OUR JOB P90165

QUARTERLY MONITORING REPORT AND WORK PLAN FOR SUPPLEMENTAL CONTAMINATION ASSESSMENT
UNOCAL 76 SERVICE STATION
2045 REDWOOD ROAD
CASTRO VALLEY, CALIFORNIA
AUGUST 1990

BSK
& Associates

BSK & Associates, Geotechnical Consultants, Inc.

Geotechnical Engineering • Engineering Geology • Environmental Engineering • Engineering Laboratories • Chemical Laboratories

August 30, 1990 OUR JOB P90165

R. T. Nahas Company/Eden Managements
20630 Redwood Road
Castro Valley, CA 94546

Attention: Ms. Roberta Buchan, Property Manager

SUBJECT: Quarterly Monitoring Report and
Work Plan for Supplemental Contamination Assessment
Unocal 76 Service Station
20405 Redwood Road
Castro Valley, California

Madam/Gentlemen:

As requested and authorized, we have performed quarterly groundwater monitoring well sampling at the above-referenced facility. In addition, in response to the July 31, 1990 letter from Mr. Scott Seery of Alameda County Department of Environmental Health, Division of Hazardous Materials, to the R. T. Nahas Company, we have prepared this Work Plan for your consideration. The quarterly monitoring report is presented in Part I of this submittal. Part II consists of the Work Plan and related Appendices.

BACKGROUND

BSK & Associates installed three groundwater monitoring wells in December 1989, designated as MW-2, MW-3 and MW-4 on the attached Site Plan (Figure 1), at the Unocal 76 Service Station located at 20405 Redwood Road, Castro Valley, California. The monitoring facilities were installed in order to comply with the California UST Monitoring requirements of Alternative 6, Subchapter 16, Title 23, California Code of Regulations. Initially, the plan included four monitoring wells with at least one well (MW-1) to be located down-gradient of the existing tank

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☐ **Sacramento,** California [illegible] • [illegible] Road, Suite C • Telephone (916) [illegible], Fax (916) [illegible]

cluster. However, due to the encounter of fuel contamination of soil from approximately 10 to 13 feet below grade, the down-gradient Borings MW-1 and MW-1A were backfilled with 11-sack cement-sand grout following soil sampling in order to avoid further groundwater contamination. The results of well installations, soil sampling and chemical testing of the soil and water samples were summarized in Our Report P89134, dated February 5, 1990, and are (chemical test data only) presented in Appendix "A" of this Work Plan.

Following our meeting with you and Mr. Scott Seery on April 24, 1990, and receipt of Alameda County Environmental Health letter dated April 24, 1990, we prepared and submitted our proposal PR90066 to provide quarterly monitoring services for a year and to assess the extent of soil contamination at the subject site. We received authorization to proceed with the monitoring and the soil contamination assessment work on August 2, 1990. The soil Contamination Assessment Work Plan has been prepared in accordance with Appendix "A" of the Regional Board Staff Recommendations. The first quarterly monitoring event is presented in the following portion of this submittal (Part I).

Review of Subsurface Conditions

The site subsurface soil conditions, as exposed by Borings MW-1A, MW-2, MW-3 and MW-4 of our previous investigation (P89134), consist primarily of silty and sandy clays. Four to five feet of black organic-rich silty clay fill are found immediately below the ground surface, followed by three to five feet of greenish-gray sandy/silty clay native material. In the western portion of the study area, the greenish clay is underlain by seven to eleven feet of yellow-brown sandy clay, grading sandy with depth. In the eastern portion of the tank area, the sandy clay and clayey sand are split by a six foot layer of silty clay. Light brown silty clay was encountered in each boring between 17 and 24 feet, and continued to the final depth explored. It is apparent from the boring logs that this lower-most clay slopes to the northeast. For additional subsurface detail, see Subsurface Profile, Figure 2.

Groundwater was encountered in each boring. In the eastern portion of the site, groundwater was first encountered in Borings MW-2 and MW-3 at 20-1/2 and 19 feet below surface. The water level then stabilized in an open well at approximately 12-1/2 feet in depth. In the western portion of the site, Wells MW-1, MW-1A and MW-4 encountered an elevated saturated zone between 16 and 17 feet. In MW-1, water was again encountered at 20 feet, with stiff, moist clays separating the saturated zones. Localized groundwater flow in February 1990 was southwesterly, with a gradient of less than 1.0 percent.

Soil and groundwater petroleum contamination was observed in Borings MW-1 and MW-1A, resulting in the abandonment of this area as a monitoring well site. In Boring MW-1, Photo-ionization Detector (PID) measurements detected hydrocarbon compounds from 15 to 17 feet. The PID readings were especially high in the saturated zone at 17 feet. In Boring MW-1A, hydrocarbons were detected from 10 to 17 feet and were strongest at 10 feet. Also in MW-1A, oily water was observed seeping into the open boring at a depth of 15 feet. Small amounts of photo-ionizable compounds were encountered in Borings MW-2, MW-3 and MW-4 as well, but were not considered significant.

The Unocal Station Manager reported to BSK that an excavation had been made at the west end of the two 10,000-gallon tanks to accommodate repairs, and that petroleum leakage had occurred into this excavation, concurrent with a rainstorm. This may explain the presence of a perched saturated zone and petroleum contaminants in that area.

PART I

QUARTERLY MONITORING REPORT

August 31, 1990

The first quarterly monitoring of the installed Underground Storage Tank (UST) groundwater monitoring wells was performed on August 7, 1990. Field procedures and observations are provided in the following text and figures.

Field Work

Three groundwater monitoring wells (MW-2, MW-3 and MW-4), located adjacent to and surrounding two 10,000-gallon gasoline USTs, were purged and sampled for gasoline and waste oil related contaminants on August 7, 1990. The wells were installed and developed in December 1989 (see BSK & Associates Report P89134, dated 2/5/90).

The wells were purged using a PVC hand pump. Five to six well volumes were removed from each well. Purge effluent was field monitored for pH, Conductivity and Temperature during purging, to assess the influx of fresh formational water to the well. Purged water was then transferred to a 55-gallon DOT-approved steel drum for holding. The drum was labeled according to its contents, suspected contaminants, content source, date, etc.

Prior to purging, the depth to water in each well was measured using a Solinst electric sounding tape, marked in twentieths of a foot. The water depth was then extrapolated to the hundredth of a foot increment from the tape. Each well was subsequently examined for floating and sinking immiscible product layers, sheen and odor, using a clean PVC bailer having dual check valves for point source sampling. Groundwater flow direction and gradient data were determined from depth measurements and are presented in Figure 1.1, Groundwater Flow Direction and Gradient.

Upon purge completion, each well was again measured to establish a minimum of 80% well recovery prior to sampling. Water sampling was then performed with a teflon bailer. Contaminants were sampled for in the order of their volatility, with the most volatile constituents sampled first. Contaminants known to have densities greater than water were sampled for at the bottom of the well. Each water sample obtained for a specific contaminant, or contaminants, was placed into the appropriate receptacle, sealed, labeled and refrigerated for delivery to our State-certified laboratory.

A Well Field Log was prepared for each well sampled, which records water depth, well volume, water temperature and other data. The Well Field Logs are shown as Figures 1.2 through 1.4.

<u>Chemical Analyses</u>

The water samples obtained from Wells MW-2 and MW-3 were analyzed for constituents related to gasoline, due to the wells location adjacent to two 10,000 gallon underground gasoline tanks. The contaminants tested for were Total Volatile Hydrocarbons (TVH) and Benzene, Toluene, Xylene and Ethylbenzene (BTXE). Monitoring Well MW-4 was sampled for the waste-oil related contaminants: TVH, BTXE, Total Petroleum Hydrocarbons as diesel (TPH) and Oil and Grease.

The contaminants tested for are those specified by the Tri-Regional Water Quality Control Board Recommendations of July 6, 1990. The analyses results are presented in the following tables. The Chemical Test Data Sheets are presented in Figures 1.5 through 1.9. Project Chain of Custody is shown as Figure 1.10.

WATER ANALYSES

TABLE 1
(Results in ppb)

Sample Locations	Benzene (1*)	Toluene (100+)	Xylene (1750*)	Ethylbenzene (680*)
Well MW-2	21	3.9	28	7.2
Well MW-3	55	3.8	59	20
Well MW-4	ND	ND	ND	ND

ND = None Detected

*DHS Primary Drinking Water Standard (3/89)

+DHS Action Level

TABLE 2
(Results in ppb)

Sample Location	TPH (100*)	TVH (100*)	Oil and Grease (100*)
Well MW-2	--	180	--
Well MW-3	--	290	--
Well MW-4	ND	ND	ND

ND = None Detected

-- = Not Tested

*Quantified Action Levels are not provided for these parameters. The amount given is often informally used by regulatory agencies as a threshold value.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based upon the results of the groundwater testing of Wells MW-2 and MW-3, significant hydrocarbon contamination of the shallow groundwater has occurred in the area of these wells. The detected amounts of Benzene are in excess of those allowable by the local health agency and water quality control boards. Well MW-4 does not appear to contain groundwater contaminants.

The source of the detected contamination is unclear. Wells MW-2 and MW-3 are located up-gradient from the USTs, as determined from past and present groundwater flow data. A groundwater well located down-gradient from the USTs does not exist due to contaminated soils encountered during the initial monitoring facilities installation (for details, see Our Report P89134). It is possible that the contaminant source is located off the site to the northeast. This is unlikely, however, due to the absence of an identifiable source in that direction. The probable contaminant source is the UST group and/or related plumbing. Monitoring wells impacted by contamination are close enough to the tanks to be affected by a fuel release.

On the basis of present findings, we conclude that an unauthorized fuel release has occurred at the site in the vicinity of the two 10,000-gallon underground gasoline storage tanks.

Recommendations

The following actions should be implemented as soon as possible.

1. Precision testing of the gasoline tanks and their attendant piping. This testing will help determine the integrity of the fuel storage and transfer system, and locate dysfunctional areas.

2. Submittal of an Unauthorized Fuel Release Report to the governing regulatory agency (ACEH).

3. Establishment of a groundwater monitoring well at a location down-gradient from the gasoline tanks. A location near the west property boundary is advantageous.

Steps 1 and 2 should be initiated immediately. Failure to report an unauthorized release may result in disciplinary action by ACEH. The precision test will aid in contaminant source determination. It is considered likely at this stage that the two tanks will need to be removed; if only to facilitate the remediation of contaminated soils.

Characterization of the contaminant release area to determine the extent of soil and groundwater contamination, and the potential hazard to the local environment and community is addressed in Part II of this report, the Contamination Assessment Work Plan.

PART II
SUPPLEMENTAL SOIL & GROUNDWATER CONTAMINATION ASSESSMENT SCOPE OF WORK

I. Soil Contamination Assessment

Field Work: Upon approval and receipt of permits from ACEH and the Zone 7 Water District, we propose the drilling of at least five borings to assess the horizontal extent of the soil contamination encountered during drilling of Borings MW-1 and MW-1A. While the scope and estimated charges presented in this Proposal are based on five (5) borings and one (1) well, additional borings may be necessary to delineate the contaminated soil area. The soil borings designated as SBs on the Site Plan would extend to the maximum 15-foot depth to avoid a perched water horizon. Based on our previous borings, the first true groundwater level is at approximately 20 feet below the existing grade. The borings would not penetrate the groundwater table.

The test holes would be drilled with a truck-mounted rotary drill rig using eight-inch diameter hollow stem augers. The field exploration program would be supervised by an engineer or geologist who would direct the drilling and sampling operations.

Down-Gradient Monitoring Well: One groundwater monitoring well would be installed at a location down-gradient of the gasoline tank area, as determined by soil contamination data derived from the exploratory soil borings. The well would be constructed of 2-inch I.D., Schedule 40 PVC pipe, to a maximum depth of approximately 35 feet, unless a 5-foot clay aquitard is encountered before the maximum depth is reached. The well would then be completed within the aquitard. The slotted interval would extend from the bottom of the well to approximately two feet above the first encountered groundwater level to accommodate groundwater fluctuation and floating product monitoring, if any. Well construction details are presented in Figure 2.1, Typical Monitoring Well Design.

Soil samples would be obtained at a minimum of every five feet in each boring from a depth of 10 feet to the soil/water interface, as required by State guidelines. The soil test-boring samples would be field-screened using a photo-ionization detector (PID), and retained for laboratory analysis based on PID results. One sample from the well would be retained and tested from the soil-groundwater interface. Samples would be obtained using 6-inch stainless steel sampling sleeves in a Modified California Sampler. Samples would be plastic-capped with a teflon liner, labeled, and refrigerated for delivery, along with appropriate chain-of-custody, to our State-certified Analytical Laboratory for analysis. Tests performed on the sample would be for Total Volatile Hydrocarbons (TVH), Benzene, Toluene, Xylene and Ethylbenzene (BTXE).

The Monitoring Well would be surveyed to establish an elevation with respect to a reference point at the site, such as a building slab. Water levels within each well would be established within 1/100-foot accuracy by electronic sounder following 24-hours time allotted for groundwater surface stabilization.

Well Development: Upon completion of installation, the monitoring well would be developed by bailing, surging or mechanical or air displacement pumping until the well is as free of sand, silt and or turbidity as possible. The water removed during well development would be containerized at the site until groundwater chemical analysis is completed and the fate of the waste water can be determined.

Purging and Sampling: At the time of sampling, four to ten well volumes would be removed from the well to achieve a representative sample of "fresh" well water. Purging would be accomplished by hand-pump or bladder pump. Purged water would be stored on-site in suitable containers until a proper disposal method is determined. During purging, water temperature, pH and conductivity would be recorded.

Sampling of the well water would follow 80% recovery of water in the well after purging. The water sample(s) would be obtained by teflon bailer or bladder pump. Samples would be placed into the appropriate container per test, labeled, cooled to approximately 4 degrees Centigrade and delivered to our analytical laboratory with chain-of-custody documentation. The samples would be tested for TVH and BTXE.

NOTE: Proper disposal of soil and water containerized at the site during our activities, and later found to contain hazardous quantities of contaminants, are the responsibility of the client and cannot be removed from the site without authorization by governing agencies.

Drilling and sampling equipment would be properly cleansed by hi-pressure, hi-temperature and/or non-phosphate detergent wash prior to use at the site and/or between sampling events.

Following completion of soil sampling, the test holes would be backfilled with 11-sack sand-cement slurry to ground surface, as required by Alameda County Flood Control and Water Conservation District, Zone 7.

Laboratory Testing: Two soil samples from each boring would be analyzed by our laboratory for an unknown fuel, using Total Petroleum Hydrocarbons (TPH) as gasoline, Benzene, Toluene, Xylene and Ethylbenzene (BTXE), and Total Petroleum Hydrocarbons (TPH) as per Tri-Regional RWQCB Recommendations (July 6, 1990 - Table 2).

Reporting: Upon receipt of the analytical results of the soil samples, a report would be prepared containing the analyses results, descriptions of field activities and observations, boring logs, analysis of release impact on other properties and uses, locations of contaminant migration pathways such as underground utilities, subsurface profiles of soil and contaminant horizons, review of previously published data, and conclusions with regard to vertical and horizontal extent of soil contamination.

SCHEDULE AND FEES

We would mobilize for performing the additional soil borings and well installation within one week of your authorization to proceed. We would coordinate our field work with ACEH and ACFC - Zone 7. We estimate that additional soil borings, sampling, chemical testing and report preparation would take four to five weeks to complete following start of the field work.

Our fee for this soil contamination assessment under our present agreement is $5,500 to $6,500. A separate proposal for intalling, sampling and testing a down-gradient groundwater monitoring well would be submitted following completion of soil contamination assessment.

* * * *

We appreciate the opportunity to submit this quarterly report and work plan for your consideration and look forward to providing additional services for you on this project. Should you have questions regarding our proposed scope of work, sampling report, please contact us.

The following are attached and complete this report.

FIGURE 1	VICINITY MAP AND SITE PLAN
FIGURE 2	SUBSURFACE PROFILE

PART ONE

QUARTERLY MONITORING REPORT

FIGURE 1.1	GROUNDWATER FLOW DIRECTION AND GRADIENT
FIGURES 1.2 to 1.4	WELL FIELD LOGS
FIGURES 1.5 to 1.9	CHEMICAL TEST DATA SHEETS
FIGURE 1.10	PROJECT CHAIN OF CUSTODY

PART TWO

SOIL CONTAMINATION ASSESSMENT

FIGURE 2.1	TYPICAL MONITORING WELL CONSTRUCTION DETAILS

APPENDICES

APPENDIX "A"	SUMMARY OF PREVIOUS CHEMICAL DATA
APPENDIX "B"	HEALTH AND SAFETY PROCEDURES

Respectfully submitted,

BSK & Associates

Alex Y. Eskandari

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Manager - Geotechnical Services

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(PR#1.A27)

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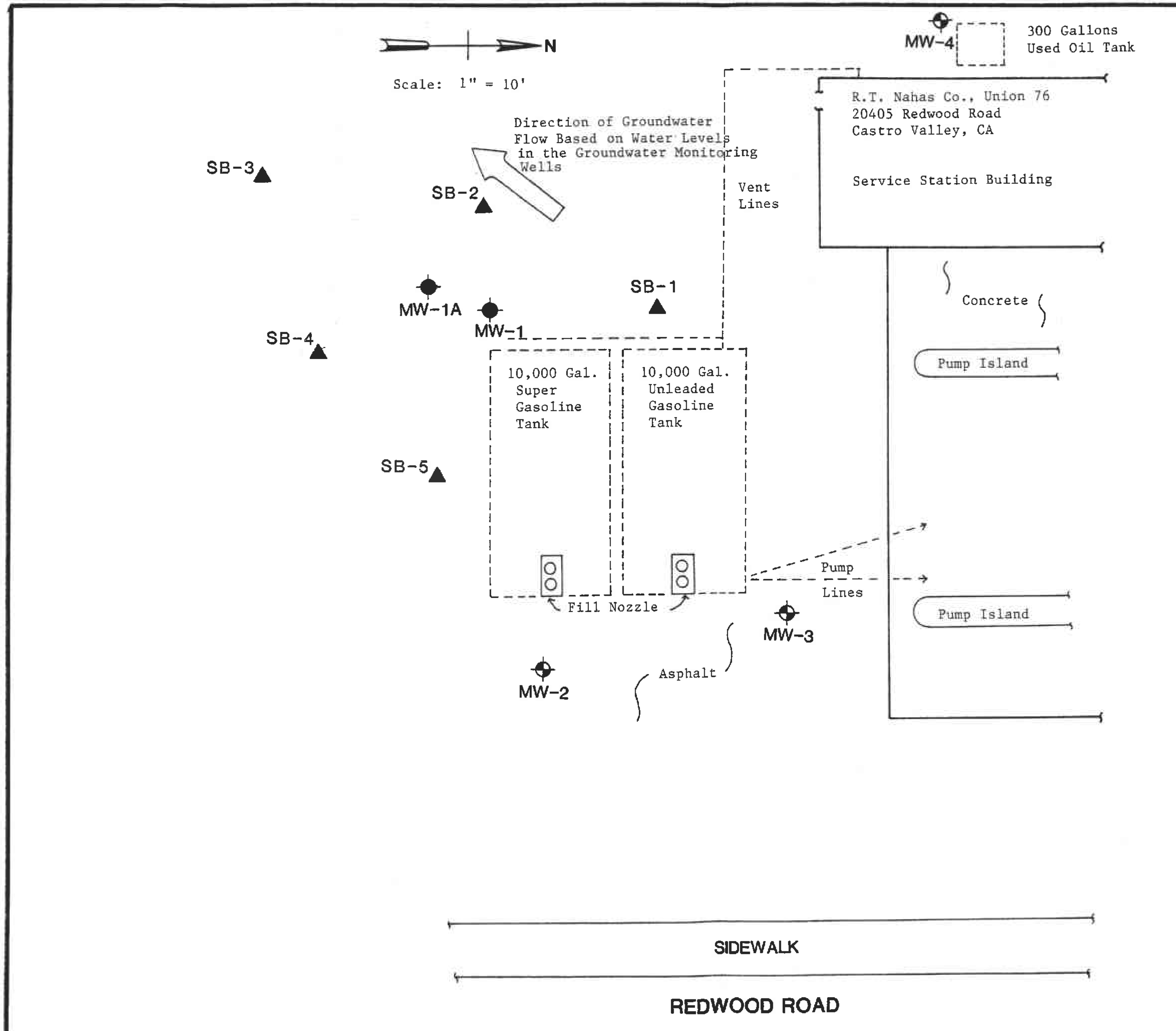

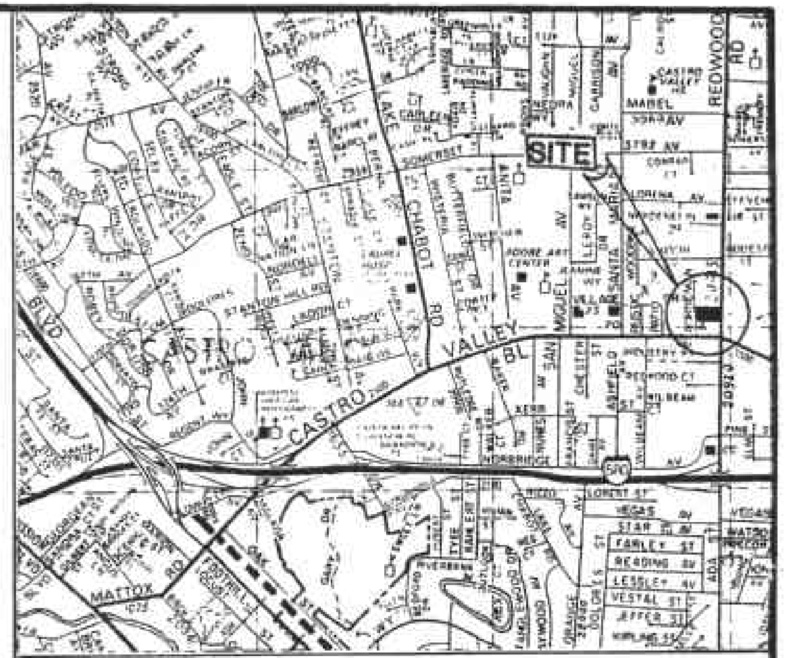

VICINITY MAP
(N.T.S.)

LEGEND:

- MW-2, MW-3 and MW-4 denote existing groundwater monitoring wells installed in December 1989.
- MW-1 and MW-1A denote well drilled, sampled and backfilled to surface with cement grout (exploration borings) in December 1989.
- SB - Denote proposed soil borings for soil contamination assessment

SITE PLAN

SOIL CONTAMINATION ASSESSMENT

Underground Petroleum Tanks

Unocal Station
20405 Redwood Road
Castro Valley, CA

Job No. P90165
August 1990
FIGURE 1

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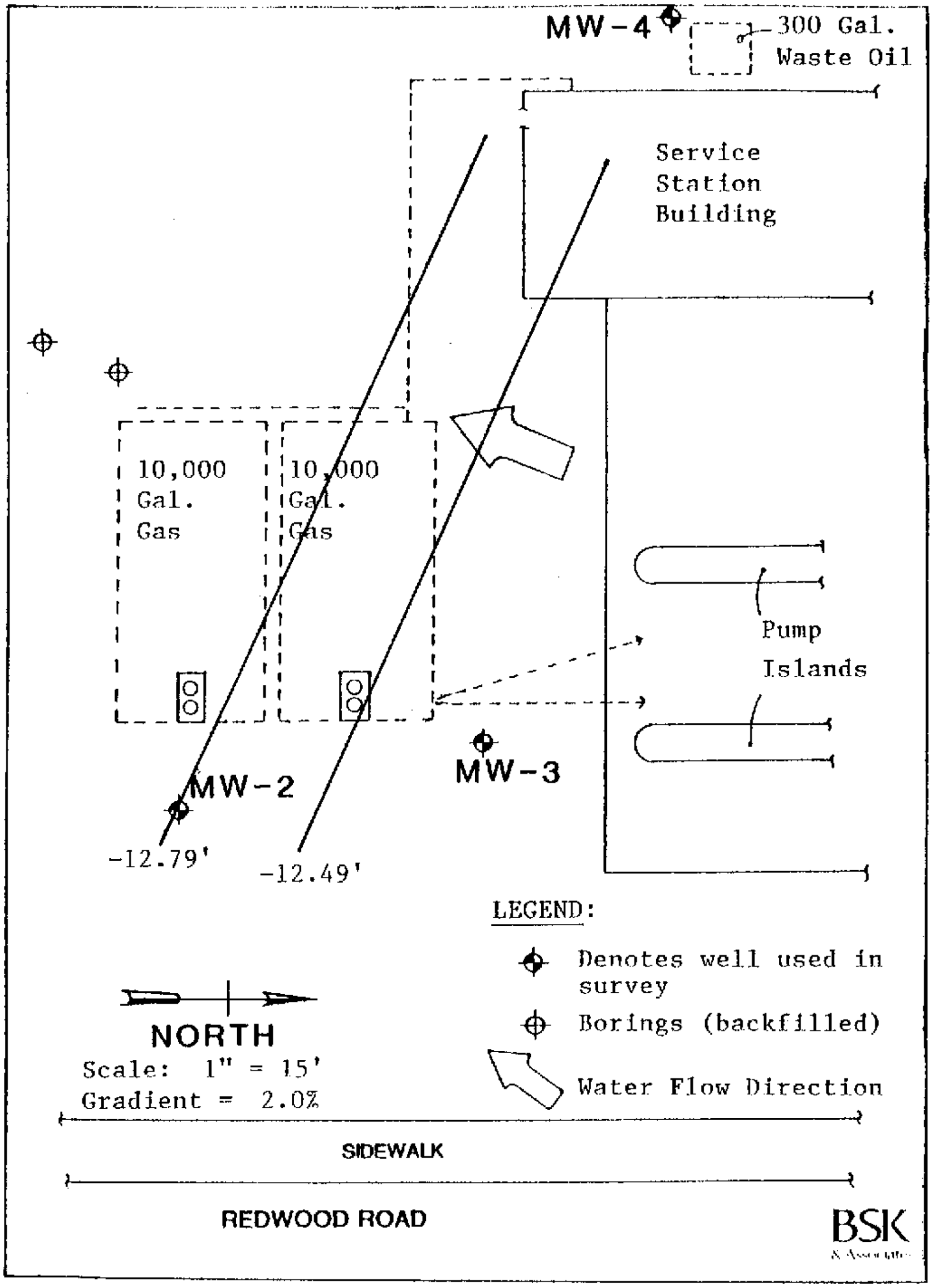

GROUNDWATER FLOW DIRECTION AND GRADIENT : 8/7/90

MONITORING FACILITIES INSTALLATION
UNDERGROUND PETROLEUM TANKS
UNOCAL 76 SERVICE STATION
20405 REDWOOD ROAD
CASTRO VALLEY, CALIFORNIA

Job No. P90165
August 1990
FIGURE: 1.1

BSK & Associates

Project No.: P90165
Date: 8/7/90
Figure No.: 1.2

INDIVIDUAL WELL FIELD LOG

WELL DEVELOPMENT: ____ Date: ____
SAMPLE COLLECTION: X Date: 8/7/90

PROJECT NAME & LOCATION: Unocal 76 - Castro Valley, CA

PERSONNEL: M. Cline
WEATHER: Clear 80°s

WELL INFORMATION:
Well No.: MW-2
Depth to water: 11.31
Well Depth: 30 feet
Water Volume: 3.1 gallons
Reference Point Elevation: +188.60 MSL
Groundwater Elevation: +175.89 MSL
Measurement Technique: Solinst Electric Sounding Tape

Date Purged: 8/7/90
Purge Method: PVC Hand Pump
Purge Begin: 10:44
End Purge: 10:57

IMMISCIBLE LAYERS:
TOP: None Observed
BOTTOM: None Observed--Musty Odor
Detection Method: Visual - Olfactory
Collection Method: PVC Bailer

WELL DEVELOPMENT/PURGE DATA:

TIME	VOLUME REMOVED (gal)	ELECTRICAL CONDUCTIVITY (Ec/Range)	pH	TEMPERATURE (° F)	COMMENTS
10:47	3	1117	6.47	79.8	
10:50	6	1063	6.24	78.9	
10:53	9	1052	6.20	78.0	
10:55	12	1028	6.13	78.0	
10:57	15	1022	6.13	77.7	

SAMPLE COLLECTION DATA:
Sampling Equiptment and Procedures: Teflon "Point Sample" Bailer

TIME	TYPE OF TEST	AMOUNT/CONTAINER USED	DEPTH
11:03	TVH & BTXE	two 40 ml. vials with HCL	12 feet

Field Observations:

BSK & Associates

Project No.: P90165
Date: 8/7/90
Figure No.: 1.3

INDIVIDUAL WELL FIELD LOG

WELL DEVELOPMENT: ____ Date: ________
SAMPLE COLLECTION: X Date: 8/7/90

PROJECT NAME & LOCATION: Unocal 76 - Castro Valley, CA

PERSONNEL: M. Cline
WEATHER: Clear 80°s

WELL INFORMATION:
Well No.: MW-3
Depth to water: 11.27
Well Depth: 30 feet
Water Volume: 3.1 gallons
Reference Point Elevation: +189.02 MSL
Groundwater Elevation: +176.77 MSL
Measurement Technique: Solinst Electric Well Sounder

Date Purged: 8/7/90
Purge Method: PVC Hand Pump
Purge Begin: 9:33
End Purge: 9:48

IMMISCIBLE LAYERS:
TOP: None Observed
BOTTOM: Black & Rust-colored Scales, Musty Odor
Detection Method: Visual Olfactory
Collection Method: PVC Bailer

WELL DEVELOPMENT/PURGE DATA:

TIME	VOLUME REMOVED (gal)	ELECTRICAL CONDUCTIVITY (Ec/Range)	pH	TEMPERATURE (°F)	COMMENTS
9:37	3	868	8.00	77.4	
9:41	6	844	7.28	76.3	
9:43	9	823	7.04	75.9	
9:45	12	836	6.83	75.8	
9:48	15	836	6.70	75.8	

SAMPLE COLLECTION DATA:
Sampling Equiptment and Procedures: Teflon "point sample" bailer

TIME	TYPE OF TEST	AMOUNT/CONTAINER USED	DEPTH
9:58 a.m.	TVH & BTXE	two 40 ml. vials with HCL	12 feet

Field Observations: ________

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Project No.: P90165
Date: 8/7/90
Figure No.: 1.4

INDIVIDUAL WELL FIELD LOG

WELL DEVELOPMENT: ____ Date: ________
SAMPLE COLLECTION: X Date: 8/7/90

PROJECT NAME & LOCATION: Unocal 76 - Castro Valley

PERSONNEL: M. Cline
WEATHER: Clear 80°s

WELL INFORMATION:
Well No.: MW-4
Depth to water: 12.19
Well Depth: 25 feet
Water Volume: 2.1 gallons
Reference Point Elevation: +189.70 MSL
Groundwater Elevation: +177.21 MSL
Measurement Technique: Solinst Electric Well Sounder

Date Purged: 8/7/90
Purge Method: PVC Hand Pump
Purge Begin: 11:43 a.m.
End Purge: 11:54 a.m.

IMMISCIBLE LAYERS:
TOP: None observed - no odor
BOTTOM: None observed - no odor
Detection Method: Visual Olfactory
Collection Method: PVC Bailer

WELL DEVELOPMENT/PURGE DATA:

TIME	VOLUME REMOVED (gal)	ELECTRICAL CONDUCTIVITY (Ec/Range)	pH	TEMPERATURE (° F)	COMMENTS
11:46	3	740	6.68	79.5	
11:50	6	721	6.27	78.5	
11:52	9	720	6.15	77.6	
11:54	12	716	6.13	76.4	

SAMPLE COLLECTION DATA:
Sampling Equiptment and Procedures: Teflon "point sample" bailer

TIME	TYPE OF TEST	AMOUNT/CONTAINER USED	DEPTH
12:04	TVH & BTXE	240 ml vials with HCL	13 feet
12:08	TPH as diesel	1 Amber 1000 ml. Flask	22 feet
12:14	Oil and Grease	1 Amber 1000 ml. Flask	22 feet

Field Observations: ________

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FIGURE: 1.5

BSK Analytical Laboratories

1414 Stanislaus Street * Fresno, California 93706 * Telephone (209) 485-8310 * Fax (209) 485-7427

R. J. Nahas
P90165

Lab No. Ch903077-1

Report Date 8/15/90

Sample Type Water

Date Sampled 8/7/90

Sample Description 1103 hrs.
MW #2 #1

Date Received 8/8/90

Date of Analyses 8/9/90

Water Analyses for BTXE and TVH

Compound	Results (ug/l)	Detection Limit (DLR)
Benzene	21	0.5
Toluene	3.9	0.5
Ethylbenzene	7.2	0.5
Total Xylene Isomers	28	0.5
Total Volatile Hydrocarbons	180	50

Method: BTXE-EPA 8020 TVH-EPA 8015M

ND-None Detected BDL-Below Detection Limit

DLR-Detection Limit For the Purposes of Reporting

Cynthia Pigman,
QA/QC Supervisor

Michael Brechmann,
Organics Supervisor

FIGURE: 1.6

BSK Analytical Laboratories

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R. J. Nahas
P90165

Lab No. Ch903077-2

Report Date 8/15/90

Sample Type Water

Date Sampled 8/7/90

Sample Description 0958 hrs. MW #3 #1

Date Received 8/8/90

Date of Analyses 8/9/90

Water Analyses for BTXE and TVH

Compound	Results (ug/l)	Detection Limit (DLR)
Benzene	55	0.5
Toluene	3.8	0.5
Ethylbenzene	20	0.5
Total Xylene Isomers	59	0.5
Total Volatile Hydrocarbons	290	50

Method: BTXE-EPA 8020 TVH-EPA 8015M

ND-None Detected BDL-Below Detection Limit

DLR-Detection Limit For the Purposes of Reporting

Cynthia Pigman,
QA/QC Supervisor

Michael Brechmann,
Organics Supervisor

FIGURE: 1.7

BSK Analytical Laboratories

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R. J. Nahas
P90165

Lab No. Ch903077-3

Report Date 8/15/90

Sample Type Water

Date Sampled 8/7/90

Sample Description 1204 hrs.
MW #4 #1

Date Received 8/8/90

Date of Analyses 8/9/90

Water Analyses for BTXE and TVH

Compound	Results (ug/l)	Detection Limit (DLR)
Benzene	ND	0.5
Toluene	ND	0.5
Ethylbenzene	ND	0.5
Total Xylene Isomers	ND	0.5
Total Volatile Hydrocarbons	ND	50

Method: BTXE-EPA 8020 TVH-EPA 8015M

ND-None Detected BDL-Below Detection Limit

DLR-Detection Limit For the Purposes of Reporting

Cynthia Pigman,
QA/QC Supervisor

Michael Brechmann,
Organics Supervisor

FIGURE: 1.8

BSK Analytical Laboratories

1414 Stanislaus Street * Fresno, California 93706 * Telephone (209) 485-8310 * Fax (209) 485-7427

R. J. Nahas
P90165

Lab No. Ch903077-4

Report Date 8/15/90

Sample Type Water

Date Sampled 8/7/90

Sample Description 1208 hrs.
MW #4 #2

Date Received 8/8/90

Date of Analyses 8/10/90

Water Analyses for TPH

Compound	Results (ug/l)	Detection Limit (DLR)
Total Petroleum Hydrocarbons	ND	100

Method: TPH DHS GC/FID

ND-None Detected BDL-Below Detection Limit

DLR-Detection Limit For the Purposes of Reporting

Cynthia Pigman,
QA/QC Supervisor

Michael Brechmann,
Organics Supervisor

R042690

FIGURE: 1.9

BSK Analytical Laboratories

1414 Stanislaus Street * Fresno, California 93706 * Telephone (209) 485-8310 * Fax (209) 485-7427

R. J. Nahas
P90165

Lab No. Ch903077-5

Report Date 8/15/90

Sample Type Water

Date Sampled 8/7/90

Sample Description 1214 hrs.

MW #4 #3

Date Received 8/8/90

Date of Analyses 8/10/90

Total Oil & Grease

Analyte	Units	Results	DLR
Total Oil and Grease......	mg/l	ND	1

ND-None Detected BDL-Below Detection Limit
DLR-Detection Limit For the Purposes of Reporting
Analyses performed by SM 503B/413.2

Cynthia Pigman
QA/QC Supervisor

Michael J. Brechmann
Organics Supervisor

R042390

1000-0477

BSK Log Number ______________

ANALYSIS REQUEST/CHAIN OF CUSTODY RECORD

Client Name: R.T. Nuhas (BSK Pleasanton)	Project or P.O.#: P90165
Address: 5779-F Sonoma Dr.	Phone #: (415) 462-4000
City, State, Zip: Pleasanton CA	Report, attention: Alex

Sampled by: M. Cline

Lab Use Only in this section: 8-1590

Date sampled	Time sampled	Type (See key below)	Sample description	Number of containers	Lab Sample number	Sample Seals (See key below)	TVH & BTXE	TPH as Diesel	Oil & Grease					Hazardous sample Special handling required	Remarks
8-7-90	11:03	AQ	MW #2 #1	2	-1	P	X								2x40ml
|	9:58	|	MW #3 #1	2	-2	↓	X								"
	12:04	|	MW #4 #1	2	-3	↓	X								"
	12:08		MW #4 #2	1	-4	A		X							1x1L
↓	12:14	↓	MW #4 #3	1	-5	↓			X						"

IMPORTANT NOTICE: No samples will be analyzed without an authorized signature in this section.

I am hereby requesting BSK's Normal Chain-of-Custody Procedures for the above samples. I understand that these procedures are generally consistent with those outlined in the U.S. E.P.A. SW 846 and that there is no extra charge for this service.

By: Marty Cline
Authorized Signature

I am hereby requesting BSK's Formal Chain-of-Custody Procedures for the above samples. I understand that these procedures are generally consistent with those outlined in U.S. EPA Contract Laboratory Program Statement of Work, Section F, and that there is a charge of $50.00 per work order or $5.00 a bottle, whichever is greater.

By: ______________
Authorized Signature

	Signature	Print Name	Company	Date	Time
Relinquished by	Marty Cline	Martin Cline	BSK & Assoc.	8-7-90	1:30
Received by	Cecil Harris	C. Harris	B.S.K. Labs	8-8-90	1035
Relinquished by					
Received by					
Relinquished by					
Received by					

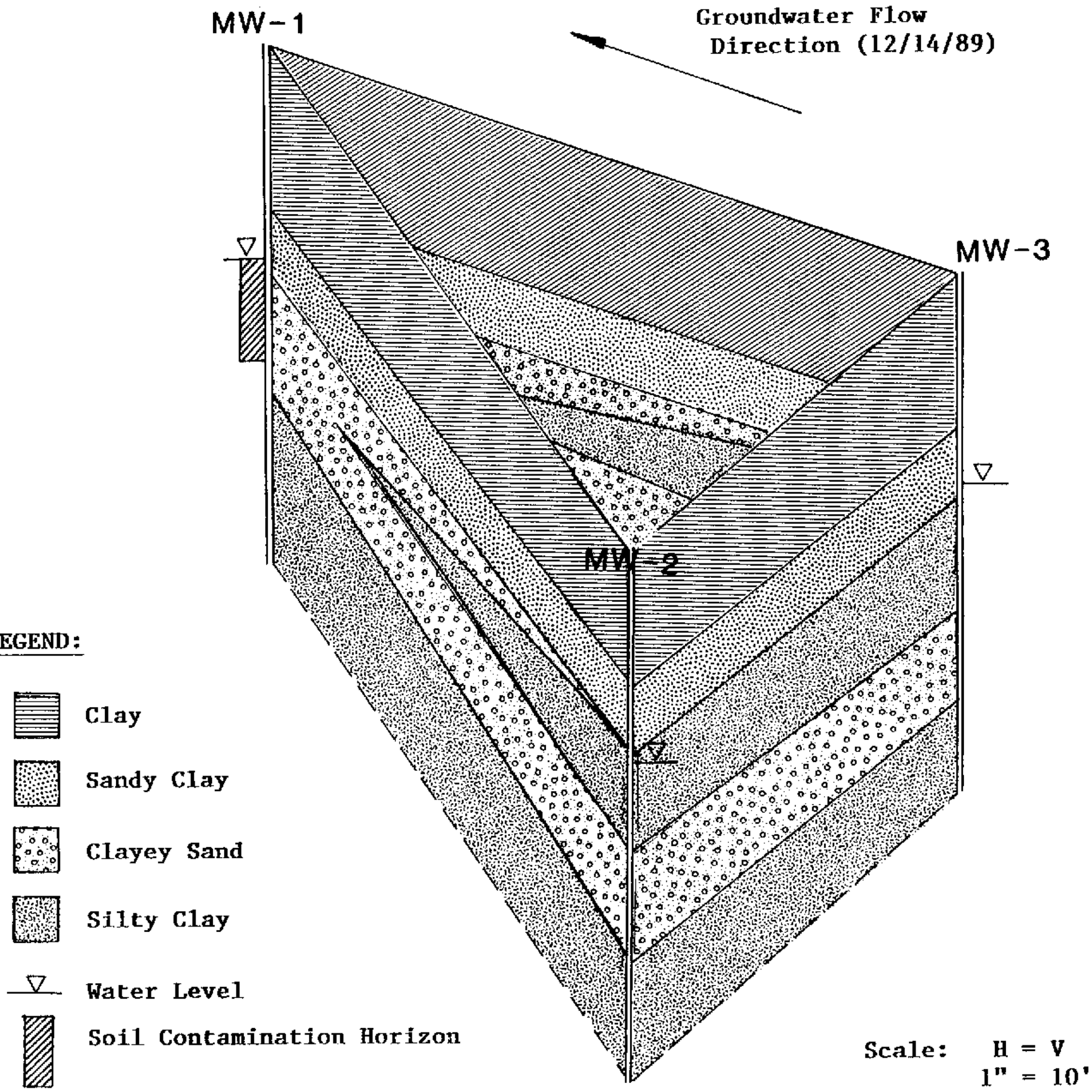
BSK & Associates Chemical Laboratories

1414 Stanislaus Street Fresno, California 93706

Telephone (209) 485-8310 • Fax (209) 485-7427

KEY: Type: AQ–Aqueous SL–Sludge SO–Soil PE–Petroleum OT–Other
Seals: P–Present A–Absent B–Broken
DISTRIBUTION: WHITE, CANARY - LABORATORY PINK - ORIGINATOR
Note:
Samples are discarded 14 days after results are reported unless other arrangements are made.
Hazardous samples will be returned to client or disposed of at client expense.

FIGURE: 1.10



CHECKED BY ____ DATE ____ BY ____

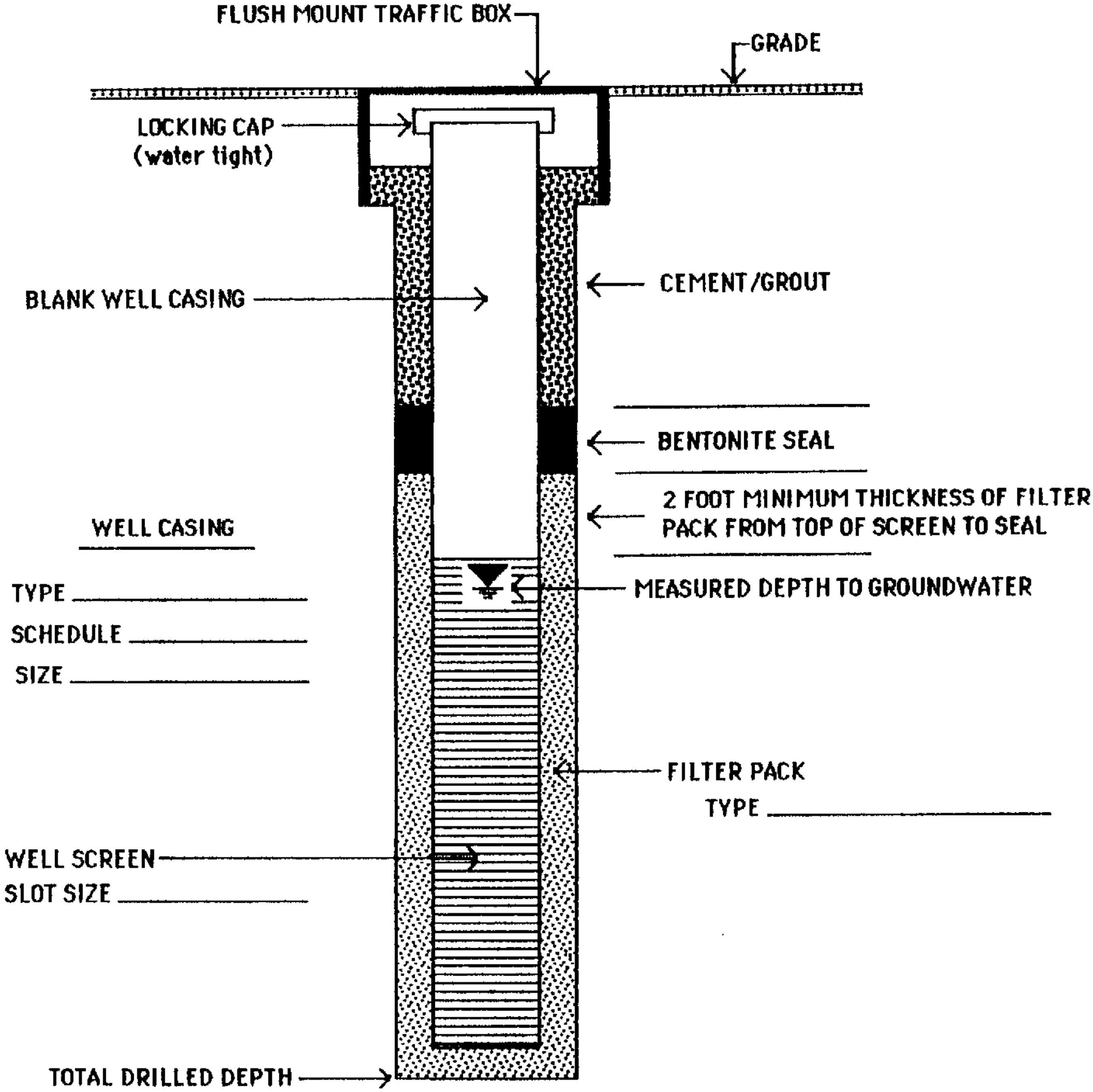
SUBSURFACE PROFILE

QUARTERLY SAMPLING REPORT
UNDERGROUND PETROLEUM TANKS
UNOCAL 76 SERVICE STATION
20405 REDWOOD ROAD
CASTRO VALLEY, CALIFORNIA

Job No. P90165
August 1990
FIGURE: 2

BSK & Associates

Job No. P90165
August 1990
FIGURE: 2.1



TYPICAL MONITORING WELL CONSTRUCTION DETAILS

BSK
& Associates

APPENDIX "A"

SUMMARY OF PREVIOUS CHEMICAL DATA

BSK PREVIOUS REPORT P89134

FEBRUARY 1990

A summation of the chemical analyses results for soil and water, respectively, is presented in the follwoing tables.

SOILS ANALYSES

TABLE I

BTXE (PPM)

Sample Location	Depth	Benzene (0)	Toluene (0)	Xylene (0)	Ethylbenzene (0)
MW-1	10'	1.8	7.8	20	3.8
MW-1	15'	0.09	ND	ND	ND
MW-1A	10'	2.2	11	25	5.4
MW-1A	13'	0.64	0.71	3.5	0.64
MW-2	10'	0.05	ND	0.03	ND
MW-3	15'	ND	ND	4.0	0.97

ND = None Dectected
() = Action Level

TABLE II

TPH as Gas, TPH AS Diesel, Oil and Grease, Total Lead (PPM)

Sample Location	Depth	TPH as Gas (10)	TPH as Diesel (100)	Oil and Grease (NAV)	Total Lead (NAV)
MW-1	10'	89	NT	NT	NT
MW-1A	10'	110	50	NT	ND
MW-1A	13'	11	ND	NT	ND
MW-3	15'	92	NT	NT	NT

ND = None Detected
NT = Not Tested
() = Action Level

TABLE III

Purgeable Halocarbons

No purgeable halocarbons were detected in the soil samples analyzed.

WATER ANALYSES

TABLE I

BTXE (PPM)

No BTXE compounds were detected in the water samples analyzed.

TABLE II

TPH Gas, TPG Diesel, Oil and Grease, Total Lead (PPB)

Sample Location	Depth (NAV)	TPH as Gas (NAV)	TPH as Diesel (NAV)	Oil and Grease (NAV)	Total Lead (NAV)
MW-2	72	NT	NT	NT	NT

NT = Not Tested
NAV = Not Available

TABLE III

Purgeable Halocarbons

No purgeable halocarbons were detected in the water samples analyzed.

APPENDIX "B"

HEALTH AND SAFETY PROCEDURES FOR FIELD INVESTIGATION OF UNDERGROUND SPILLS OF MOTOR OIL AND PETROLEUM DISTILLATE FUEL

BSK
& Associates

HEALTH AND SAFETY PROCEDURES
FOR
FIELD INVESTIGATION OF UNDERGROUND SPILLS OF
MOTOR OIL AND PETROLEUM DISTILLATE FUEL

1.0 PURPOSE

This operating procedure established minimum procedures for protecting personnel against the hazardous properties of motor oil and petroleum distillate fuels during the performance of field investigations of known and suspected underground releases of such materials. The procedure was developed to enable health and safety personnel and project managers to quickly prepare and issue site safety plans for investigations of such releases.

2.0 APPLICABILITY

This procedure is applicable to field investigations of underground releases of the substances listed below and involving one or more of the activities listed below.

Substances

Motor oil (used and unused)
Leaded and unleaded gasoline
No. 1 Fuel oil (kerosene, JP-1)
No. 1-D Fuel oil (light diesel)
No. 2 Fuel oil (home heating oil)
No. 2-D Fuel oil (medium diesel)
No. 4 Fuel oil (residual fuel oil)
No. 5 Fuel oil (residual fuel oil)
No. 6 Fuel oil (Bunker C fuel oil)
JP-3, 4 & 5 (jet fuels)
Gasahol

Activities

Collection of samples of subsurface soil with aid of truck-mounted drill rig, hand-held power auger or hand auger.

Construction, completion and testing of groundwater monitoring wells.

Collection of groundwater samples from new and existing wells.

Observing removal of underground fuel pipes and storage tanks.

This procedure must not be used for confined space entry (including trench entry) or for installing or operating pilot and full-scale fuel recovery systems.

No safety plans needed for non-intrusive geophysical surveys, reconnaissance surveys and collection of surface soil, surface water and biota.

3.0 RESPONSIBILITY AND AUTHORITY

Personnel responsible for project safety are the Business Unit Health and Safety Officer (HSO), the Project Manager (PM) and the Site Safety Officer (SSO).

The HSO is responsible for reviewing and approving site safety plans and any addenda and for advising both PM and SSO on health and safety matters. The HSO has the authority to audit compliance with the provisions of site safety plans. suspend work or modify work practices for safety reasons, and to dismiss from the site any individual whose conduct on site endangers the health and safety of others.

The PM is responsible for having site safety plans prepared and distributing them to all field personnel and to an authorized representative of each firm contracted to assist with on-site work. The PM is also responsible for ensuring that the provisions of safety plans and their addenda are carried out.

The SSO is responsible for assisting the PM with on site implementation of site safety plans. Responsibilities include:

1. Maintaining safety equipment supplies.

2. Performing or supervising air quality measurements.

3. Directing decontamination operations and emergency response operations.

4. Setting up work zone markers and signs if such zones are specified in the site safety plan.

5. Reporting all accidents, incidents and infractions of safety rules and requirements.

6. Directing other personnel to wear protective equipment when use conditions described in Section 5.0 are met.

The SSO may suspend work anytime he/she determines that the provisions of the site safety plan are inadequate to ensure worker safety and inform the PM and HSO of individuals who on-site behavior jeopardizes their health and safety or the health and safety of others.

4.0 HAZARD EVALUATION

Motor oil and petroleum distillate fuels are mixtures of aliphatic and aromatic hydrocarbons. The predominant classes of compounds in motor oil, gasoline, kerosene and jet fuels are the paraffins (e.g., benzene, toluene). Gasoline contains about 80 percent paraffins, 6 percent naphthenes, and 14 percent aromatic. Kerosene and jet fuels contain 42-48 percent paraffins, 36-38 percent naphthenes, and 16-20 percent aromatic. Diesel fuels and heating oils contain less than 10 percent paraffins, 14-23 percent naphthenes, and 68-78 percent non-volatile aromatic. These heavier fuels contain almost no volatile aromatic compounds. Chemicals are usually added to automotive and aviation fuels to improve their burning properties. Examples are tetraethyl-lead and ethylene dibromide. Most additives are proprietary materials.

Flammability

Crude oil and petroleum distillate fuels possess two intrinsic hazardous properties, namely, flammability and toxicity. The flammable property of the oil and fuels presents a far greater hazard to field personnel than toxicity because it is difficult to protect against and can result in catastrophic consequences. Being flammable, the vapors of volatile components of crude oil and the fuels can be explosive when confined.

The lower flammable or explosive limits (LFL or LEL) of the fuels listed in SEction 508.2 range from 0.6 percent for JP-5 to 1.4 percent for gasolines. LFL and LEL are synonyms. Flash points range from -36°F for gasoline to greater than 150°F for No. 6 fuel oil. JP-5 has a flash point of 140°F. Although it has a lower LEL than gasoline, it can be considered less hazardous because its vapors must be heated to a higher temperature to ignite.

Crude oil and petroleum distillate fuels will not burn in the liquid form; only the vapors will burn and only if the vapor concentration is between the upper and lower flammable limits, sufficient oxygen is present, and an ignition source is present. If these conditions occur in a confined area an explosion may result.

The probability of fire and explosion can be minimized by eliminating any one of the three factors needed to produce combustion. Two of the factors -- ignition source and vapor concentration -- can be controlled in many cases. Ignition can be controlled by prohibiting open fires and smoking on site, installing spark arrestors on drill rig engines, and turning the engines off when LELs are approached. Vapor concentrations can be reduced by using fans. In fuel tanks, vapor concentrations in the head space can be reduced by introducing dry ice (solid carbon dioxide) into the tank; the carbon dioxide gas will displace the combustible vapors.

Toxicity

Crude oil and petroleum distillate fuels exhibit relatively low acute inhalation and dermal toxicity. Concentrations of 160 to 270 ppm gasoline vapor have been reported to cause eye, nose and throat irritation after several hours of exposure. Levels of 500 to 900 ppm can cause irritation and dizziness in one hour, and 2000 ppm produces mile anesthesia in 30 minutes. Headaches have been reported with exposure to 25 ppm or more of gasoline vapors measured with a photoionization meter. Most fuels, particularly gasoline, kerosene and jet fuels are capable of causing skin irritation after several hours contact with the skin.

Petroleum fuels exhibit moderate oral toxicity. The lethal dose of gasoline in children has been reported to be as low as 10-15 grams (2-3 teaspoons). In adults, ingestion of 20-50 grams of gasoline may produce severe symptoms of poisoning. If liquid fuel aspirated (passed in to the lungs) gasoline and other petroleum distillate fuels may cause secondary pneumonia.

Some of the additives to gasoline, such as ethylene dichloride, ethylene dibromide, and tetraethyl and tetramethyl lead,are highly toxic; however, they are present in such low concentrations that their contribution to the overall toxicity of gasoline and other fuels is negligible in most instances.

OSHA has not developed permissible workplace exposure limits for crude oil and petroleum distillate fuels. It recommends using permissible exposure limits for individual components, such as benzene. ACGIH has established a permissible exposure limit of 300 ppm for gasoline. The limit took into consideration the average concentration of benzene in gasoline (one percent) as well as its common additives. Exposure limits established by other countries range from 250 to 500 ppm. Chemical data sheets, prepared for the U.S. Coast Guard's Chemical Hazard Information System (CHRIS), list 200 ppm as the permissible exposure limit for kerosene and jet fuels. This limit was not developed by NIOSH/OSHA or ACGIH.

5.0 HEALTH AND SAFETY DIRECTIVES

5.1 Site-Specific Safety Briefing

Before field work beings, all field personnel, including subcontractor employees, must be briefed on their work assignments and safety procedures contained in this document.

5.2 Personal Protective Equipment

The following equipment should be available on-site to each member of the field team:

- NIOSH-approved full or half-face respirator with organic vapor cartridges (color coded black)
- Saranex or polyethylene-coated Tyvek coveralls
- Splash-proof safety goggles
- Nitrile or neoprene gloves
- Neoprene or butyl boots, calf-length with steel toe and shank
- Hardhat

Equipment Usage

Chemical-resistant safety boots must be worn during the performance of work where surface soil is obviously contaminated with oil or fuel, when product quantities of oil or fuel are likely to be encountered, and within 10 feet of operating heavy equipment.

Respirators must be worn whenever total airborne hydrocarbons levels in the breathing zone of field personnel reach or exceed a 15-minute average of 25 ppm. If total airborne hydrocarbons in the breathing zone exceeds 100 ppm, work must be suspended, personnel directed to move a safe distance from the source, and the HSO or designee consulted.

Chemical resistant gloves must be worn whenever soil or water known or suspected of containing petroleum hydrocarbons is collected or otherwise handled.

Chemical resistant coveralls must be worn whenever product quantities of fuel are actually encountered and when oil or fuel-saturated soil is handled.

Safety goggles must be worn when working within 10 feet of any operating heavy equipment (e.g., drill rig, backhoe). Splash-proof goggles or face shields must be worn whenever product quantities of oil or fuel are encountered.

Hardhats must be worn when working within 10 feet of an operating drill rig, backhoe or other heavy equipment.

Operators of some facilities, such as refineries, often require all personnel working within facility boundaries to wear certain specified safety equipment. Such requirements shall be strictly observed

5.3 Vapor Monitoring

Required Equipment

--- Organic vapor meter with flame or photoionization detector
--- Combustible gas meter

Monitoring Requirements and Guidelines

Vapor monitoring shall be performed as often as necessary and whenever necessary to protect field personnel from hazardous vapors. Monitoring must be performed by individuals trained in the use and care of the monitoring equipment.

During drilling operations, vapor emissions from boreholes must be measured whenever the auger is removed from the boring and whenever flights are added or removed from hollow-stem augers. This requirement does not apply to borings less than five feet deep and borings of any depth made to install monitoring wells in uncontaminated soils. Measurements should be made initially with an organic vapor meter, followed with a combustible gas meter if vapor levels exceed the highest concentration measurable with the organic vapor meter.

Initially measurements shall be made about 12 inches from the bore hole, both upwind and downwind positions. If the total hydrocarbon concentrations exceed the respirator use action level (See Section 508.5.2), measurements must be made in the breathing zone of the individual(s) working closest to the borehole. Decisions regarding respiratory protection should be made using vapor concentrations in the breathing zone.

Organic vapor meters capable of being operated continuously without attention may be operated in that fashion if desired. However, the instrument must be equipped with an alarm set to sound when vapor concentrations reach 25 ppm and must be protected against physical damage and soilage.

If total organic vapor concentrations within 12 inches of the borehole exceed the capacity of the organic vapor meter, a combustible gas meter (CGM) must be used to determine if explosive conditions exist. Operations must be suspended, the drill rig motor shut down, and corrective action taken if combustible gas concentrations reach 40 percent of LEL within a 12-inch radius of the borehole or 10 percent of LEL at a distance greater than 24 inches from the borehole. This procedure must also be followed whenever the organic vapor meter goes offscale at its highest range and no CGM is available. If corrective action cannot be taken, field personnel and all other individuals in the vicinity of the borehole must be directed to move to a safe are and the local fire department and facility management must be alerted.

Organic vapor meters with flame ionization detectors (FID) are much more sensitive to paraffins, with the major component of gasoline, kerosene, and jet fuels, then are meters with 10.0 or 10.2 eV photoionization detectors. As the data in Table 1 show, an FID instrument, such as the Century Systems OVA (Foxboro Analytical), will detect 70-90 percent of actual paraffin concentrations, whereas PID instruments, such as the HNU Model PI-101, AID Model 580, and Photovac TIP with 10.0 to 10.2 eV lamp will detect only 17-25 percent of actual paraffin concentrations when calibrated with benzene and only 24-35 percent when calibrated with isobutylene. Both types of meters are equally sensitive to most aromatic, including benzene, toluene, xylene and ethylbenzene. For these compounds, meter readings equal or exceed 100 percent of actual concentrations. PIDs with 11.7 eV lamps are extremely sensitive to paraffins and aromatic. When calibrated to isobutylene, an 11.7 eV PID will register about twice actual paraffin concentrations and 100 percent or more of actual concentrations of benzene, toluene, and xylene.

An FID meter, recently calibrated with methane and in good working condition, can be expected to provide readings close enough to actual petroleum hydrocarbon concentrations to make corrections unnecessary. Value obtained with a PID must be corrected when measuring for paraffins. For 10.0 and 10.2 eV PIDs, the meter reading should be multiplied by 5 if the instrument is calibrated with benzene. If the instrument is calibrated with isobutylene, the meter readings should be multiplied by 3. If the instrument is equipped with an 11.7 eV probe and is calibrated with isobutylene, the meter reading should be divided by 2.

5.4 Area Control

Access to hazardous and potential hazardous areas of spill sites must be controlled to reduce the probability of occurrence of physical injury and chemical exposure of field personnel, visitors and the public. A hazardous or potentially hazardous area includes any area where

1. Field personnel are required to wear respirators.

2. Borings are being drilled with powered augers.

3. Excavating operations with heavy equipment are being performed.

The boundaries of hazardous and potentially hazardous areas must be identified by cordons, barricades, or emergency traffic cones or posts, depending on conditions. If such areas are left unattended, signs warning of the danger and forbidding entry must be placed around the perimeter if the areas are accessible to the public. Trenches and other large holes must be guarded with wooded or metal barricades spaced no further than 20 feet apart and connected with yellow or yellow and black nylon tape not less and 3/4-inches wide. The barricades must be placed no less than two feet from the edge of the excavation or hole.

Entry to hazardous areas shall be limited to individuals who must work in those areas. Unofficial visitors must not be permitted to enter hazardous areas while work in those areas is in progress. Official visitors should be discouraged from entering hazardous areas, but may be allowed to enter only if they agree to abide by the provisions of this document, follow orders issued by the site safety officer and are informed of the potential dangers that could be encountered in the areas.

5.5 Decontamination

Field decontamination of personnel and equipment is not required except when contamination is obvious (visually or by odor). Recommended decontamination procedures follow:

Personnel

Gasoline, kerosene, jet fuel, heating oil, gasahol and diesel oil should be removed from skin using a mild detergent and water. Hot water is more effective than cold. Liquid dishwashing detergent is more effective than hand soap. Motor oil and the heavier fuel oils (No. 4-6) can be removed with dishwashing detergent and hot ware also; however, if weathered to an asphaltic condition, mechanic's waterless hand cleaner is recommended for initial cleaning followed by detergent and water.

Equipment

Gloves, respirators, hardhats, boots and goggles should be cleaned as described under personnel; however, if boots do not become clean after washing with detergent and water, wash them with a strong solution of trisodium phosphate and hot water and, if this fails, clean them with diesel oil followed by detergent and water to remove diesel oil.

Sampling equipment, augers, vehicle undercarriages and tires should be steam cleaned. The steam cleaner is a convenient source of hot water for personnel and protective equipment cleaning.

5.6 Smoking

Smoking and open flames are strictly prohibited at sites under investigation.

TABLE 1
RELATIVE SENSITIVITIES OF FID AND PID INSTRUMENTS TO SELECTED COMPONENTS OF OILS AND PETROLEUM DISTILLATE FUELS

Component	Sensitivity in Percent of Standard		
	FID	PID	
		10.2 eV[a]	11.7 eV[b]
Paraffins			
Pentane	65	--	141
Hexane	70	22 (31)	189
Heptane	75	17 (24)	221
Octane	80	25 (35)	--
Nonane	90		--
Decane	75	--	--
Napthenes			
Cyclopentane	--	--	--
Methylcyclopentane	80	--	--
Cyclohexane	85	34 (40)	--
Methylcyclohexane	100	--	--
Aromatic			
Benzene	150	100 (143)	122
Toluene	110	100 (143)	100
Ethylbenzene	100	--	--
p-Xylene	116	114 (60)	--
Cumene	100	--	--
n-Propylbenzene	--	--	--
Napthaeine	--	--	--

[a] Values are relative to benzene standard. Values in parentheses are relative to isobutylene standard and were calculated.

[b] Values are relative to isobutylene standard.