *Tosco (76) Service Station No. 4186*

LOCATION: *1771 First Street, Livermore, CA*

GR PROJECT NO.: *140175.07*

CASING ELEVATION: *478.74 Ft. (MSL)*

DATE STARTED: *12/06/01*

WL (ft. bgs): *20* DATE: *12/06/01* TIME: *13:05*

DATE FINISHED: *12/06/01*

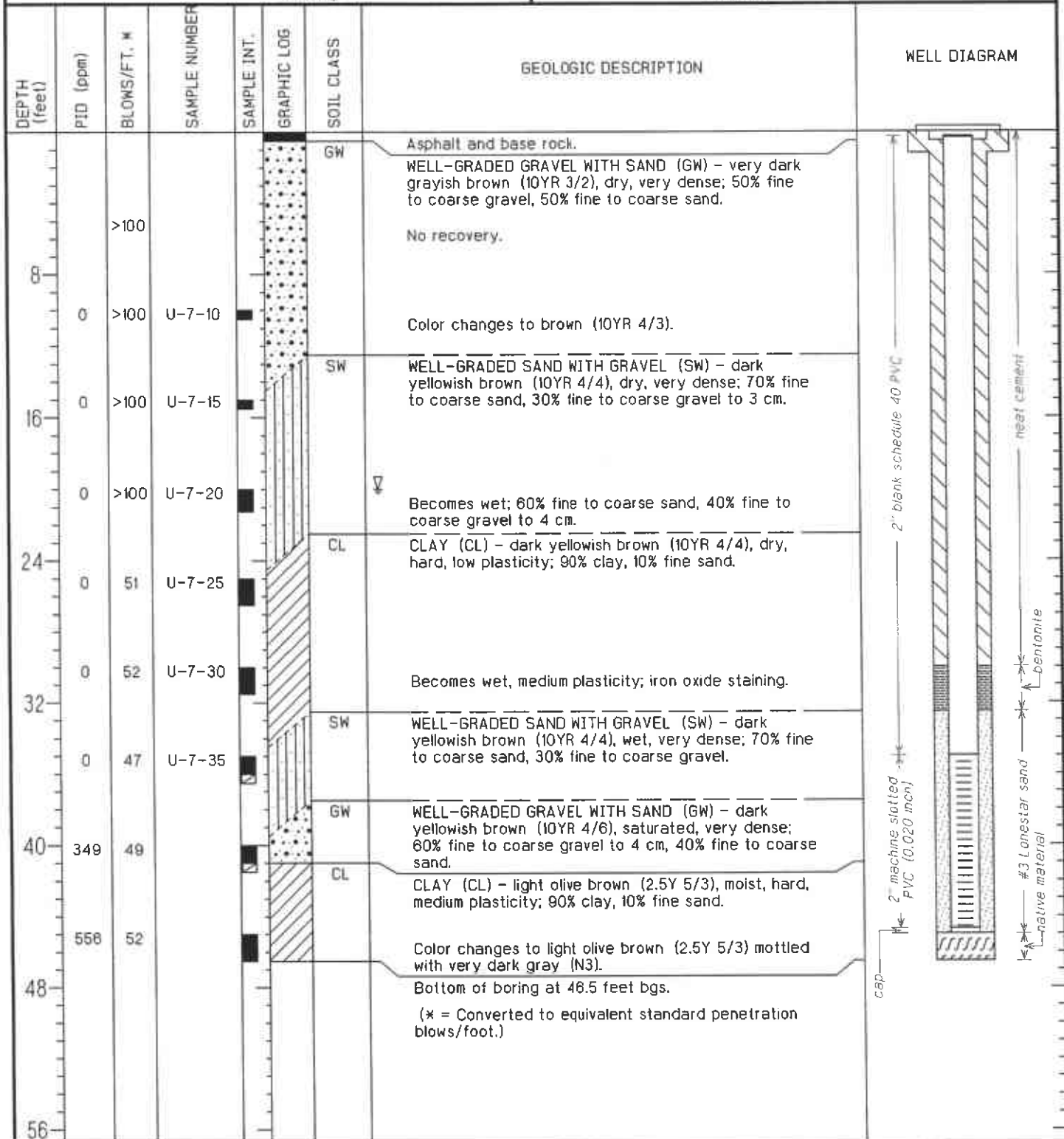
WL (ft. bgs): DATE: TIME:

DRILLING METHOD: *8 in. Hollow Stem Auger*

TOTAL DEPTH: *46.5 feet*

DRILLING COMPANY: *Cascade Drilling*

GEOLOGIST: *Jed Douglas*



Gettler-Ryan, Inc.

Log of Boring SP-1

PROJECT: *Tosco (76) Service Station No. 4186*

LOCATION: *1771 First Street, Livermore, CA*

GR PROJECT NO.: *140175.07*

CASING ELEVATION:

DATE STARTED: *12/07/01*

WL (ft. bgs): DATE: TIME:

DATE FINISHED: *12/07/01*

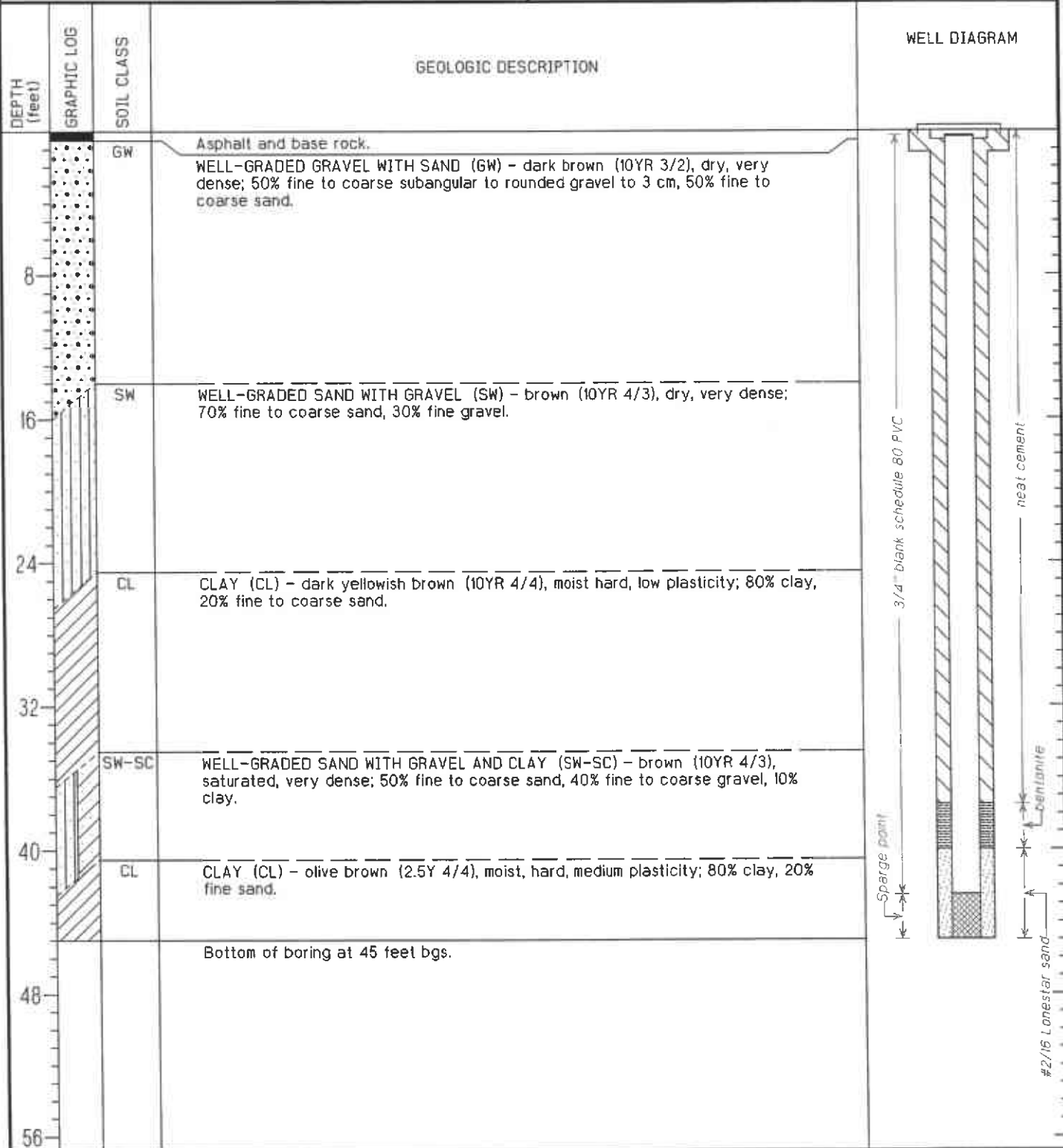
WL (ft. bgs): DATE: TIME:

DRILLING METHOD: *8 in. Hollow Stem Auger*

TOTAL DEPTH: *45 feet*

DRILLING COMPANY: *Cascade Drilling*

GEOLOGIST: *Jed Douglas*



Gettler-Ryan, Inc.

Log of Boring SP-2

PROJECT: *Tosco (76) Service Station No. 4186*

LOCATION: *1771 First Street, Livermore, CA*

GR PROJECT NO.: *140175.07*

CASING ELEVATION:

DATE STARTED: *12/07/01*

WL (ft. bgs): DATE: TIME:

DATE FINISHED: *12/07/01*

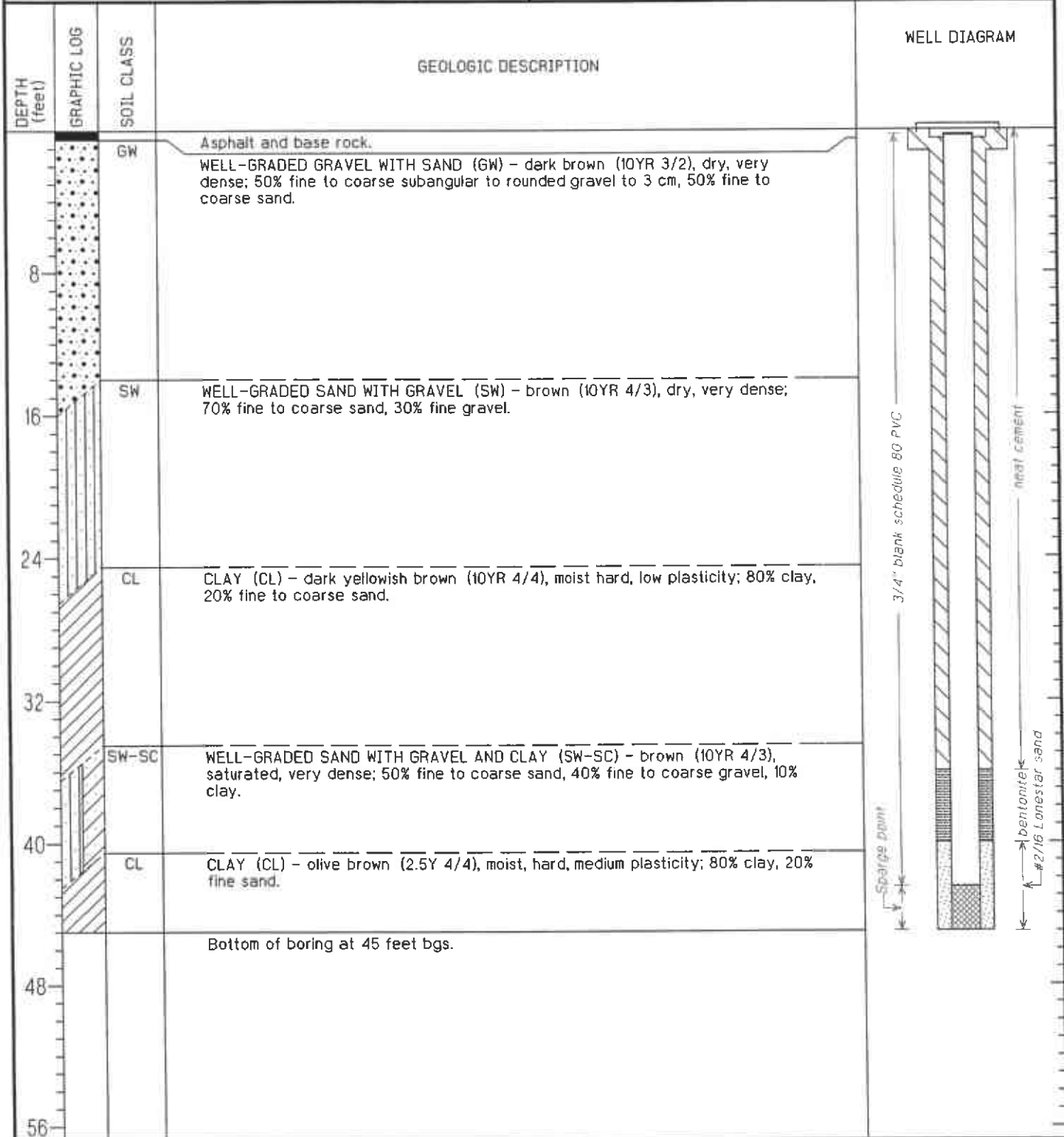
WL (ft. bgs): DATE: TIME:

DRILLING METHOD: *8 in. Hollow Stem Auger*

TOTAL DEPTH: *45 feet*

DRILLING COMPANY: *Cascade Drilling*

GEOLOGIST: *Jed Douglas*



Gettler-Ryan, Inc.

Log of Boring SP-3

PROJECT: *Tosco (76) Service Station No. 4186*

LOCATION: *1771 First Street, Livermore, CA*

GR PROJECT NO.: *140175.07*

CASING ELEVATION:

DATE STARTED: *12/06/01*

WL (ft. bgs): DATE: TIME:

DATE FINISHED: *12/06/01*

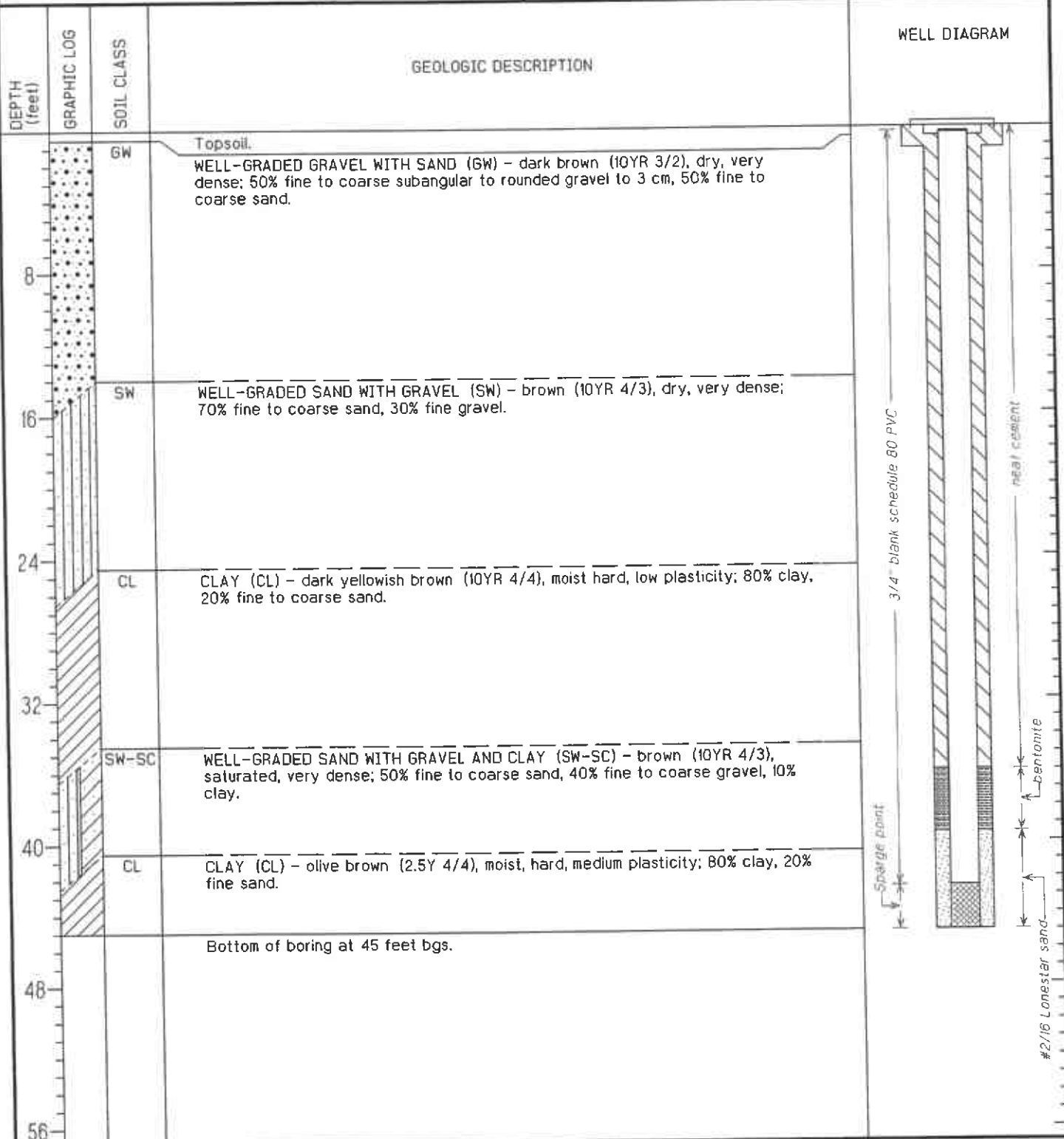
WL (ft. bgs): DATE: TIME:

DRILLING METHOD: *8 in. Hollow Stem Auger*

TOTAL DEPTH: *45 feet*

DRILLING COMPANY: *Cascade Drilling*

GEOLOGIST: *Jed Douglas*



Gettler-Ryan, Inc.

Log of Boring SP-4

PROJECT: *Tosco (76) Service Station No. 4186*

LOCATION: *1771 First Street, Livermore, CA*

GR PROJECT NO. : *140175.07*

CASING ELEVATION:

DATE STARTED: *12/05/01*

WL (ft. bgs): DATE: TIME:

DATE FINISHED: *12/05/01*

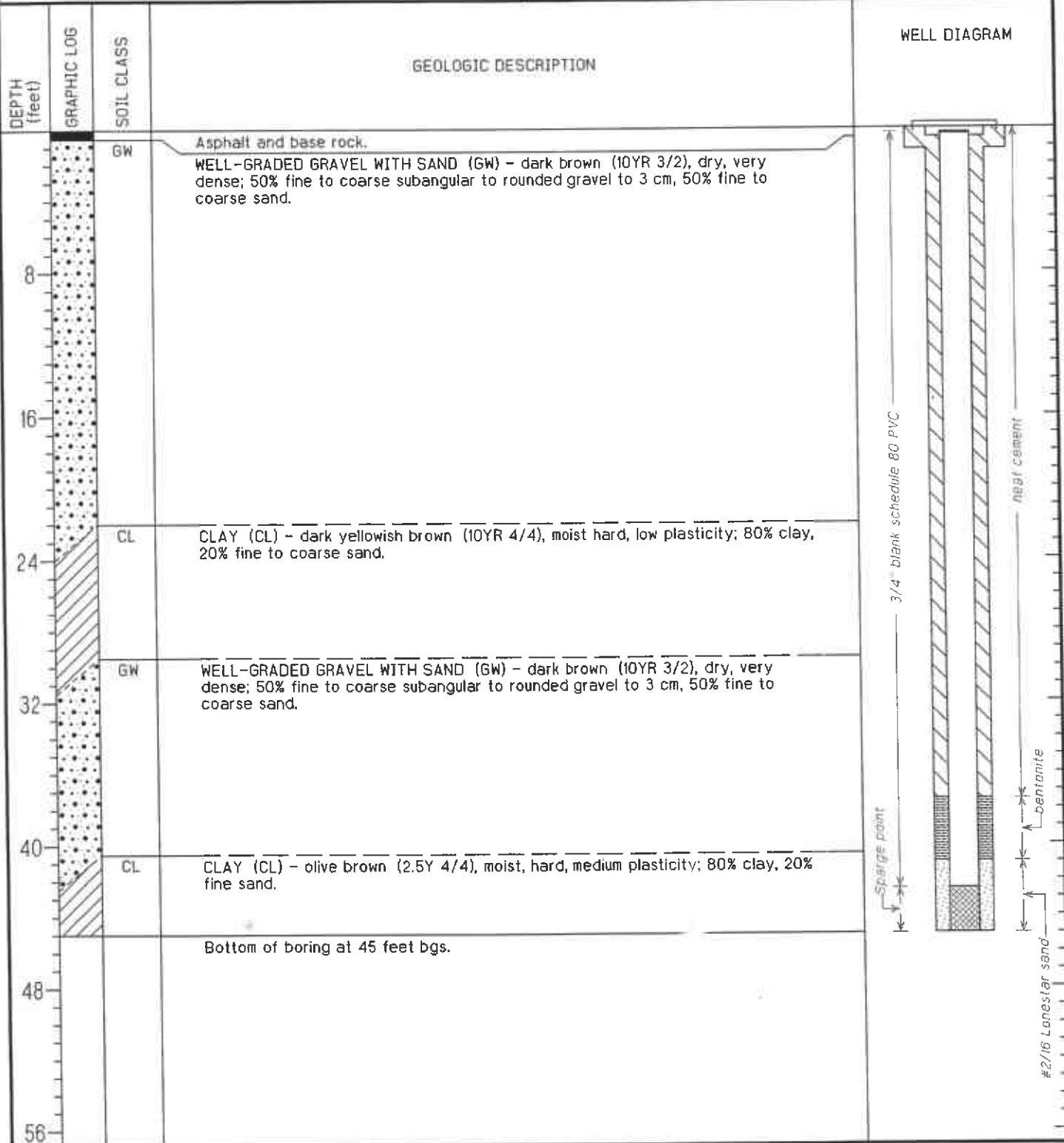
WL (ft. bgs): DATE: TIME:

DRILLING METHOD: *8 in. Hollow Stem Auger*

TOTAL DEPTH: *45 feet*

DRILLING COMPANY: *Cascade Drilling*

GEOLOGIST: *Jed Douglas*



Gettler-Ryan, Inc.

Log of Boring SP-5

PROJECT: *Tosco (76) Service Station No. 4186*

LOCATION: *1771 First Street, Livermore, CA*

GR PROJECT NO.: *140175.07*

CASING ELEVATION:

DATE STARTED: *12/05/01*

WL (ft. bgs): DATE: TIME:

DATE FINISHED: *12/05/01*

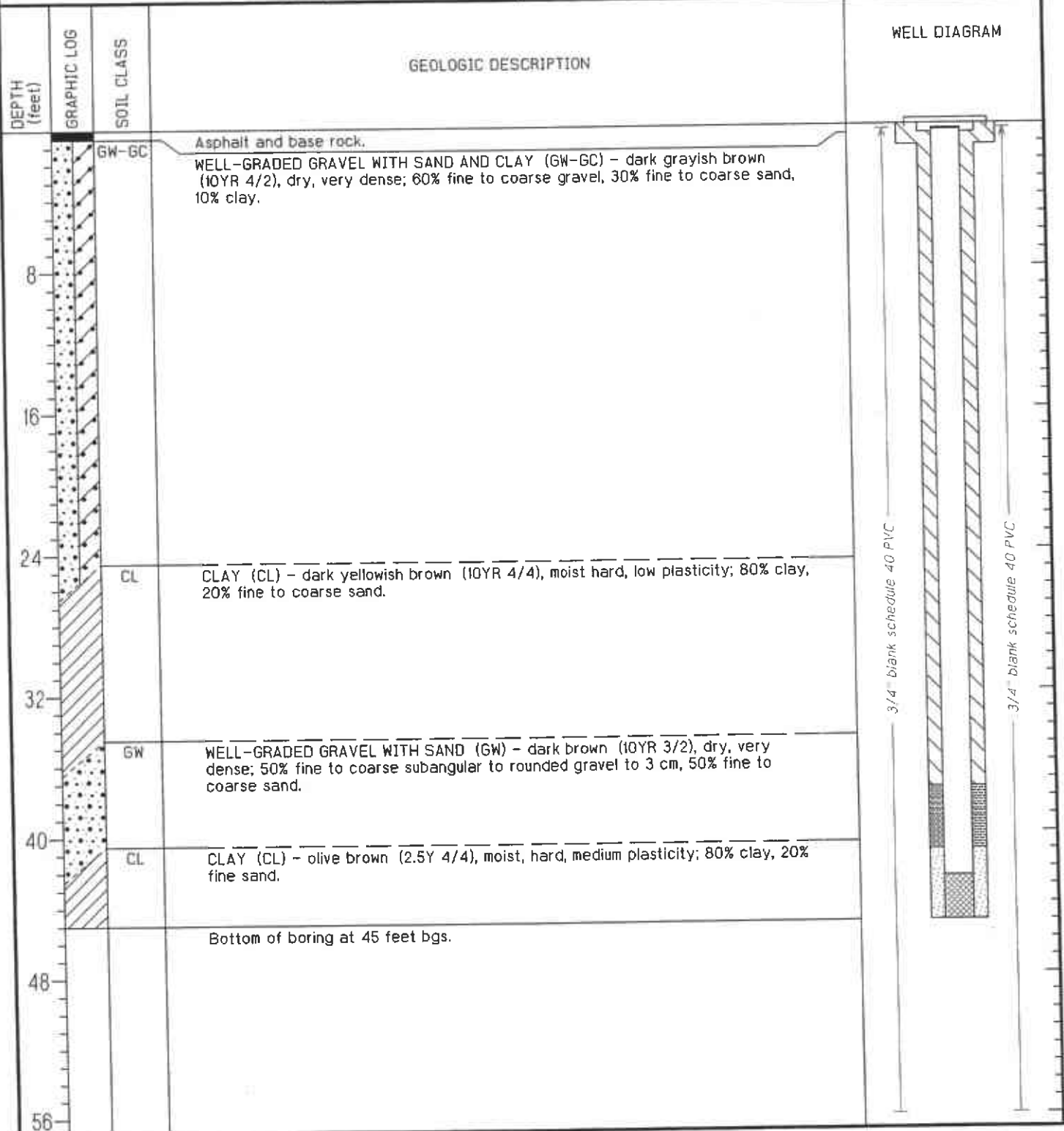
WL (ft. bgs): DATE: TIME:

DRILLING METHOD: *8 in. Hollow Stem Auger*

TOTAL DEPTH: *45 feet*

DRILLING COMPANY: *Cascade Drilling*

GEOLOGIST: *Jed Douglas*



Gettler-Ryan, Inc.

Log of Boring SP-5/SP-5S

PROJECT: *Tosco (76) Service Station No. 4186*

LOCATION: *1771 First Street, Livermore, CA*

GR PROJECT NO.: *140175.07*

CASING ELEVATION:

DATE STARTED: *12/05/01*

WL (ft. bgs): DATE: TIME:

DATE FINISHED: *12/05/01*

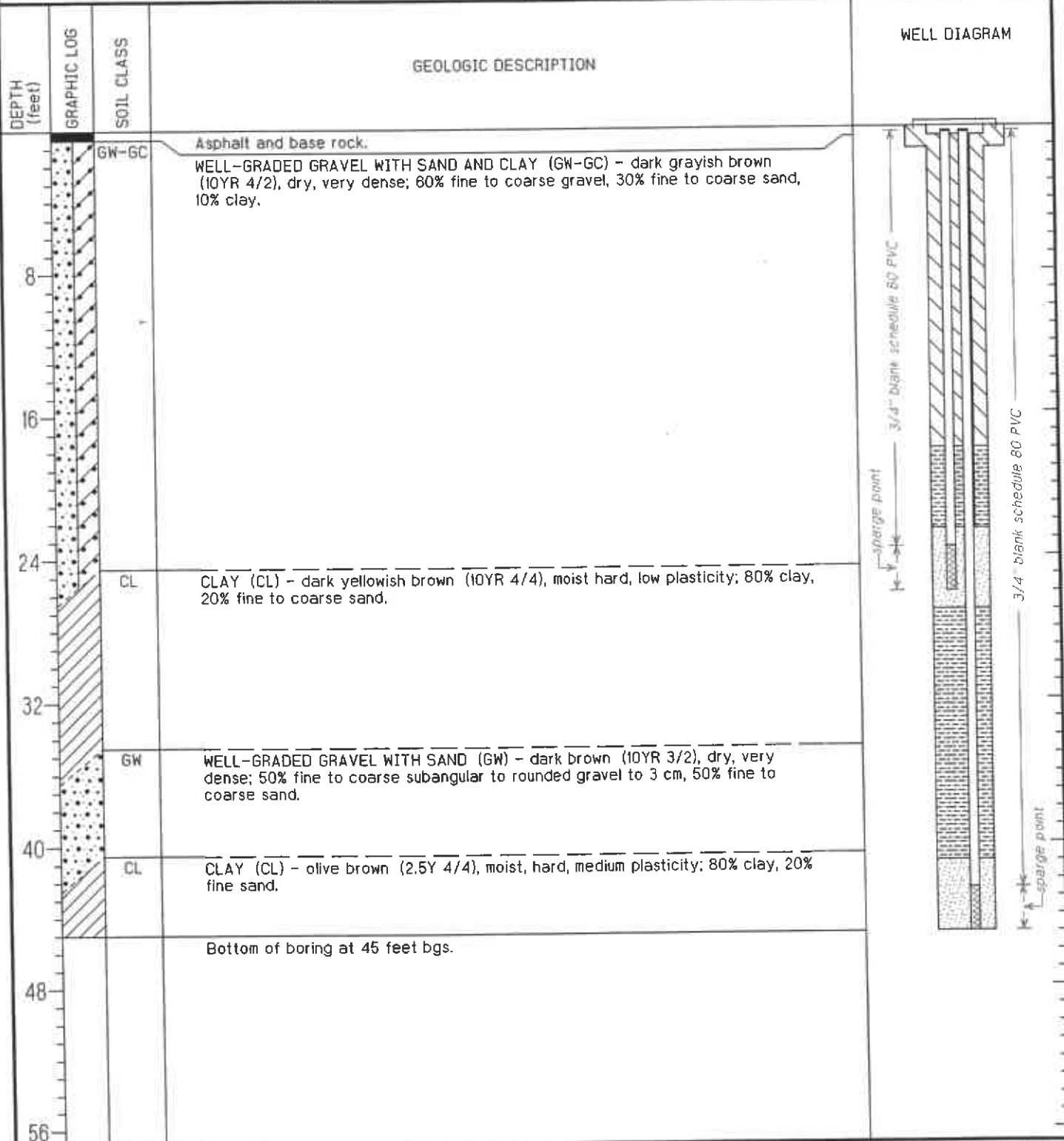
WL (ft. bgs): DATE: TIME:

DRILLING METHOD: *8 in. Hollow Stem Auger*

TOTAL DEPTH: *45 feet*

DRILLING COMPANY: *Cascade Drilling*

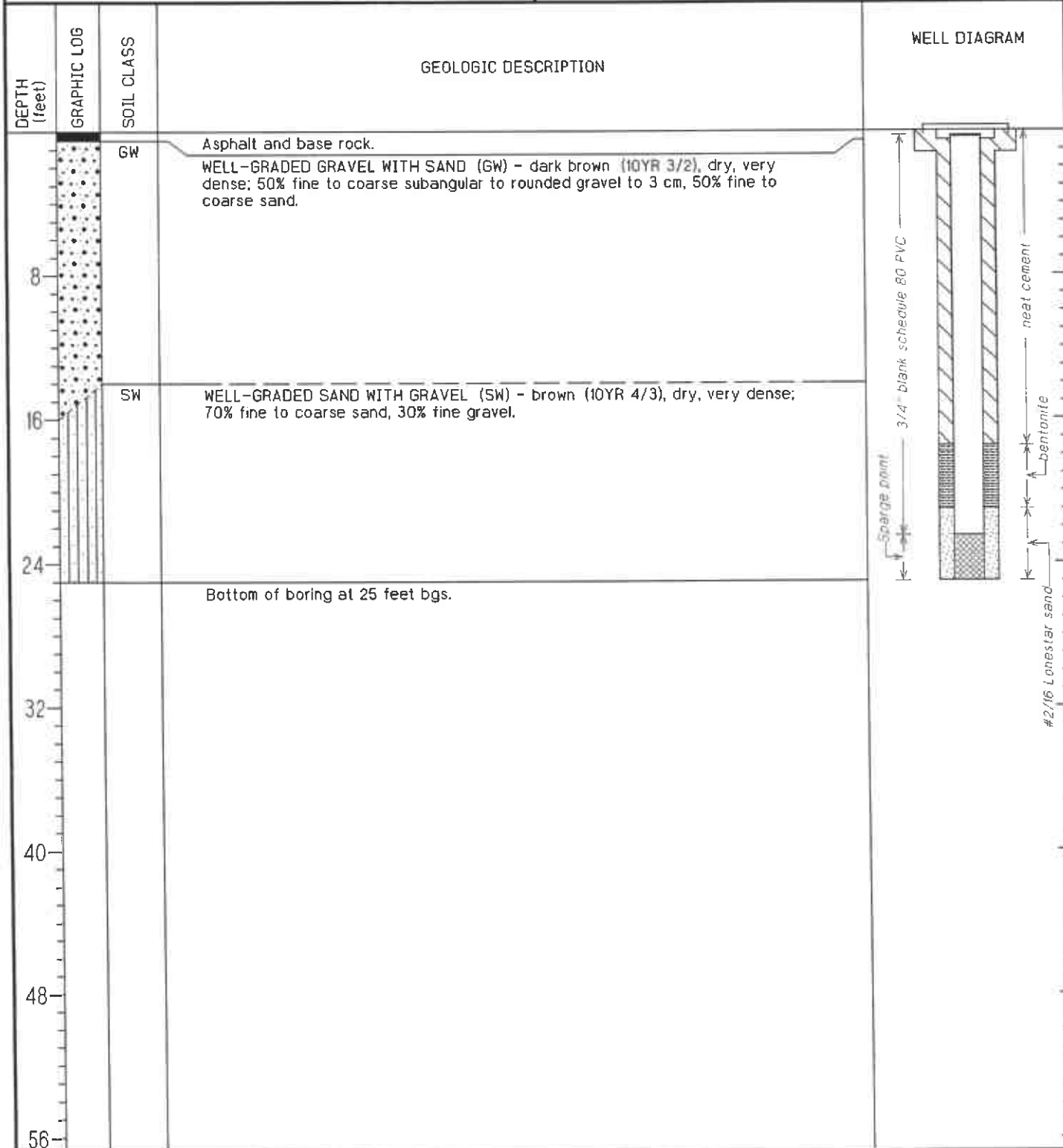
GEOLOGIST: *Jed Douglas*



Gettler-Ryan, Inc.

Log of Boring SP-6S

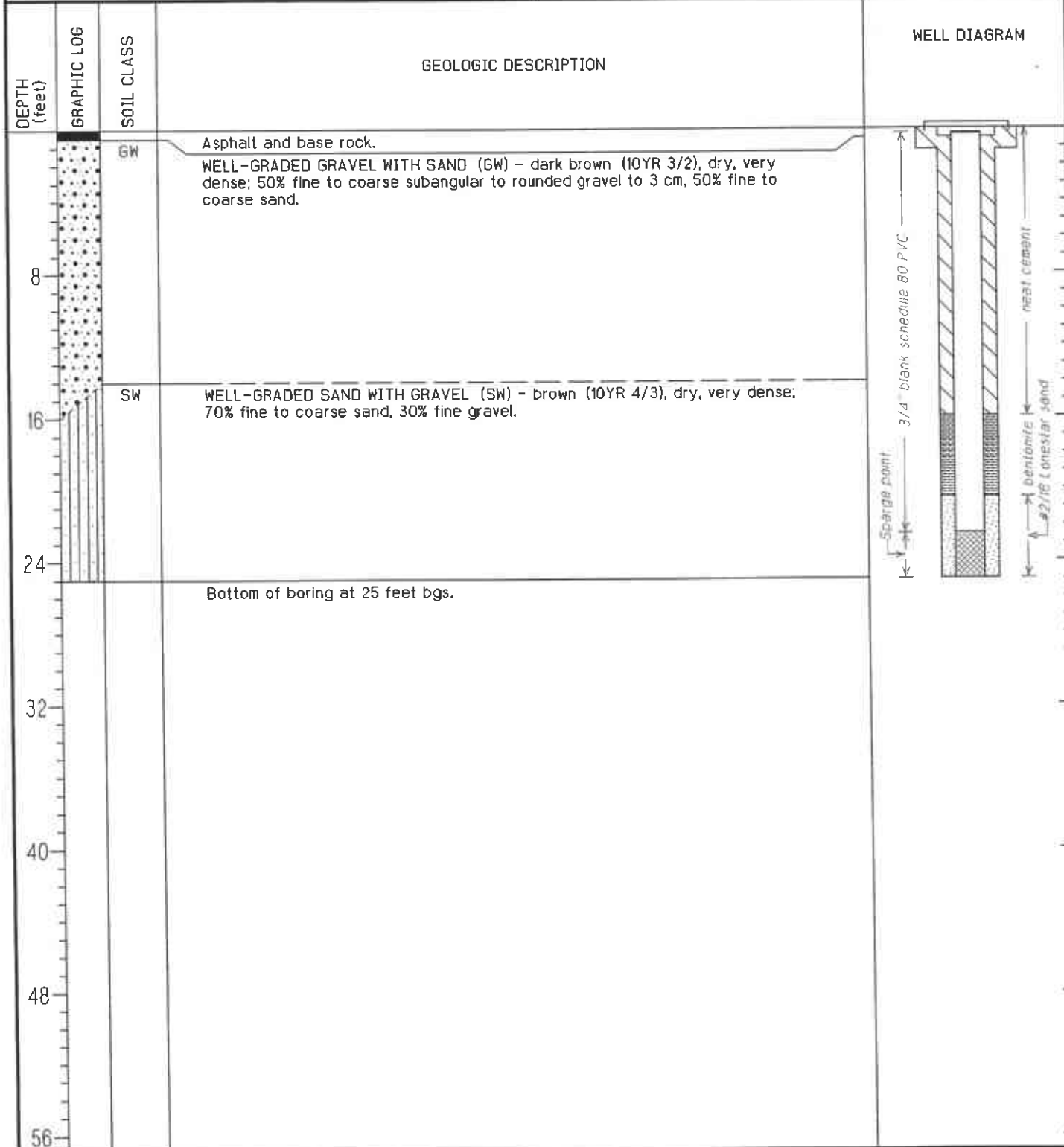
PROJECT: <i>Tosco (76) Service Station No. 4186</i>	LOCATION: <i>1771 First Street, Livermore, CA</i>
GR PROJECT NO.: <i>140175.07</i>	CASING ELEVATION:
DATE STARTED: <i>12/07/01</i>	WL (ft. bgs): DATE: TIME:
DATE FINISHED: <i>12/07/01</i>	WL (ft. bgs): DATE: TIME:
DRILLING METHOD: <i>8 in. Hollow Stem Auger</i>	TOTAL DEPTH: <i>25 feet</i>
DRILLING COMPANY: <i>Cascade Drilling</i>	GEOLOGIST: <i>Jed Douglas</i>



Gettler-Ryan, Inc.

Log of Boring SP-7S

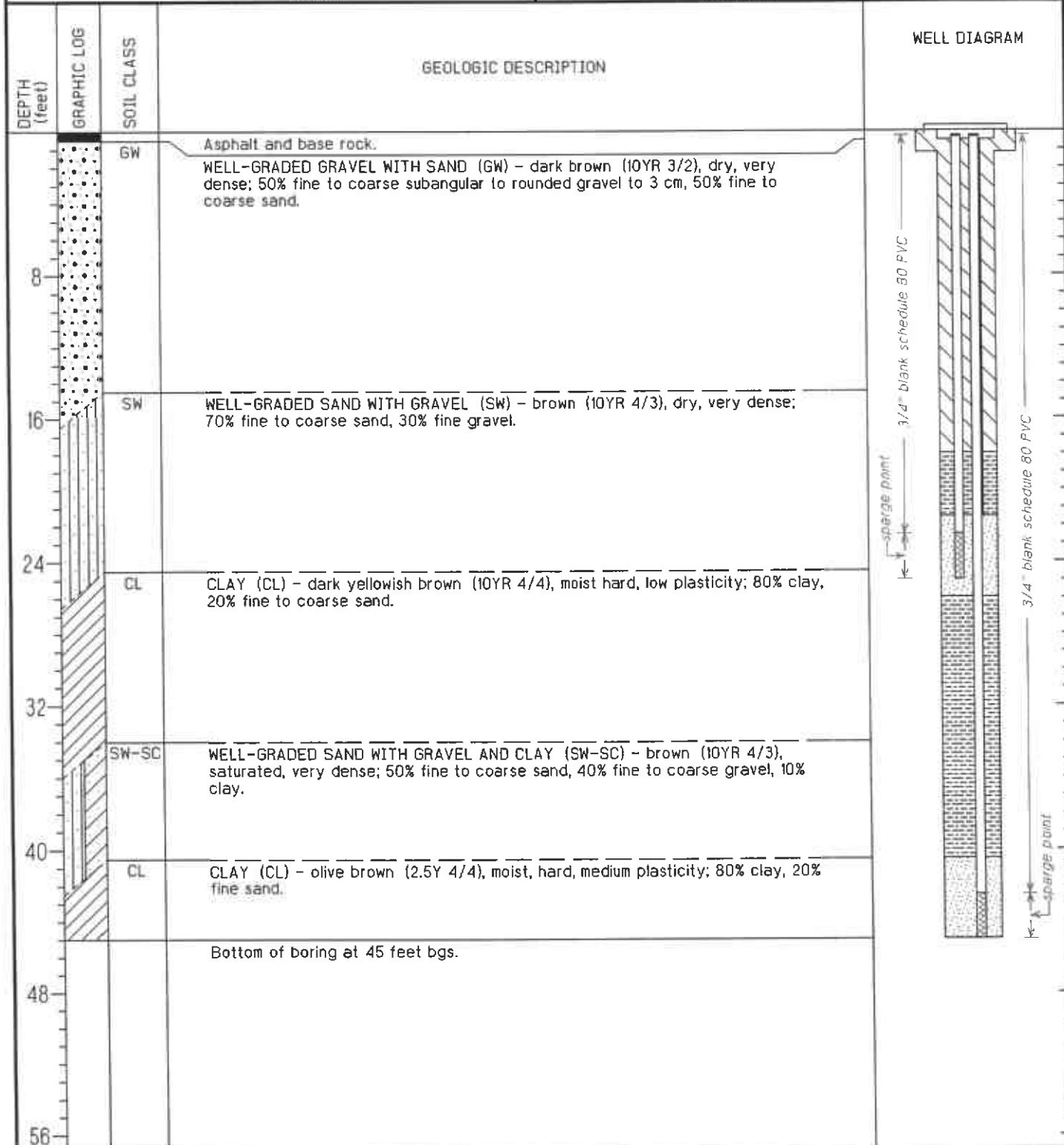
PROJECT: <i>Tosco (76) Service Station No. 4186</i>	LOCATION: <i>1771 First Street, Livermore, CA</i>
GR PROJECT NO.: <i>140175.07</i>	CASING ELEVATION:
DATE STARTED: <i>12/06/01</i>	WL (ft. bgs): DATE: TIME:
DATE FINISHED: <i>12/06/01</i>	WL (ft. bgs): DATE: TIME:
DRILLING METHOD: <i>8 in. Hollow Stem Auger</i>	TOTAL DEPTH: <i>25 feet</i>
DRILLING COMPANY: <i>Cascade Drilling</i>	GEOLOGIST: <i>Jed Douglas</i>



Gettler-Ryan, Inc.

Log of Boring SP-8/SP-8S

PROJECT: <i>Tosco (76) Service Station No. 4186</i>	LOCATION: <i>1771 First Street, Livermore, CA</i>
GR PROJECT NO. : <i>140175.07</i>	CASING ELEVATION:
DATE STARTED: <i>12/05/01</i>	WL (ft. bgs): DATE: TIME:
DATE FINISHED: <i>12/05/01</i>	WL (ft. bgs): DATE: TIME:
DRILLING METHOD: <i>8 in. Hollow Stem Auger</i>	TOTAL DEPTH: <i>45 feet</i>
DRILLING COMPANY: <i>Cascade Drilling</i>	GEOLOGIST: <i>Jed Douglas</i>



APPENDIX C

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD DATA SHEETS

**WELL MONITORING/DEVELOPMENT
FIELD DATA SHEET**

Client/ TOSCO
 Facility# 4186
 Address: 1771 First st.
 City: Livermore, Ca.

Job#: 180181
 Date: 11/3/02
 Sampler: Vantre

Well ID U-6
 Well Diameter 2 in.
 Total Depth 44.65 ft.
 Depth to Water 33.99 ft.

Well Condition: OK

Hydrocarbon Thickness: 0.00 Ft. Amount Bailed (product/water): 0 (gal.)

Volume Factor (VF)	2" = 0.17	3" = 0.38	4" = 0.66
	6" = 1.50	12" = 5.80	

10.66 x VF 0.17 = 1.81 x ¹⁰ (case volume) = Estimated Purge Volume: 18 (gal.)

Purge Equipment: Disposable Bailer
 Bailer
 Stack
 Suction
 Grundfos
 Other: _____

Sampling Equipment: Disposable Bailer
 Bailer
 Pressure Bailer
 Grab Sample
 Other: _____

Starting Time: 1205
 Sampling Time: 1255
 Purging Flow Rate: 1 gpm.
 Did well de-water? Y

Weather Conditions: clear
 Water Color: brn. Odor: mild
 Sediment Description: fine silt (very little)
 If yes; Time: 1214, 1229, 1245 Volume: 8, 12 + 15 (gal.)

Time	Volume (gal.)	pH	Conductivity μ hos/cm	Temperature $^{\circ}$ F	D.O. (mg/L)	ORP (mV)	Alkalinity (ppm)
<u>1207</u>	<u>2</u>	<u>7.77</u>	<u>780</u>	<u>67.6</u>			
<u>1209</u>	<u>4</u>	<u>7.63</u>	<u>803</u>	<u>68.2</u>	<u>clear after 2nd ga.</u>		
<u>1211</u>	<u>6</u>	<u>7.60</u>	<u>809</u>	<u>68.0</u>			
<u>1214</u>	<u>8</u>	<u>7.54</u>	<u>816</u>	<u>68.2</u>			
<u>1227</u>	<u>10</u>	<u>7.56</u>	<u>807</u>	<u>68.1</u>			
<u>1229</u>	<u>12</u>	<u>7.47</u>	<u>801</u>	<u>68.3</u>			
<u>1245</u>	<u>15</u>	<u>7.42</u>	<u>806</u>	<u>68.5</u>			

Dewatered 3 times. slow recovery.

LABORATORY INFORMATION

SAMPLE ID	(#) - CONTAINER	REFRIG.	PRESERV. TYPE	LABORATORY	ANALYSES
<u>U-6</u>	<u>5 VOA's</u>	<u>Y</u>	<u>HCl</u>	<u>SEQUOIA</u>	<u>TPH/G/BTEX/MTBE + 8org's (826c)</u>

COMMENTS: started with stainless steel Bailer - very little silt, no sand.

**WELL MONITORING/DEVELOPMENT
FIELD DATA SHEET**

Client/ Facility# Tosco 4186
 Address: 1771 First st.
 City: Livermore, Ca.

Job#: 180181
 Date: 11/3/02
 Sampler: Verttus

Well ID U-7
 Well Diameter 2 in.
 Total Depth 44.45 ft.
 Depth to Water 32.43 ft.

Well Condition: ok
 Hydrocarbon Thickness: 0.00 Ft. Amount Bailed (product/water): ∅ (gal.)

Volume Factor (VF)	2" = 0.17	3" = 0.38	4" = 0.66
	6" = 1.50	12" = 5.80	

$12.02 \times \text{VF } 0.17 = 2.04 \times 10 \text{ (case volume)} = \text{Estimated Purge Volume: } 20.5 \text{ (gal.)}$

Purge Equipment: Disposable Bailer
 Bailer
 Stack
 Suction
 Grundfos
 Other: _____

Sampling Equipment: Disposable Bailer
 Bailer
 Pressure Bailer
 Grab Sample
 Other: _____

Starting Time: 1310
 Sampling Time: 1400
 Purging Flow Rate: 1 gpm.
 Did well de-water? 4

Weather Conditions: clear
 Water Color: clear Odor: mild
 Sediment Description: _____
 If yes; Time: 1318, 1333, 1346 Volume: 7, 10, 13 (gal.)

Time	Volume (gal.)	pH	Conductivity $\mu\text{mhos/cm}$	Temperature $^{\circ}\text{F}$	D.O. (mg/L)	ORP (mV)	Alkalinity (ppm)
1310	2	7.60	721	68.3			
1314	4	7.53	762	68.5			
1316	6	7.50	763	68.3			
1318	7	7.43	767	68.4			
1333	10	7.38	760	68.2			
1345	12	7.32	772	68.3			
1346	13	7.35	776	68.5			
Dewatered 3 times - slow recovery							

LABORATORY INFORMATION

SAMPLE ID	(#) - CONTAINER	REFRIG.	PRESERV. TYPE	LABORATORY	ANALYSES
U-7	5 VOA's	Y	HCY	SEQUOIA	TPH/G/BTEX/MTBE+ 8042 (800)

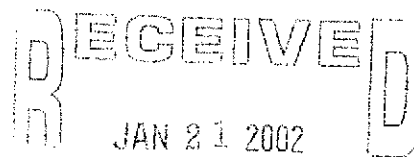
COMMENTS: started with stainless steel Bailer - clear

Virgil Chavez Land Surveying

312 Georgia Street, Suite 225
Vallejo, California 94590-5907
(707) 553-2476 • Fax (707) 553-8698

January 17, 2002
Project No. 1604-19A

Jed Douglas
Gettler-Ryan Inc.
1364 N. McDowell Blvd., Suite B2
Petaluma, CA 94954



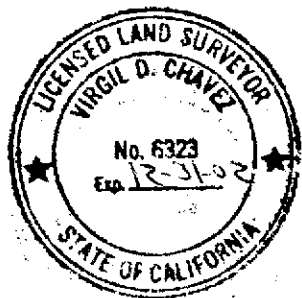
Subject: Monitoring Well Survey
Former Tosco (76) Service Station No. 4186
1771 First Street
Livermore, CA

GETTLER-RYAN, INC.
GENERAL CONTRACTOR

Dear Jed:

This is to confirm that we have proceeded at your request to survey the ground water monitoring wells located at the above referenced location. The survey was completed on January 16, 2002. The benchmark for this survey was a City of Livermore survey monument at First & "Q" Streets. The latitude, longitude and coordinates are for top of casings and are based on the California State Coordinate System, Zone III (NAD83). Measurements taken at approximate top of box and top of casing. Benchmark Elev. = 469.246 feet, (NGVD 29).

<u>Latitude</u>	<u>Longitude</u>	<u>Northing</u>	<u>Easting</u>	<u>Elev.</u>	<u>Desc.</u>
				478.65	Rim U-6
37.6797775	121.7741765	2072494.83	6192941.69	478.38	TOC U-6
				479.09	Rim U-7
37.6797136	121.7739540	2072470.71	6193005.75	478.74	TOC U-7



Sincerely,

Virgil D. Chavez
Virgil D. Chavez, PLS 6323

APPENDIX E

LABORATORY ANALYTICAL REPORTS AND CHAIN-OF-CUSTODY RECORDS



**Sequoia
Analytical**

404 N. Wiget Lane
Walnut Creek, CA 94598
(925) 988-9600
FAX (925) 988-9673
www.sequoialabs.com

21 December, 2001

Jed Douglas
Gettler Ryan, Inc. - Petaluma
1364 North McDowell Boulevard, Suite B2
Petaluma, CA 94954-1175

RE: Tosco
Sequoia Report: W112113

Enclosed are the results of analyses for samples received by the laboratory on 07-Dec-01 10:35. If you have any questions concerning this report, please feel free to contact me.



Charlie Westwater
Project Manager
CA ELAP Certificate #1271



Gettler Ryan, Inc. - Petaluma
1364 North McDowell Boulevard, Suite B2
Petaluma CA, 94954-1175

Project: Tosco
Project Number: Tosco # 4186
Project Manager: Jed Douglas

Reported:
21-Dec-01 08:29

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
U6-25	W112113-01	Soil	06-Dec-01 09:35	07-Dec-01 10:35
U6-30	W112113-02	Soil	06-Dec-01 09:40	07-Dec-01 10:35
U7-15	W112113-03	Soil	06-Dec-01 12:55	07-Dec-01 10:35
U7-25	W112113-04	Soil	06-Dec-01 13:15	07-Dec-01 10:35

Sequoia Analytical - Walnut Creek

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Charlie Westwater, Project Manager



Gettler Ryan, Inc. - Petaluma
1364 North McDowell Boulevard, Suite B2
Petaluma CA, 94954-1175

Project: Tosco
Project Number: Tosco # 4186
Project Manager: Jed Douglas

Reported:
21-Dec-01 08:29

Total Purgeable Hydrocarbons (C6-C12), BTEX and MTBE by DHS LUFT
Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
U6-25 (W112113-01) Soil Sampled: 06-Dec-01 09:35 Received: 07-Dec-01 10:35									
Purgeable Hydrocarbons (C6-C12)	ND	1.0	mg/kg	20	1L12003	12-Dec-01	12-Dec-01	EPA 8015/8021	
Benzene	ND	0.0050	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Methyl tert-butyl ether (MTBE)	ND	0.050	"	"	"	"	"	"	
<i>Surrogate: a,a,a-Trifluorotoluene</i>		106 %	40-140		"	"	"	"	
U6-30 (W112113-02) Soil Sampled: 06-Dec-01 09:40 Received: 07-Dec-01 10:35									
Purgeable Hydrocarbons (C6-C12)	ND	1.0	mg/kg	20	1L12003	12-Dec-01	13-Dec-01	EPA 8015/8021	
Benzene	ND	0.0050	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Methyl tert-butyl ether (MTBE)	ND	0.050	"	"	"	"	"	"	
<i>Surrogate: a,a,a-Trifluorotoluene</i>		104 %	40-140		"	"	"	"	
U7-15 (W112113-03) Soil Sampled: 06-Dec-01 12:55 Received: 07-Dec-01 10:35									
Purgeable Hydrocarbons (C6-C12)	ND	1.0	mg/kg	20	1L12003	12-Dec-01	12-Dec-01	EPA 8015/8021	
Benzene	ND	0.0050	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Methyl tert-butyl ether (MTBE)	ND	0.050	"	"	"	"	"	"	
<i>Surrogate: a,a,a-Trifluorotoluene</i>		89 %	40-140		"	"	"	"	



Gettler Ryan, Inc. - Petaluma
1364 North McDowell Boulevard, Suite B2
Petaluma CA, 94954-1175

Project: Tosco
Project Number: Tosco # 4186
Project Manager: Jed Douglas

Reported:
21-Dec-01 08:29

**Total Purgeable Hydrocarbons (C6-C12), BTEX and MTBE by DHS LUFT
Sequoia Analytical - Walnut Creek**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
U7-25 (W112113-04) Soil Sampled: 06-Dec-01 13:15 Received: 07-Dec-01 10:35									
Purgeable Hydrocarbons (C6-C12)	ND	1.0	mg/kg	20	1L12003	12-Dec-01	12-Dec-01	EPA 8015/8021	
Benzene	ND	0.0050	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Methyl tert-butyl ether (MTBE)	ND	0.050	"	"	"	"	"	"	
Surrogate: <i>a,a,a</i> -Trifluorotoluene		93 %	40-140		"	"	"	"	



Gettler Ryan, Inc. - Petaluma
1364 North McDowell Boulevard, Suite B2
Petaluma CA, 94954-1175

Project: Tosco
Project Number: Tosco # 4186
Project Manager: Jed Douglas

Reported:
21-Dec-01 08:29

**Volatile Organic Compounds by EPA Method 8260B
Sequoia Analytical - Walnut Creek**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
U6-25 (W112113-01) Soil Sampled: 06-Dec-01 09:35 Received: 07-Dec-01 10:35									
tert-Butyl alcohol	ND	2.5	mg/kg	100	1L10029	10-Dec-01	10-Dec-01	EPA 8260B	
Methyl tert-butyl ether (MTBE)	ND	0.20	"	"	"	"	"	"	
Di-isopropyl ether	ND	0.10	"	"	"	"	"	"	
Ethyl tert-butyl ether	ND	0.10	"	"	"	"	"	"	
tert-Amyl methyl ether	ND	0.10	"	"	"	"	"	"	
1,2-Dichloroethane	ND	0.10	"	"	"	"	"	"	
1,2-Dibromoethane	ND	0.20	"	"	"	"	"	"	
<i>Surrogate: Dibromofluoromethane</i>		95 %	50-150		"	"	"	"	
<i>Surrogate: 1,2-Dichloroethane-d4</i>		118 %	50-150		"	"	"	"	
U6-30 (W112113-02) Soil Sampled: 06-Dec-01 09:40 Received: 07-Dec-01 10:35									
tert-Butyl alcohol	ND	2.5	mg/kg	100	1L10029	10-Dec-01	10-Dec-01	EPA 8260B	
Methyl tert-butyl ether (MTBE)	ND	0.20	"	"	"	"	"	"	
Di-isopropyl ether	ND	0.10	"	"	"	"	"	"	
Ethyl tert-butyl ether	ND	0.10	"	"	"	"	"	"	
tert-Amyl methyl ether	ND	0.10	"	"	"	"	"	"	
1,2-Dichloroethane	ND	0.10	"	"	"	"	"	"	
1,2-Dibromoethane	ND	0.20	"	"	"	"	"	"	
<i>Surrogate: Dibromofluoromethane</i>		100 %	50-150		"	"	"	"	
<i>Surrogate: 1,2-Dichloroethane-d4</i>		120 %	50-150		"	"	"	"	
U7-15 (W112113-03) Soil Sampled: 06-Dec-01 12:55 Received: 07-Dec-01 10:35									
tert-Butyl alcohol	ND	2.5	mg/kg	100	1L10029	10-Dec-01	10-Dec-01	EPA 8260B	
Methyl tert-butyl ether (MTBE)	ND	0.20	"	"	"	"	"	"	
Di-isopropyl ether	ND	0.10	"	"	"	"	"	"	
Ethyl tert-butyl ether	ND	0.10	"	"	"	"	"	"	
tert-Amyl methyl ether	ND	0.10	"	"	"	"	"	"	
1,2-Dichloroethane	ND	0.10	"	"	"	"	"	"	
1,2-Dibromoethane	ND	0.20	"	"	"	"	"	"	
<i>Surrogate: Dibromofluoromethane</i>		97 %	50-150		"	"	"	"	
<i>Surrogate: 1,2-Dichloroethane-d4</i>		123 %	50-150		"	"	"	"	



Gettler Ryan, Inc. - Petaluma 1364 North McDowell Boulevard, Suite B2 Petaluma CA, 94954-1175	Project: Tosco Project Number: Tosco # 4186 Project Manager: Jed Douglas	Reported: 21-Dec-01 08:29
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**Volatile Organic Compounds by EPA Method 8260B
Sequoia Analytical - Walnut Creek**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
U7-25 (W112113-04) Soil Sampled: 06-Dec-01 13:15 Received: 07-Dec-01 10:35									
tert-Butyl alcohol	ND	2.5	mg/kg	100	1L10029	10-Dec-01	10-Dec-01	EPA 8260B	
Methyl tert-butyl ether (MTBE)	ND	0.20	"	"	"	"	"	"	
Di-isopropyl ether	ND	0.10	"	"	"	"	"	"	
Ethyl tert-butyl ether	ND	0.10	"	"	"	"	"	"	
tert-Amyl methyl ether	ND	0.10	"	"	"	"	"	"	
1,2-Dichloroethane	ND	0.10	"	"	"	"	"	"	
1,2-Dibromoethane	ND	0.20	"	"	"	"	"	"	
<i>Surrogate: Dibromofluoromethane</i>		98 %	50-150		"	"	"	"	
<i>Surrogate: 1,2-Dichloroethane-d4</i>		127 %	50-150		"	"	"	"	

Gettler Ryan, Inc. - Petaluma
 1364 North McDowell Boulevard, Suite B2
 Petaluma CA, 94954-1175

 Project: Tosco
 Project Number: Tosco # 4186
 Project Manager: Jed Douglas

Reported:
 21-Dec-01 08:29

Total Purgeable Hydrocarbons (C6-C12), BTEX and MTBE by DHS LUFT - Quality Control
Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 1L12003 - EPA 5030B MeOH
Blank (1L12003-BLK1)

Prepared & Analyzed: 12-Dec-01

Purgeable Hydrocarbons (C6-C12)	ND	1.0	mg/kg							
Benzene	ND	0.0050	"							
Toluene	ND	0.0050	"							
Ethylbenzene	ND	0.0050	"							
Xylenes (total)	ND	0.0050	"							
Methyl tert-butyl ether (MTBE)	ND	0.050	"							
<i>Surrogate: a,a,a-Trifluorotoluene</i>	0.608		"	0.600		101	40-140			

LCS (1L12003-BS1)

Prepared & Analyzed: 12-Dec-01

Benzene	0.874	0.0050	mg/kg	0.800		109	50-150			
Toluene	0.886	0.0050	"	0.800		111	50-150			
Ethylbenzene	0.852	0.0050	"	0.800		106	50-150			
Xylenes (total)	2.68	0.0050	"	2.40		112	50-150			
<i>Surrogate: a,a,a-Trifluorotoluene</i>	0.788		"	0.600		131	40-140			

Matrix Spike (1L12003-MS1)

Source: W112113-01

Prepared: 12-Dec-01 Analyzed: 13-Dec-01

Benzene	0.654	0.0050	mg/kg	0.800	ND	82	50-150			
Toluene	0.816	0.0050	"	0.800	ND	102	50-150			
Ethylbenzene	0.790	0.0050	"	0.800	ND	99	50-150			
Xylenes (total)	2.56	0.0050	"	2.40	ND	107	50-150			
<i>Surrogate: a,a,a-Trifluorotoluene</i>	0.522		"	0.600		87	40-140			

Matrix Spike Dup (1L12003-MSD1)

Source: W112113-01

Prepared: 12-Dec-01 Analyzed: 13-Dec-01

Benzene	0.650	0.0050	mg/kg	0.800	ND	81	50-150	0.6	20	
Toluene	0.832	0.0050	"	0.800	ND	104	50-150	2	20	
Ethylbenzene	0.860	0.0050	"	0.800	ND	108	50-150	8	20	
Xylenes (total)	2.56	0.0050	"	2.40	ND	107	50-150	0	20	
<i>Surrogate: a,a,a-Trifluorotoluene</i>	0.532		"	0.600		89	40-140			



Gettler Ryan, Inc. - Petaluma
1364 North McDowell Boulevard, Suite B2
Petaluma CA, 94954-1175

Project: Tosco
Project Number: Tosco # 4186
Project Manager: Jed Douglas

Reported:
21-Dec-01 08:29

Volatile Organic Compounds by EPA Method 8260B - Quality Control
Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 1L10029 - EPA 5030B (MeOH)

Blank (1L10029-BLK1)		Prepared & Analyzed: 10-Dec-01								
Ethanol	ND	25	mg/kg							
tert-Butyl alcohol	ND	2.5	"							
Methyl tert-butyl ether (MTBE)	ND	0.20	"							
Di-isopropyl ether	ND	0.10	"							
Ethyl tert-butyl ether	ND	0.10	"							
tert-Amyl methyl ether	ND	0.10	"							
1,2-Dichloroethane	ND	0.10	"							
1,2-Dibromoethane	ND	0.20	"							

<i>Surrogate: Dibromofluoromethane</i>	2.47		"	2.50		99	50-150			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	2.89		"	2.50		116	50-150			

LCS (1L10029-BS1)		Prepared & Analyzed: 10-Dec-01								
Methyl tert-butyl ether (MTBE)	2.00	0.20	mg/kg	2.50		80	70-130			
<i>Surrogate: Dibromofluoromethane</i>	2.40		"	2.50		96	50-150			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	2.84		"	2.50		114	50-150			

Matrix Spike (1L10029-MS1)		Source: W112113-01		Prepared & Analyzed: 10-Dec-01						
Methyl tert-butyl ether (MTBE)	2.14	0.20	mg/kg	2.50	ND	86	60-140			
<i>Surrogate: Dibromofluoromethane</i>	2.51		"	2.50		100	50-150			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	3.26		"	2.50		130	50-150			

Matrix Spike Dup (1L10029-MSD1)		Source: W112113-01		Prepared & Analyzed: 10-Dec-01						
Methyl tert-butyl ether (MTBE)	2.50	0.20	mg/kg	2.50	ND	100	60-140	16	25	
<i>Surrogate: Dibromofluoromethane</i>	2.49		"	2.50		100	50-150			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	3.24		"	2.50		130	50-150			



Gettler Ryan, Inc. - Petaluma
1364 North McDowell Boulevard, Suite B2
Petaluma CA, 94954-1175

Project: Tosco
Project Number: Tosco # 4186
Project Manager: Jed Douglas

Reported:
21-Dec-01 08:29

Notes and Definitions

DET Analyte DETECTED
ND Analyte NOT DETECTED at or above the reporting limit
NR Not Reported
dry Sample results reported on a dry weight basis
RPD Relative Percent Difference



**Sequoia
Analytical**

1551 Industrial Road
San Carlos, CA 94070
(650) 232-9600
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www.sequoialabs.com

22 January, 2002

Deanna Harding
Gettler-Ryan/Geostrategies(1)
6747 Sierra Court, Suite J
Dublin, CA 94568

RECEIVED
REGISTRY

JAN 22 2002

GETTLER-RYAN, INC.
GENERAL CONTRACTORS

RE: Tosco(1)
Sequoia Report: L201017

Enclosed are the results of analyses for samples received by the laboratory on 01/03/02 19:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Latonya Pelt
Project Manager

CA ELAP Certificate #2360



Gettler-Ryan/Geostrategies(1)
6747 Sierra Court, Suite J
Dublin CA, 94568

Project: Tosco(1)
Project Number: Unocal SS#4186, Livermore, CA
Project Manager: Deanna Harding

Reported:
01/22/02 12:10

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
TB-LB	L201017-01	Water	01/03/02 00:00	01/03/02 19:30
U-1	L201017-02	Water	01/03/02 10:30	01/03/02 19:30
U-2	L201017-03	Water	01/03/02 11:10	01/03/02 19:30
U-3	L201017-04	Water	01/03/02 11:50	01/03/02 19:30
U-4	L201017-05	Water	01/03/02 09:45	01/03/02 19:30
U-5	L201017-06	Water	01/03/02 09:05	01/03/02 19:30
U-6	L201017-07	Water	01/03/02 12:55	01/03/02 19:30
U-7	L201017-08	Water	01/03/02 14:00	01/03/02 19:30

Sequoia Analytical - San Carlos

Latonya Pelt, Project Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Gettler-Ryan/Geostrategies(1)
6747 Sierra Court, Suite J
Dublin CA, 94568

Project: Tosco(1)
Project Number: Unocal SS#4186, Livermore, CA
Project Manager: Deanna Harding

Reported:
01/22/02 12:10

**Total Purgeable Hydrocarbon (C6-C12) by EPA 8015M and BTEX/MTBE by EPA 8021B
Sequoia Analytical - San Carlos**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
TB-LB (L201017-01) Water Sampled: 01/03/02 00:00 Received: 01/03/02 19:30									
Purgeable Hydrocarbons as Gasoline	ND	50	ug/l	1	2010043	01/14/02	01/14/02	EPA 8021B	
Benzene	ND	0.50	"	"	"	"	"	"	
Toluene	ND	0.50	"	"	"	"	"	"	
Ethylbenzene	ND	0.50	"	"	"	"	"	"	
Xylenes (total)	ND	0.50	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	5.0	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		90.2 %	70-130		"	"	"	"	
U-1 (L201017-02) Water Sampled: 01/03/02 10:30 Received: 01/03/02 19:30									
Purgeable Hydrocarbons as Gasoline	160	50	ug/l	1	2010044	01/14/02	01/14/02	EPA 8021B	P-03
Benzene	ND	0.50	"	"	"	"	"	"	
Toluene	0.51	0.50	"	"	"	"	"	"	
Ethylbenzene	ND	0.50	"	"	"	"	"	"	
Xylenes (total)	0.69	0.50	"	"	"	"	"	"	
Methyl tert-butyl ether	31	5.0	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		86.8 %	70-130		"	"	"	"	
U-2 (L201017-03) Water Sampled: 01/03/02 11:10 Received: 01/03/02 19:30									
Purgeable Hydrocarbons as Gasoline	260	50	ug/l	1	2010043	01/14/02	01/14/02	EPA 8021B	P-01
Benzene	7.7	0.50	"	"	"	"	"	"	
Toluene	11	0.50	"	"	"	"	"	"	
Ethylbenzene	1.7	0.50	"	"	"	"	"	"	
Xylenes (total)	15	0.50	"	"	"	"	"	"	
Methyl tert-butyl ether	42	5.0	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		124 %	70-130		"	"	"	"	

Gettler-Ryan/Geostrategies(1)
 6747 Sierra Court, Suite J
 Dublin CA, 94568

 Project: Tosco(1)
 Project Number: Unocal SS#4186, Livermore, CA
 Project Manager: Deanna Harding

Reported:
 01/22/02 12:10

Total Purgeable Hydrocarbon (C6-C12) by EPA 8015M and BTEX/MTBE by EPA 8021B
Sequoia Analytical - San Carlos

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
U-3 (L201017-04) Water Sampled: 01/03/02 11:50 Received: 01/03/02 19:30									
Purgeable Hydrocarbons as Gasoline	9900	1200	ug/l	25	2010044	01/14/02	01/14/02	EPA 8021B	P-01
Benzene	700	12	"	"	"	"	"	"	
Toluene	130	12	"	"	"	"	"	"	
Ethylbenzene	24	12	"	"	"	"	"	"	
Xylenes (total)	1000	12	"	"	"	"	"	"	
Methyl tert-butyl ether	14000	500	"	100	"	"	"	"	M-04
Surrogate: a,a,a-Trifluorotoluene		84.0 %	70-130		"	"	"	"	
U-4 (L201017-05) Water Sampled: 01/03/02 09:45 Received: 01/03/02 19:30									
Purgeable Hydrocarbons as Gasoline	100	50	ug/l	1	2010044	01/14/02	01/15/02	EPA 8021B	P-03
Benzene	ND	0.50	"	"	"	"	"	"	
Toluene	ND	0.50	"	"	"	"	"	"	
Ethylbenzene	ND	0.50	"	"	"	"	"	"	
Xylenes (total)	ND	0.50	"	"	"	"	"	"	
Methyl tert-butyl ether	10	5.0	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		100 %	70-130		"	"	"	"	
U-5 (L201017-06) Water Sampled: 01/03/02 09:05 Received: 01/03/02 19:30									
Purgeable Hydrocarbons as Gasoline	ND	50	ug/l	1	2010044	01/14/02	01/15/02	EPA 8021B	
Benzene	ND	0.50	"	"	"	"	"	"	
Toluene	0.59	0.50	"	"	"	"	"	"	
Ethylbenzene	ND	0.50	"	"	"	"	"	"	
Xylenes (total)	0.91	0.50	"	"	"	"	"	"	
Methyl tert-butyl ether	51	5.0	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		92.3 %	70-130		"	"	"	"	



Gettler-Ryan/Geostrategies(1)
6747 Sierra Court, Suite J
Dublin CA, 94568

Project: Tosco(1)
Project Number: Unocal SS#4186, Livermore, CA
Project Manager: Deanna Harding

Reported:
01/22/02 12:10

Total Purgeable Hydrocarbon (C6-C12) by EPA 8015M and BTEX/MTBE by EPA 8021B
Sequoia Analytical - San Carlos

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
U-6 (L201017-07) Water Sampled: 01/03/02 12:55 Received: 01/03/02 19:30									
Purgeable Hydrocarbons as Gasoline	5000	2500	ug/l	50	2010044	01/14/02	01/15/02	EPA 8021B	P-02
Benzene	36	25	"	"	"	"	"	"	
Toluene	ND	25	"	"	"	"	"	"	
Ethylbenzene	260	25	"	"	"	"	"	"	
Xylenes (total)	450	25	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	250	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		76.8 %	70-130		"	"	"	"	
U-7 (L201017-08) Water Sampled: 01/03/02 14:00 Received: 01/03/02 19:30									
Purgeable Hydrocarbons as Gasoline	3100	1000	ug/l	20	2010044	01/14/02	01/15/02	EPA 8021B	P-02
Benzene	93	10	"	"	"	"	"	"	
Toluene	ND	10	"	"	"	"	"	"	
Ethylbenzene	35	10	"	"	"	"	"	"	
Xylenes (total)	73	10	"	"	"	"	"	"	
Methyl tert-butyl ether	140	100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		84.6 %	70-130		"	"	"	"	



Gettler-Ryan/Geostrategies(1)
6747 Sierra Court, Suite J
Dublin CA, 94568

Project: Tosco(1)
Project Number: Unocal SS#4186, Livermore, CA
Project Manager: Deanna Harding

Reported:
01/22/02 12:10

Volatile Organic 8 Oxygenated Compounds by EPA Method 8260B

Sequoia Analytical - San Carlos

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
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U-3 (L201017-04) Water Sampled: 01/03/02 11:50 Received: 01/03/02 19:30

Ethanol	ND	50000	ug/l	100	2010020	01/07/02	01/07/02	EPA 8260B	
1,2-Dibromoethane	ND	100	"	"	"	"	"	"	
1,2-Dichloroethane	ND	100	"	"	"	"	"	"	
Di-isopropyl ether	ND	100	"	"	"	"	"	"	
Ethyl tert-butyl ether	ND	100	"	"	"	"	"	"	
Methyl tert-butyl ether	12000	100	"	"	"	"	"	"	
Tert-amyl methyl ether	ND	100	"	"	"	"	"	"	
Tert-butyl alcohol	17000	2000	"	"	"	"	"	"	

Surrogate: 1,2-Dichloroethane-d4

93.5 % 70-130

Surrogate: Toluene-d8

99.8 % 70-130

U-4 (L201017-05) Water Sampled: 01/03/02 09:45 Received: 01/03/02 19:30

Ethanol	ND	500	ug/l	1	2010014	01/07/02	01/07/02	EPA 8260B	
1,2-Dibromoethane	ND	1.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	1.0	"	"	"	"	"	"	
Di-isopropyl ether	ND	1.0	"	"	"	"	"	"	
Ethyl tert-butyl ether	ND	1.0	"	"	"	"	"	"	
Methyl tert-butyl ether	8.5	1.0	"	"	"	"	"	"	
Tert-amyl methyl ether	ND	1.0	"	"	"	"	"	"	
Tert-butyl alcohol	ND	20	"	"	"	"	"	"	

Surrogate: 1,2-Dichloroethane-d4

98.2 % 70-130

Surrogate: Toluene-d8

101 % 70-130

U-5 (L201017-06) Water Sampled: 01/03/02 09:05 Received: 01/03/02 19:30

Ethanol	ND	500	ug/l	1	2010014	01/07/02	01/07/02	EPA 8260B	
1,2-Dibromoethane	ND	1.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	1.0	"	"	"	"	"	"	
Di-isopropyl ether	ND	1.0	"	"	"	"	"	"	
Ethyl tert-butyl ether	ND	1.0	"	"	"	"	"	"	
Methyl tert-butyl ether	53	1.0	"	"	"	"	"	"	
Tert-amyl methyl ether	ND	1.0	"	"	"	"	"	"	
Tert-butyl alcohol	ND	20	"	"	"	"	"	"	

Surrogate: 1,2-Dichloroethane-d4

97.8 % 70-130

Surrogate: Toluene-d8

101 % 70-130



Gettler-Ryan/Geostrategies(1)
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Dublin CA, 94568

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Project Manager: Deanna Harding

Reported:
01/22/02 12:10

Volatile Organic 8 Oxygenated Compounds by EPA Method 8260B
Sequoia Analytical - San Carlos

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
U-6 (L201017-07) Water Sampled: 01/03/02 12:55 Received: 01/03/02 19:30									R-05
Ethanol	ND	5000	ug/l	10	2010020	01/07/02	01/07/02	EPA 8260B	
1,2-Dibromoethane	ND	10	"	"	"	"	"	"	
1,2-Dichloroethane	ND	10	"	"	"	"	"	"	
Di-isopropyl ether	ND	10	"	"	"	"	"	"	
Ethyl tert-butyl ether	ND	10	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	10	"	"	"	"	"	"	
Tert-amyl methyl ether	ND	10	"	"	"	"	"	"	
Tert-butyl alcohol	ND	200	"	"	"	"	"	"	
<i>Surrogate: 1,2-Dichloroethane-d4</i>		94.5 %	70-130	"	"	"	"	"	
<i>Surrogate: Toluene-d8</i>		99.7 %	70-130	"	"	"	"	"	
U-7 (L201017-08) Water Sampled: 01/03/02 14:00 Received: 01/03/02 19:30									
Ethanol	ND	500	ug/l	1	2010014	01/07/02	01/07/02	EPA 8260B	
1,2-Dibromoethane	ND	1.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	1.0	"	"	"	"	"	"	
Di-isopropyl ether	ND	1.0	"	"	"	"	"	"	
Ethyl tert-butyl ether	ND	1.0	"	"	"	"	"	"	
Methyl tert-butyl ether	130	1.0	"	"	"	"	"	"	
Tert-amyl methyl ether	ND	1.0	"	"	"	"	"	"	
Tert-butyl alcohol	30	20	"	"	"	"	"	"	
<i>Surrogate: 1,2-Dichloroethane-d4</i>		99.7 %	70-130	"	"	"	"	"	
<i>Surrogate: Toluene-d8</i>		100 %	70-130	"	"	"	"	"	

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 6747 Sierra Court, Suite J
 Dublin CA, 94568

 Project: Tosco(1)
 Project Number: Unocal SS#4186, Livermore, CA
 Project Manager: Deanna Harding

Reported:
 01/22/02 12:10

**Total Purgeable Hydrocarbon (C6-C12) by EPA 8015M and BTEX/MTBE by EPA 8021B - Quality Control
Sequoia Analytical - San Carlos**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 2010043 - EPA 5030B (P/T)
Blank (2010043-BLK1)

Prepared & Analyzed: 01/14/02

Purgeable Hydrocarbons as Gasoline	ND	50	ug/l							
Benzene	ND	0.50	"							
Toluene	ND	0.50	"							
Ethylbenzene	ND	0.50	"							
Xylenes (total)	ND	0.50	"							
Methyl tert-butyl ether	ND	5.0	"							

<i>Surrogate: a,a,a-Trifluorotoluene</i>	8.21		"	10.0		82.1	70-130			
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LCS (2010043-BS1)

Prepared & Analyzed: 01/14/02

Benzene	11.4	0.50	ug/l	10.0		114	70-130			
Toluene	11.1	0.50	"	10.0		111	70-130			
Ethylbenzene	10.9	0.50	"	10.0		109	70-130			
Xylenes (total)	33.2	0.50	"	30.0		111	70-130			

<i>Surrogate: a,a,a-Trifluorotoluene</i>	8.65		"	10.0		86.5	70-130			
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LCS (2010043-BS2)

Prepared & Analyzed: 01/14/02

Purgeable Hydrocarbons as Gasoline	270	50	ug/l	250		108	70-130			
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<i>Surrogate: a,a,a-Trifluorotoluene</i>	9.16		"	10.0		91.6	70-130			
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Matrix Spike (2010043-MS1)

Source: L201019-04

Prepared: 01/14/02 Analyzed: 01/15/02

Purgeable Hydrocarbons as Gasoline	264	50	ug/l	250	ND	106	60-140			
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<i>Surrogate: a,a,a-Trifluorotoluene</i>	9.73		"	10.0		97.3	70-130			
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Matrix Spike Dup (2010043-MSD1)

Source: L201019-04

Prepared: 01/14/02 Analyzed: 01/15/02

Purgeable Hydrocarbons as Gasoline	261	50	ug/l	250	ND	104	60-140	1.14	25	
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<i>Surrogate: a,a,a-Trifluorotoluene</i>	9.23		"	10.0		92.3	70-130			
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Gettler-Ryan/Geostrategies(1)
 6747 Sierra Court, Suite J
 Dublin CA, 94568

 Project: Tosco(1)
 Project Number: Unocal SS#4186, Livermore, CA
 Project Manager: Deanna Harding

Reported:
 01/22/02 12:10

Total Purgeable Hydrocarbon (C6-C12) by EPA 8015M and BTEX/MTBE by EPA 8021B - Quality Control
Sequoia Analytical - San Carlos

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2010044 - EPA 5030B (P/T)										
Blank (2010044-BLK1) Prepared & Analyzed: 01/14/02										
Purgeable Hydrocarbons as Gasoline	ND	50	ug/l							
Benzene	ND	0.50	"							
Toluene	ND	0.50	"							
Ethylbenzene	ND	0.50	"							
Xylenes (total)	ND	0.50	"							
Methyl tert-butyl ether	ND	5.0	"							
<i>Surrogate: a,a,a-Trifluorotoluene</i>	7.63		"	10.0		76.3	70-130			
LCS (2010044-BS1) Prepared & Analyzed: 01/14/02										
Benzene	8.17	0.50	ug/l	10.0		81.7	70-130			
Toluene	7.32	0.50	"	10.0		73.2	70-130			
Ethylbenzene	7.11	0.50	"	10.0		71.1	70-130			
Xylenes (total)	21.0	0.50	"	30.0		70.0	70-130			
<i>Surrogate: a,a,a-Trifluorotoluene</i>	7.83		"	10.0		78.3	70-130			
LCS (2010044-BS2) Prepared & Analyzed: 01/14/02										
Purgeable Hydrocarbons as Gasoline	275	50	ug/l	250		110	70-130			
<i>Surrogate: a,a,a-Trifluorotoluene</i>	7.89		"	10.0		78.9	70-130			
Matrix Spike (2010044-MS1) Source: L201016-06 Prepared: 01/14/02 Analyzed: 01/15/02										
Purgeable Hydrocarbons as Gasoline	263	50	ug/l	250	ND	105	60-140			
<i>Surrogate: a,a,a-Trifluorotoluene</i>	9.81		"	10.0		98.1	70-130			
Matrix Spike Dup (2010044-MSD1) Source: L201016-06 Prepared: 01/14/02 Analyzed: 01/15/02										
Purgeable Hydrocarbons as Gasoline	246	50	ug/l	250	ND	98.4	60-140	6.68	25	
<i>Surrogate: a,a,a-Trifluorotoluene</i>	9.17		"	10.0		91.7	70-130			

Gettler-Ryan/Geostrategies(1)
 6747 Sierra Court, Suite J
 Dublin CA, 94568

 Project: Tosco(1)
 Project Number: Unocal SS#4186, Livermore, CA
 Project Manager: Deanna Harding

Reported:
 01/22/02 12:10

Volatile Organic 8 Oxygenated Compounds by EPA Method 8260B - Quality Control
Sequoia Analytical - San Carlos

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC %REC	Limits	RPD	RPD Limit	Notes
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Batch 2010014 - EPA 5030B [P/T]
Blank (2010014-BLK1)

Prepared & Analyzed: 01/04/02

Ethanol	ND	500	ug/l							
1,2-Dibromoethane	ND	1.0	"							
1,2-Dichloroethane	ND	1.0	"							
Di-isopropyl ether	ND	1.0	"							
Ethyl tert-butyl ether	ND	1.0	"							
Methyl tert-butyl ether	ND	1.0	"							
Tert-amyl methyl ether	ND	1.0	"							
Tert-butyl alcohol	ND	20	"							

Surrogate: 1,2-Dichloroethane-d4

9.68

"

10.0

96.8

70-130

Surrogate: Toluene-d8

9.91

"

10.0

99.1

70-130

Blank (2010014-BLK2)

Prepared & Analyzed: 01/07/02

Ethanol	ND	500	ug/l							
1,2-Dibromoethane	ND	1.0	"							
1,2-Dichloroethane	ND	1.0	"							
Di-isopropyl ether	ND	1.0	"							
Ethyl tert-butyl ether	ND	1.0	"							
Methyl tert-butyl ether	ND	1.0	"							
Tert-amyl methyl ether	ND	1.0	"							
Tert-butyl alcohol	ND	20	"							

Surrogate: 1,2-Dichloroethane-d4

9.78

"

10.0

97.8

70-130

Surrogate: Toluene-d8

10.1

"

10.0

101

70-130

LCS (2010014-BS1)

Prepared & Analyzed: 01/04/02

Methyl tert-butyl ether	45.5	1.0	ug/l	50.0		91.0	70-130			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	9.67		"	10.0		96.7	70-130			
<i>Surrogate: Toluene-d8</i>	9.72		"	10.0		97.2	70-130			



Gettler-Ryan/Geostrategies(1)
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Dublin CA, 94568

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Reported:
01/22/02 12:10

**Volatile Organic 8 Oxygenated Compounds by EPA Method 8260B - Quality Control
Sequoia Analytical - San Carlos**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 2010014 - EPA 5030B [P/T]

LCS (2010014-BS2)

Prepared & Analyzed: 01/07/02

Methyl tert-butyl ether	44.3	1.0	ug/l	50.0		88.6	70-130			
Surrogate: 1,2-Dichloroethane-d4	9.42		"	10.0		94.2	70-130			
Surrogate: Toluene-d8	9.80		"	10.0		98.0	70-130			

Matrix Spike (2010014-MS1)

Source: L201014-04

Prepared & Analyzed: 01/04/02

Methyl tert-butyl ether	45.2	1.0	ug/l	50.0	3.6	83.2	60-140			
Surrogate: 1,2-Dichloroethane-d4	9.39		"	10.0		93.9	70-130			
Surrogate: Toluene-d8	9.60		"	10.0		96.0	70-130			

Matrix Spike Dup (2010014-MSD1)

Source: L201014-04

Prepared & Analyzed: 01/04/02

Methyl tert-butyl ether	47.9	1.0	ug/l	50.0	3.6	88.6	60-140	6.29	25	
Surrogate: 1,2-Dichloroethane-d4	9.53		"	10.0		95.3	70-130			
Surrogate: Toluene-d8	9.79		"	10.0		97.9	70-130			

Batch 2010020 - EPA 5030B [P/T]

Blank (2010020-BLK1)

Prepared & Analyzed: 01/07/02

Ethanol	ND	500	ug/l							
1,2-Dibromoethane	ND	1.0	"							
1,2-Dichloroethane	ND	1.0	"							
Di-isopropyl ether	ND	1.0	"							
Ethyl tert-butyl ether	ND	1.0	"							
Methyl tert-butyl ether	ND	1.0	"							
Tert-amyl methyl ether	ND	1.0	"							
Tert-butyl alcohol	ND	20	"							
Surrogate: 1,2-Dichloroethane-d4	9.78		"	10.0		97.8	70-130			
Surrogate: Toluene-d8	10.1		"	10.0		101	70-130			

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Reported:
 01/22/02 12:10

Volatile Organic 8 Oxygenated Compounds by EPA Method 8260B - Quality Control
Sequoia Analytical - San Carlos

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
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Batch 2010020 - EPA 5030B [P/T]
LCS (2010020-BS1)

Prepared & Analyzed: 01/07/02

Methyl tert-butyl ether	44.3	1.0	ug/l	50.0		88.6	70-130		
Surrogate: 1,2-Dichloroethane-d4	9.42		"	10.0		94.2	70-130		
Surrogate: Toluene-d8	9.80		"	10.0		98.0	70-130		

Matrix Spike (2010020-MS1)

Source: L201015-09

Prepared & Analyzed: 01/07/02

Methyl tert-butyl ether	42.3	1.0	ug/l	50.0	ND	84.6	60-140		
Surrogate: 1,2-Dichloroethane-d4	9.50		"	10.0		95.0	70-130		
Surrogate: Toluene-d8	9.75		"	10.0		97.5	70-130		

Matrix Spike Dup (2010020-MSD1)

Source: L201015-09

Prepared & Analyzed: 01/07/02

Methyl tert-butyl ether	41.0	1.0	ug/l	50.0	ND	82.0	60-140	3.12	25
Surrogate: 1,2-Dichloroethane-d4	9.47		"	10.0		94.7	70-130		
Surrogate: Toluene-d8	9.77		"	10.0		97.7	70-130		

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Project: Tosco(1)
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Reported:
01/22/02 12:10

Notes and Definitions

M-04 MTBE was reported from second analysis.

P-01 Chromatogram Pattern: Gasoline C6-C12

P-02 Chromatogram Pattern: Weathered Gasoline C6-C12

P-03 Chromatogram Pattern: Unidentified Hydrocarbons C6-C12

R-05 The reporting limit(s) for this sample have been raised due to high levels of non-target interferents.

DET Analyte DETECTED

ND Analyte NOT DETECTED at or above the reporting limit

NR Not Reported

dry Sample results reported on a dry weight basis

RPD Relative Percent Difference

