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aqua resources inc.

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July 25, 1990

Alameda County Health Care Services Agency
Department of Environmental Health
Division of Hazardous Materials
80 Swan Way, Room 200
Oakland, California 94621

90239.1/1
File: correspondence

Attention: Mr. Dennis Byrne
Hazardous Material Specialist

Subject: Draft Workplan for Initial Subsurface Investigation and Site Closure
4030 Hollis Street, Emeryville, California

Gentlemen:

INTRODUCTION

This letter presents Aqua Resources Incorporated's (ARI) proposed Workplan for performing an initial subsurface and groundwater investigation and remediation of the former corporation yard operated by the Ransome Company. The site is located at 4030 Hollis Street in Emeryville, California. The purpose of this workplan is to establish an approach to identify the potential sources of contamination, the horizontal and vertical extent of contamination at identified release points and for remediating the contaminated areas for site closure purposes.

The workplan presented herein for performing the initial subsurface and groundwater investigation and site remediation conforms to the Alameda County Healthcare Services Agency, Underground Storage Tank (UST) Initial Subsurface Investigation Workplan format. The Workplan consists of the following elements:

- Site description
- Site usage summary
- Soil contamination determination methods
- Groundwater contamination determination methods
- Soil remediation methodology
- Health and Safety Plan

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aqua resources inc.

Consulting Engineers, Scientists & Managers

Mark Milani, P.E.
Project Manager

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LEVINE·FRICKE
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AMANDA L. SPENCER
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Each element is discussed below. Sections of this workplan reference work performed by others. The site is part of a larger property owned by Santa Fe Pacific Realty. This property, including the site, will be subject to eventual redevelopment. Levine-Fricke (L-F) is currently preparing a report to Santa Fe Pacific Realty summarizing their findings regarding areas where releases of potentially hazardous materials may have occurred. Four 5 USTs were removed in March 1990. These included two diesel oil tanks, two gasoline tanks and one waste oil tank. The size, orientation and location of the five USTs were presented in a letter report dated April 9, 1990 to the Alameda County Healthcare Services Agency. The sampling and chemical analyses presented in the report were performed by Kennedy/Jenks/Chilton.

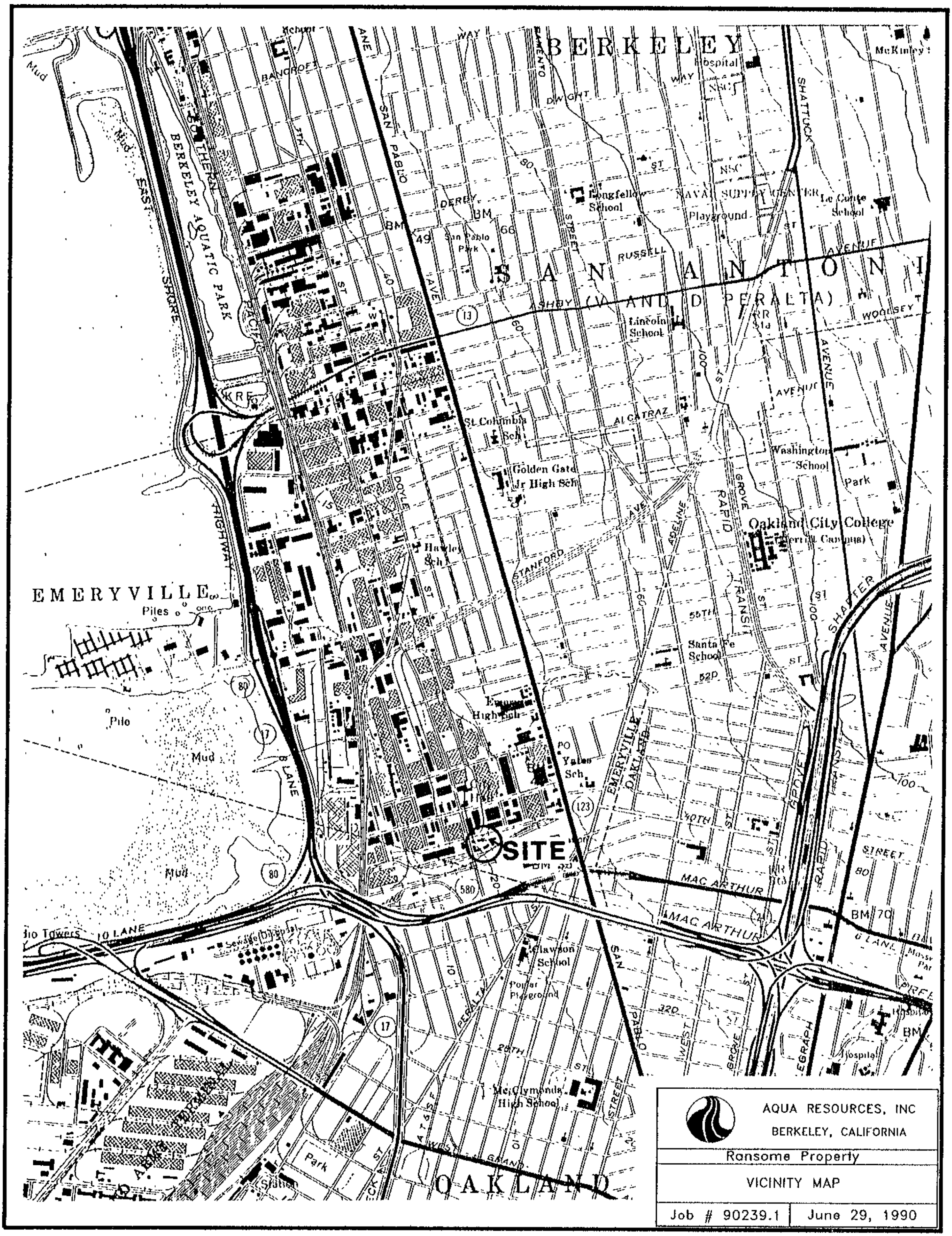
SITE DESCRIPTION

The site is located on Hollis Street in Emeryville, California (see Vicinity Map, Plate 1). The site is somewhat level and contained several structures. The buildings were one-story wood-frame buildings, with either raised floor or slab-on-grade. The building located on the north west corner of the property was used for administrative offices; the buildings located on the southwest corner were used for equipment maintenance (i.e. garage), employee locker room, petroleum product storage, spray painting and material storage. Other buildings located on the south side of the property consist primarily of wooden outbuildings or sheds used for material storage.

The site and vicinity have been mapped as Holocene interfluvial basin deposits (Helley, Lajoie and Burke) and surficial deposits (Blake, Bartow et.al). The interfluvial basin deposits are described as consisting of plastic, poorly sorted, organic-rich clay and silty clays. Groundwater is anticipated to be between about 10 feet and 15 feet below existing site grade based on review of unpublished logs of soil borings and monitoring wells performed by Levine-Fricke. The shallow groundwater appears to be unconfined, and the aquifer materials appear to have restricted permeability due to their high clay content. The soil borings and monitoring wells performed on or in the vicinity of the Ransome site generally encountered artificial fill to a depth of about one to two feet. The fill is underlain by silty and sandy clays to the depths explored (about 20 feet). Perched groundwater may be encountered at the contact between the artificial fill and the native clayey soils due to the general granular nature and higher permeability of the fill. The boring logs compiled by Levine-Fricke will be published in its forthcoming report.

SITE USAGE SUMMARY

The site has been used primarily for storage of equipment and materials used in the manufacture, transport and placement of asphalt concrete for roadways from about 1924 to the present. The Ransome Company occupied the site from about 1938 to 1990. For



AQUA RESOURCES, INC
BERKELEY, CALIFORNIA

Ransome Property

VICINITY MAP

Job # 90239.1	June 29, 1990

PLATE 1

sixteen years, between 1924 and 1938, the property was used by other companies and contractors. Raw materials for the manufacture of asphalt concrete included coarse and fine aggregates and various types of asphalts (i.e. cutback and emulsions). The raw materials were transported to the site both by rail and by truck. The aggregates were stored in below grade receiving pits; the liquid asphalt was stored in above ground tankage. For a period of years, asphalt was manufactured in two batch plants that had a combined capacity of about 5,000 pounds per hour. The batch plant operation was discontinued and dismantled in 1983. One above ground asphalt emulsion storage tank is still present on the site.

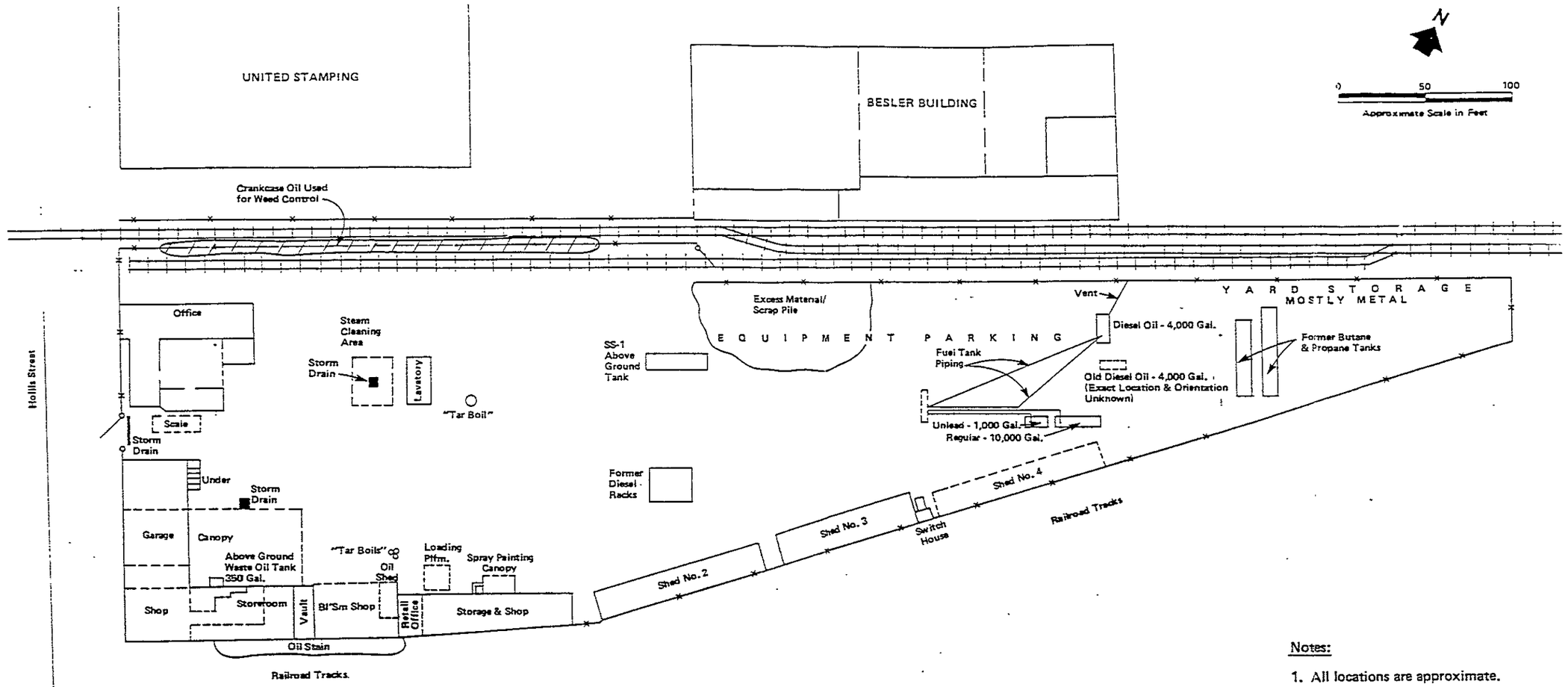
The asphalt in the batch plants was heated using natural gas provided by Pacific Gas & Electric Company. Backup supplies of butane and propane were stored in above ground tanks located at the east end of the site. The aboveground butane and propane tanks were removed at the time the asphalt batch plant equipment was removed. Diesel and gasoline fuel for paving and transport equipment were stored in underground storage tanks (USTs). Diesel was stored in two 4,000 gallon steel USTs, while regular gasoline was stored in one 10,000 gallon steel tank and unleaded gasoline in a 1,000 gallon steel tank. The USTs were removed in March, 1990. Equipment maintenance was performed in the garage located on the south west side of the site. Waste oils and solvents generated from the equipment maintenance were stored in a partially below grade waste oil tank. The practice in recent times has been to use Safety-Kleen units for parts washing so that solvents are not mixed with waste oil.

Other minor operations that were conducted on the site included torch and burner equipment assembly, material storage, printing and equipment storage. The relationship of the above activities to the site are shown on the Site Plan, Plate 2.

SOIL CONTAMINATION DETERMINATION METHODS

Based on a site reconnaissance performed by Aqua Resources Inc. and information provided by Levine-Fricke regarding their ongoing investigation, we have identified the following areas where releases of petroleum hydrocarbons, waste oils and organic solvents may have occurred. Subsurface investigation should be performed in these areas to determine the horizontal and vertical extent of contamination in these areas. The areas are identified as follows, and are shown on the attached site plan:

(1) the location of the gasoline and diesel fuel tanks, transfer piping and fuel island,
(2) the area south of the auto shop where hydraulic oil and other petroleum products drained onto surface soils,
(3) the former waste oil tank located by the auto shop,
(4) the former diesel rack location and
(5) the debris stockpile area



Notes:

1. All locations are approximate.
2. Estimated depth to groundwater -10 to 20 feet.

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BERKELEY, CALIFORNIA

Ransome Property

SITE PLAN

Job # 90239.1 | June 29, 1990

PLATE 2

During the site reconnaissance, usage and storage of petroleum products were observed in portions of the existing buildings, primarily in the auto shop and in the oil storage area. Oils and other petroleum products have been spilled inside the buildings in these areas onto concrete floor. The buildings on the property have been demolished and removed. Surface spills on the concrete are not anticipated to have migrated to the underlying foundation soils. However, if visual evidence indicates that a spill may have migrated to the underlying soil, this area will be investigated.

Areas that would be excluded from this workplan include the following:

- the area around the steam cleaning area
- the two areas where "tar boils" have been identified,
- the areas adjacent to railroad trackage where used motor oil was used for weed control,
- the SS-1 storage tank area

The first three areas have been investigated by Santa Fe Pacific Realty's environmental consultant (Levine-Fricke). The above ground SS-1 tank was used to store asphalt emulsion. Such products are not considered to be hazardous and on this basis will not be investigated further.

The horizontal and vertical extent of contamination, in the areas identified above that will be investigated as part of this workplan, will be determined using conventional drilling, rubber-tired backhoe and hand auger equipment. Backhoe and hand auger equipment will be used to evaluate the horizontal extent of contamination in surface spill areas. Drilling will be performed in areas where using backhoe or hand auger equipment would be inappropriate. Soil samples will be collected at selected intervals for chemical analyses. Field screening of the soil samples will be performed using an Organic Vapor Analyzer. Details of the field investigation procedures, sample collection and preservation and decontamination are given in the Site Sampling and Analysis Plan (SSAP), Appendix A.

GROUNDWATER CONTAMINATION DETERMINATION METHODS

At the time the underground storage tanks (USTs) were removed, it was observed that releases from the USTs had occurred into the adjacent soils. To determine whether the releases have reached groundwater, monitoring wells will be installed. Monitoring wells will also be installed in the upgradient direction of the site to assess if groundwater has been contaminated from offsite sources. The preliminary location of the monitoring wells and details of how they are to be installed, developed and sampled are given in the SSAP. Final monitoring well locations will be determined after additional data review and field observations.

SOIL AND GROUNDWATER REMEDIATION METHODOLOGY EVALUATION

As part of the workplan, various remedial measures will be evaluated concurrently with the soil and groundwater contamination investigation. Soil treatment measures to be investigated will include excavation and aeration, ex-situ bioremediation and soil vapor extraction. If groundwater is found to be contaminated, pump tests will be performed so that the aquifer characteristics can be evaluated and selection of an appropriate groundwater treatment methodology can be made. Groundwater treatment methods that could be utilized include air stripping with activated carbon absorption, air stripping with catalytic combustion, direct activated carbon absorption etc.

HEALTH AND SAFETY PLAN

A site specific Health and Safety Plan (HSP) has been prepared that covers the health and safety aspects for field activities to be conducted at the site. A copy of the HSP is presented as Appendix B.

The above represents the proposed workplan for the former Ransome Company corporation yard site. The Health and Safety Plan (HSP), the Site Sampling and Analysis Plan (SSAP) and the Quality Assurance and Quality Control Plan are presented as attachments to the workplan.

If you have any questions regarding the above, please contact the undersigned,

Very truly yours,
AQUA RESOURCES INCORPORATED

Mark Milani, P.E.
Project Manager

Attachments: Appendix A - Site Sampling and Analysis Plan
and Quality Assurance and Quality Control Plan
Appendix B - Health and Safety Plan

APPENDIX A

SITE SAMPLING AND ANALYSIS PLAN

and

QUALITY ASSURANCE AND QUALITY CONTROL PLAN

FORMER RANSOME COMPANY CORPORATION YARD

4030 HOLLIS STREET, EMERYVILLE

AQUA RESOURCES, INC.

JOB # 90239.1

SAMPLING AND QA/QC PLAN

SITE LOCATION

The site is the former Ransome Company corporation yard located at 4030 Hollis Street in Emeryville, California.

OBJECTIVE

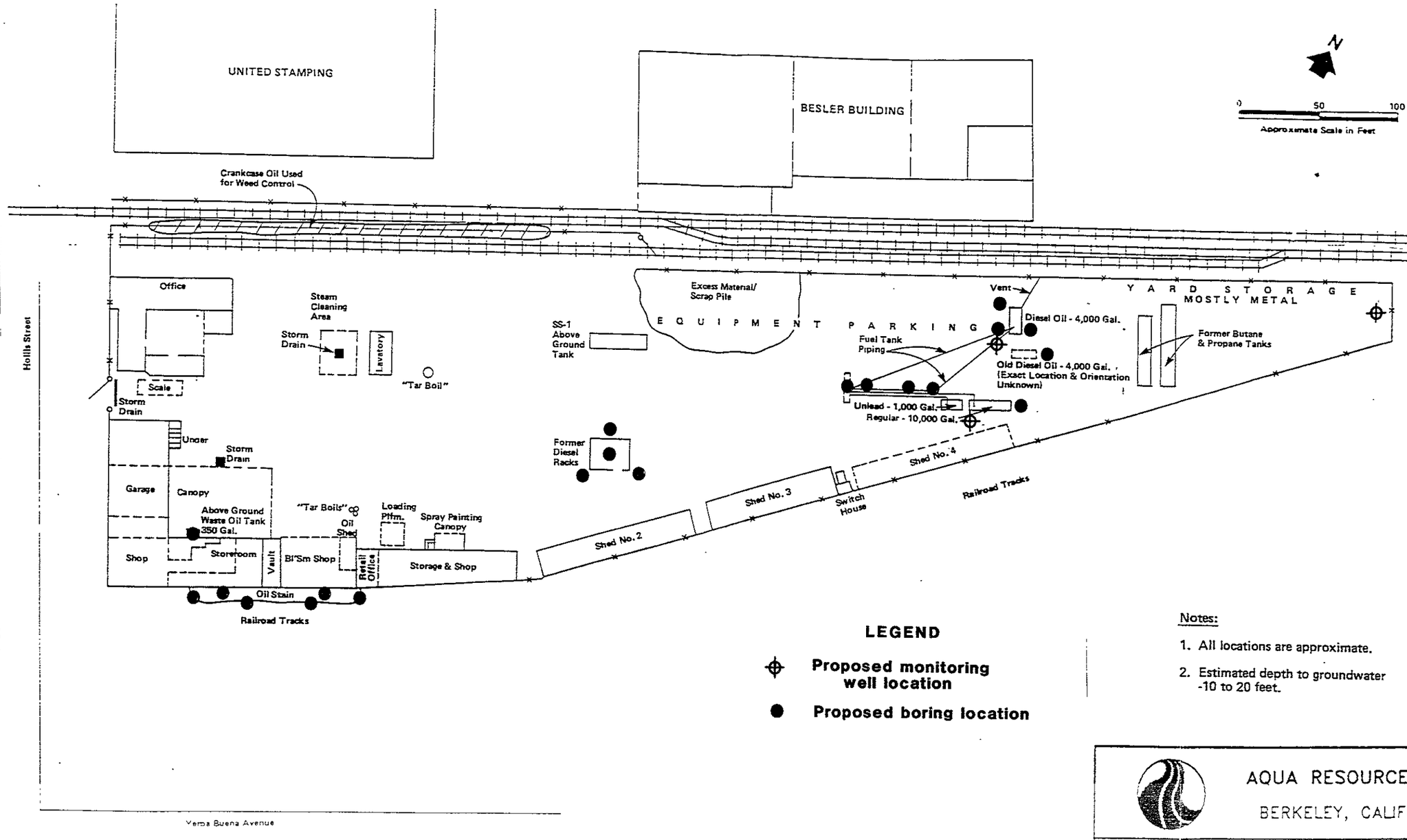
The purpose of the field sampling effort is to evaluate surface and subsurface soil contamination (horizontal and lateral extent) by fuels (gasoline, diesel), waste oils and other petroleum hydrocarbons. The extent of soil contamination will be explored through soil samples collected from boreholes drilled using hollow stem auger and hand auger drilling equipment and soil samples collected from backhoe excavated test pits using hand sampling equipment.

SOIL BORING LOCATIONS AND SAMPLING PROCEDURE

Soil borings will be located in areas where spills where thought likely or known to have occurred, based on interviews with Ransome Company personnel, review of information performed by others and from a site reconnaissance. Proposed boring locations are shown the Soil Boring and Monitoring Well Location Plan, Figure 1. Borings will be drilled to depths ranging from about 5 feet up to about 25 feet below ground surface, and soil samples will be collected at approximate five foot intervals. Sample depths between borings will be staggered in order to provide a cross section of the complete boring interval. All soil borings will be drilled using hollow stem auger drilling equipment or hand auger equipment (for collecting samples at depths less than about five feet). All augers will be steam cleaned prior to the drilling of each boring.

Borings will be logged by or under the supervision of a Certified Engineering Geologist or Registered Civil Engineer. Standard ARI boring log field forms will be completed using waterproof ink. Figure 2 is a copy of ARI's boring log form. The boring logs generally include the following:

- The depth that groundwater is first encountered in the boring
- The date and time at which each sample is taken
- Field measurements to show the location of the boring relative to prominent and permanent landmarks to an accuracy of at least one foot



LEGEND

- ⊕ **Proposed monitoring well location**
- ● **Proposed boring location**

Notes:

1. All locations are approximate.
2. Estimated depth to groundwater -10 to 20 feet.

AQUA RESOURCES, INC
BERKELEY, CALIFORNIA

Ransome Property

Soil Boring & Monitoring Well Location Plan – Proposed

Job # 90239.1 | June 29, 1990

FIGURE 1

AQUA RESOURCES, INC.

BORING LOG

LOCATION & NOTES

LOCATION	JOB NAME	JOB NO
DRILLING COMPANY		BORING NO.
DRILLER'S NAME		
DRILL RIG [ ] Solid Flight Auger [ ] Hollow Auger [ ] Rotary Wash		SHEET OF
SAMPLER TYPE: [ ] 2.5" I D Split Barrel [ ] 2.8" I D Shelby Tube [ ] SPT		
DRIVE WEIGHT LB.	FALL IN.	START / FINISH
WATER LEVEL (Feet)		TIME AM PM / TIME AM PM
TIME		
DATE		DATE
CASING DEPTH (FEET)		
ELEVATION FEET	FIELD ENGINEER	

DATUM: [ ] Mean Sea Level [ ] Other

BLOWS PER HALF FOOT	BLOWS/ft.	MOISTURE CONTENT %	DRY UNIT WEIGHT (pcf)	DEPTH IN FEET	USCS CLASSIFICATION
				0	
				1	
				2	
				3	
				4	
				5	
				6	
				7	
				8	
				9	
				0	
				1	
				2	
				3	
				4	
				5	
				6	
				7	
				8	
				9	
				0	

SURFACE CONDITIONS

FIGURE 2

Prior to obtaining each sample, including the initial one, the disassembled sampler and the brass liners will be washed and rinsed. The wash consists of a solution of TSP in water. Each piece will be triple rinsed with the final rinse being distilled water. A standard split barrel sampler with 2-5/8" OD and 2" ID will generally be used. The sampler has the capacity to obtain an 18-inch sample using three 6-inch long liners. Hand auger sampling equipment is similar to the split barrel sampler except it has the capacity to collect only one six inch sample. When driving the split barrel sampler, blow counts will be recorded for each 6-inch of penetration of the sampler.

When the sampler is removed from the boring, it will be immediately opened. The lower-most sample liner (next to the shoe) will be used for any required chemical analyses. The soil exposed in the ends of the tube will be quickly noted. The ends will then be sealed with teflon tape and new, snug-fitting plastic caps, and the edges of the caps sealed with plastic tape. The cap will be immediately labeled with the sample number, the depth, the project number, and the date. The sample number is the boring number followed by a dash and the consecutive number of the sample from the boring. The caps will be labeled using a fine-tipped waterproof marker. The sample will immediately be placed in a chilled (approximately 4°C) ice chest for storage and transport to the analytical laboratory. Standard chain of custody forms (Figure 3) will be completed and kept with the samples.

If the second sample is not required for a duplicate chemical analysis, it will be retained in its liner and saved for possible later inspection or physical properties testing. The upper sample, from the third liner, will be inspected and used for the soil description. The soil description will follow the guidelines of ASTM D2488, "Description of Soils." The sample will only be saved if the second sample is not available.

Soil samples will be selected for chemical analysis by using an Organic Vapor Analyzer to field screen the soil samples.

Soil cuttings, spent sampling and safety equipment, and decontamination fluids will be disposed of into DOT drums. Used drums will be left on-site, pending determination of appropriate disposal. Soil borings not converted to monitoring wells will be grouted with a neat cement-bentonite grout.

MONITORING WELL LOCATIONS AND INSTALLATION PROCEDURE

One monitoring well will be located in the vicinity and down gradient from the former diesel tank location. Additional monitoring wells may be located on the downgradient side of former USTs and on the upgradient portion of the site to evaluate if groundwater has been contaminated from offsite sources. The proposed monitoring well locations are shown the Soil Boring and Monitoring Well Location Plan, Figure 1. Well permits from Alameda

AQUA RESOURCES, INC.

SHIPMENT NO.:_____

CHAIN OF CUSTODY RECORD

PAGE_____OF_____

DATE_____

PROJECT NAME:_____

PROJECT NO.:_____

Sample Number	Location	Type of Sample		Type of Container	Type of Preservation		Analysis Required
		Material	Method		Temp	Chemical	

Total Number of Samples Shipped: | Sampler's Signature:

Relinquished By: Signature_____ Printed Name_____ Company_____ Reason_____	Received By: Signature_____ Printed Name_____ Company_____	Date / / Time _____
Relinquished By: Signature_____ Printed Name_____ Company_____ Reason_____	Received By: Signature_____ Printed Name_____ Company_____	Date / / Time _____

REMARKS:

Special Shipment / Handling / Storage Requirements:

FIGURE 3

County Flood Control and Water Conservation District, and any required well inspections will be coordinated by ARI personnel. Copies of well permits and inspector reports will be maintained in the project files. Monitoring wells will be installed and developed in accordance with the Regional Water Quality Control Board (RWQCB) guidelines.

Prior to installation of the monitoring well, a site reconnaissance will be performed to field locate the monitoring well(s). The monitoring wells will be installed using hollow stem auger drilling equipment. Augers will be steam cleaned prior to drilling. A standard split barrel sampler, with a 2-5/8 inch outer diameter and 2 inch inner diameter, will be used for soil sampling. Soil sampling will be performed as described above. A boring log will be prepared for each monitoring well in the field.

The monitoring well will be installed at the conclusion of soil sampling. The monitoring well casing will consist of two-inch or four-inch diameter Schedule 40 PVC pipe. The bottom of the well casing will be fitted with a closed screw-on cap. The well casing will be slotted (slot opening 0.020 inches) between depths of about 7 feet to the base of the monitoring well. The annulus between the casing and bore wall will be filled with #3 RMC Lonestar sand to a depth of 5 feet below existing grade (about two feet above the top of slotted casing). A two foot seal of 3/8-inch diameter bentonite pellets will be constructed immediately above the sand pack, and the remainder of the annulus will be filled with cement grout. The top of the well casing will be fitted with a locking cap. The well will be completed to prevent water from ponding around the well head. All monitoring wells will be constructed within a christy box for security, and to prevent damage from vehicle impact.

GROUNDWATER SAMPLING

The monitoring wells will be developed by surging and bailing. As part of well development, approximately six casing volumes will be evacuated from the well, using a teflon bailer. The water removed from the well will be placed in sealed containers and stored onsite pending results of chemical analyses and determination of appropriate disposal. ARI will request that the purge water, if found to be contaminated, be disposed of to the sanitary sewer.

After the monitoring wells are developed and allowed to recover, a groundwater sample will be collected using a bailer. The groundwater sampling methods will follow guidelines presented in EPA-600/4-84-076, Section 3.4.3, Method III-9, "Sampling Monitoring Wells with a Bucket Type Bailer." A teflon bailer will be used to collect the samples. Bailer decontamination will be a TSP wash, a tap water rinse, and a deionized water rinse. Each sample will be labeled with a boring number, time, date, and placed in a cooled ice chest for transportation to the laboratory. A new length of nylon rope will be used for lowering and raising the bailer. The first sample from the well will be retrieved from the surface of

the water, and the contents of the bailer observed to assess whether there is any floating product present. The sample vials and jars, provided by the laboratory, will be filled from the bailer. The groundwater sample vials will be placed in a chilled ice chest and transported to the laboratory under chain-of-custody control.

Cleaned sample containers will be provided by the laboratory, and will contain any required preservatives as specified by the requested EPA analytical method.

ANALYSES PLAN

Soil and groundwater samples selected for chemical analysis will be submitted to a State certified laboratory utilizing chain of custody protocols. Chemical analyses will be performed by Curtis and Tompkins, Ltd, Analytical Laboratories in Berkeley. Chemical analyses to be performed are described in the following table.

Analytical Method	Procedure	Sample Type	Location*
Total Volatile Hydrocarbons (purge ext.)	EPA 8015 (modified)	soil/water	1
Total Petroleum Hydrocarbons (sonication ext)	EPA 8015 (modified)	soil/water	1,2,3,4,5
Total Oil and Grease	SMWW 503	soil	2,3,5
Purgeable Halocarbons	EPA 8010/ 601	soil/water	1,2,3
Purgeable Aromatics	EPA 8020/602	soil/water	1,2,3
Semi-Volatile Organics	EPA 8270/625	soil/water	2,3
Heavy Metals	CAC Title 22	soil/water	1,2,5

* Numbers refer to locations described in workplan.

Results of the chemical analyses are presented on the attached certified laboratory reports.

EQUIPMENT DECONTAMINATION

All augers will be steam cleaned prior to the drilling of each boring. Prior to obtaining each sample including the initial one, the disassembled sampler will be washed and rinsed. The wash will consist of a solution of TSP in water, followed by a triple rinse with the final rinse being deionized water. The brass liners will be washed and rinsed in a fashion similar to the sampler.

CHAIN OF CUSTODY

Official custody of samples will be maintained and documented from the time of sample collection through the completion of laboratory analyses. The following custody documentation procedure was developed by the National Enforcement Investigations Center of the EPA, and was used on this project.

A sample is considered to be in an individual's custody if the following criteria are met: it is in his/her possession or it is in his view after being in his/her possession; it was in his/her possession and then locked up or transferred to a designated secure area. Under this definition, the team members actually performing the sampling are personally responsible for the care and custody of the samples collected until they were transferred or dispatched properly. The QA Officer will review all field activities to confirm that proper custody procedures are followed during the field work.

The chain of Custody Record/Sampling Log is employed as physical evidence of sample custody. The individual performing the sampling will complete a Chain of Custody Record to accompany each sample shipment from the field to the laboratory. Basic information was recorded on the Chain of Custody Record, including the project number and name and samplers' signatures. For each sample number, the sampler will indicate the sample number, depth, date, time, whether the sample was a composite or grab, and number of containers. When relinquishing the samples, the sampler will sign in the space indicated at the bottom of the form. The recipient will sign in the "Received by" section of the form, entering the date and time the samples were received.

The custody record will be completed using waterproof ink. Any corrections shall be made by drawing a line through and initialing the error, then entering the correct information. The original signature copy of the Chain of Custody Record will be secured to the samples it covered. A copy of the custody record will be retained for the sampler's files. The laboratory representative accepting the incoming sample shipment shall sign and date the Chain of Custody Record to acknowledge receipt of the samples, completing the sample transfer process. It shall be the laboratory's responsibility to maintain internal log books and records that provide a custody record throughout sample preparation and analysis.

APPENDIX B

FORMER RANSOME COMPANY CORPORATION YARD
4030 HOLLIS STREET, EMERYVILLE

HEALTH & SAFETY PLAN

Prepared for:

RANSOME COMPANY
740 JULIE ANN WAY
OAKLAND, CALIFORNIA

ARI JOB # 90239.1

AQUA RESOURCES INC.
July 3, 1990

TABLE OF CONTENTS

HEALTH & SAFETY PLAN

1. INTRODUCTION

This Health and Safety Plan (HSP) is prepared for the investigation and evaluation of petroleum hydrocarbon contamination (gasoline, diesel and waste oil) at the former Ransome Company corporation yard in Emeryville, California. The HSP addresses potential health and safety hazards that may be encountered during the project and includes health and safety guidance for the field crew, on-site supervisors and project management personnel to conduct their job responsibilities on the site. The HSP is prepared based on accepted industrial hygiene practice for the hazardous waste industry.

2. PROJECT OBJECTIVES

The objectives of the proposed work at the former Ransome corporation yard are to evaluate the extent of possible soil and groundwater contamination from releases of petroleum hydrocarbons and to obtain representative bulk samples of contaminated soil for bioremediation treatability studies. These data will be utilized in preparing a detailed corrective action plan for the site. The corrective action plan will also include bioremediation evaluation based on the results of the treatability study.

Field activities at the Site will include:

- Backhoe excavation in previous excavations and spoil stockpiles to obtain representative bulk soil samples for treatability studies
- Drilling of soil borings (number unspecified)
- Soil sampling during drilling
- Installation and development of monitoring wells (up to three)
- Collection of groundwater samples

3. SITE DESCRIPTION

The site is located at 4030 Hollis Street in Emeryville, California. The site is shown in relation to the City of Emeryville on the Vicinity Map, Plate 1. A detailed plan view of the is shown on the Site Plan, Plate 2. The site was formerly used by Ransome Company as a corporation yard for staging of grading and paving operations, equipment maintenance and material storage. The site is no longer being used by Ransome Company; however, areas are still used for storage of equipment and materials. Some surfaces are paved with concrete or asphalt, and a large portion of the site is unpaved or surfaced with gravel only. Other site improvements include several buildings and storage sheds and an above ground storage tank that was used to store asphalt emulsions. The site is described further in the Site Sampling Plan.

4. JOB HAZARD EVALUATION

4.1 Chemical Hazards

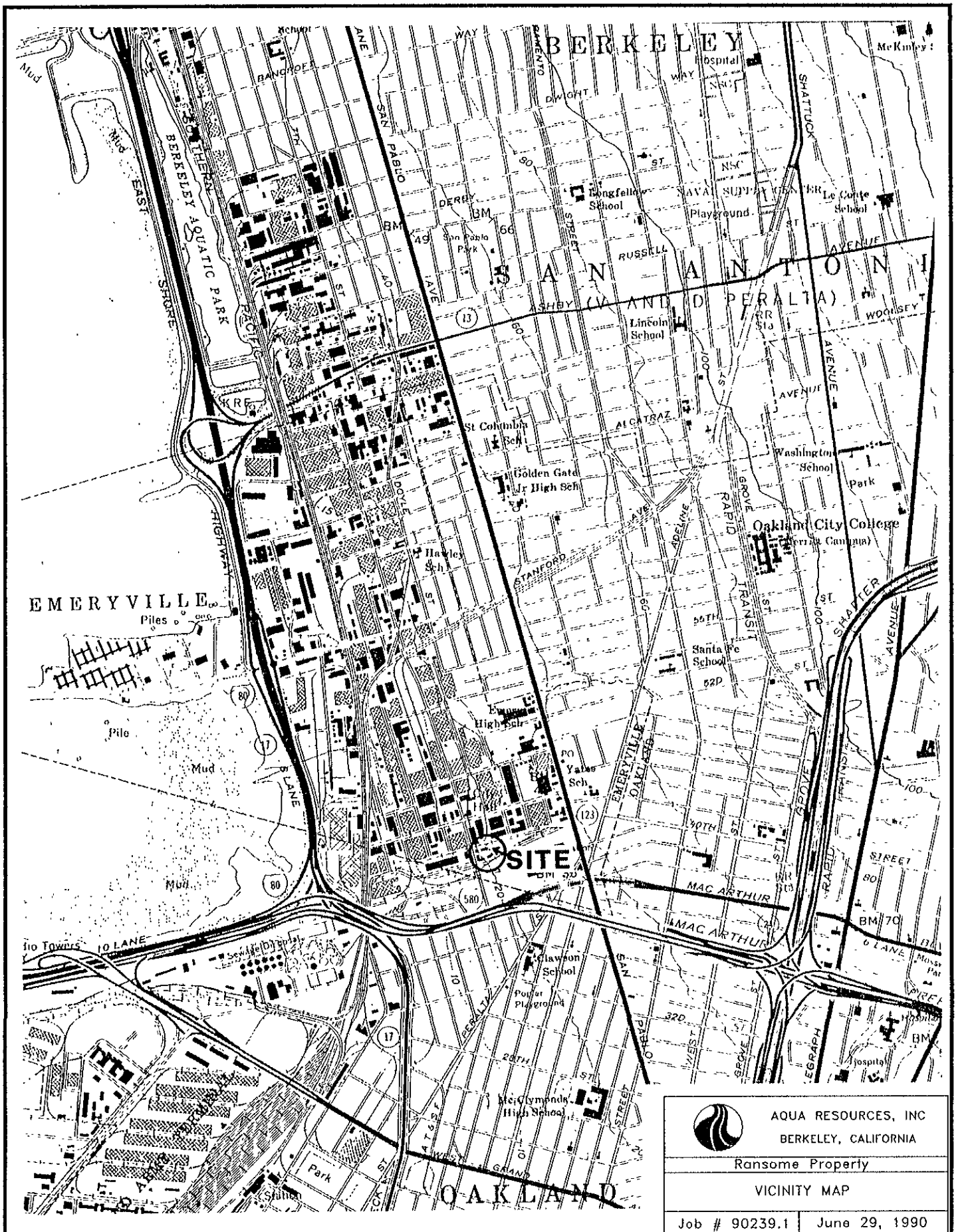
Petroleum hydrocarbons are expected to be encountered in this project. Hazardous Substance Information Forms contained in Appendix I contain general physical, chemical, and toxicological data on petroleum hydrocarbons. The toxicological data are summarized below:

Substances	Route	Exposure Symptoms
petroleum hydrocarbons	Inhalation*	Dizziness, drowsiness,
	Ingestion	head ache, nausea,
	Skin Adsorption*	irritates eyes,

* Primary exposure route(s)

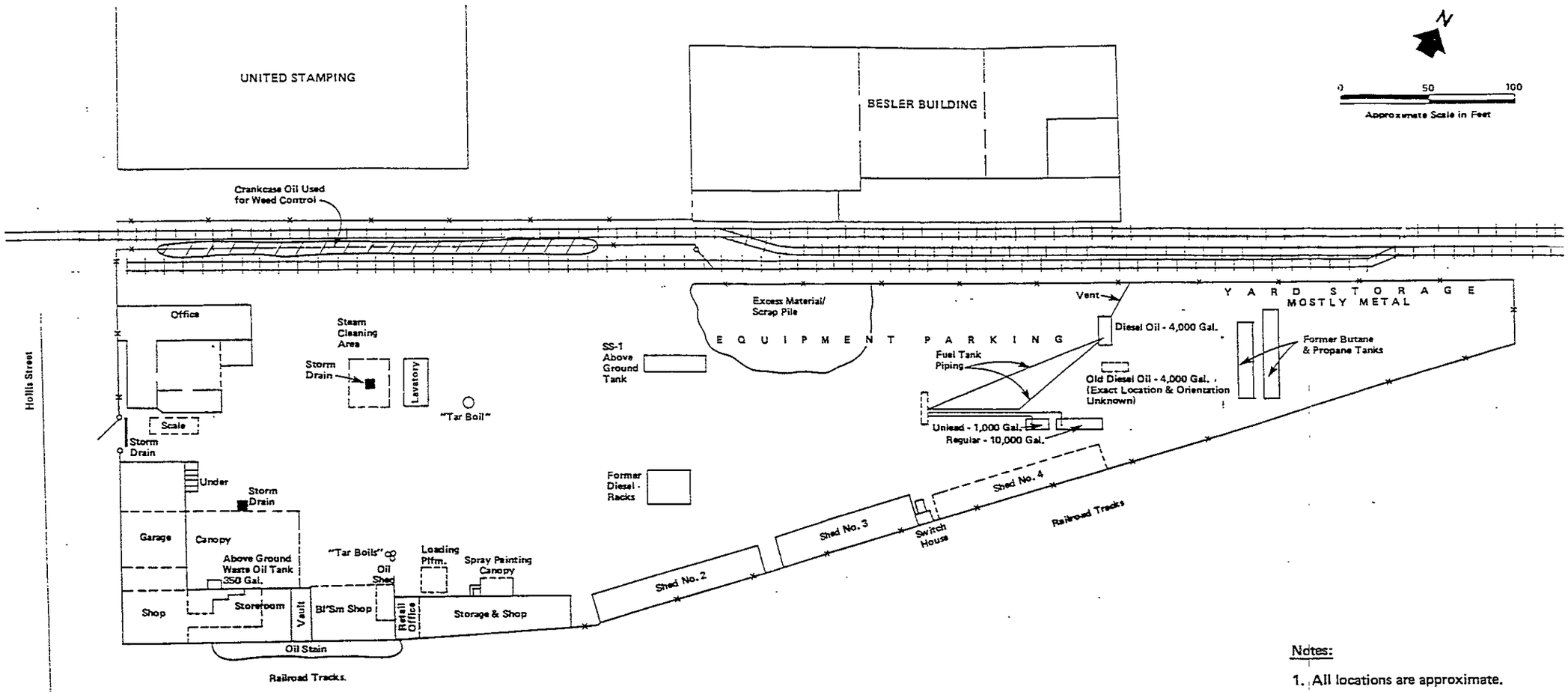
Petroleum hydrocarbons used at the site are known to contain benzene which has been identified as a potential carcinogen for man by the International Agency for Research on Cancer (IARC) (IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Volume 7, 1974, and Volume 18, 1978).

The current OSHA permissible exposure limit (PEL) for petroleum hydrocarbons is 2000 mg/m^3 over an eight hour day. NIOSH recommends that the permissible exposure limit for petroleum hydrocarbons be 350 mg/m^3 averaged over a work shift of up to 10 hours per day, 40 hours per week.



AQUA RESOURCES, INC BERKELEY, CALIFORNIA	
Ransome Property	
VICINITY MAP	
Job # 90239.1	June 29, 1990

PLATE 1



Notes:

1. All locations are approximate.
2. Estimated depth to groundwater -10 to 20 feet.

AQUA RESOURCES, INC
BERKELEY, CALIFORNIA

Ransome Property

SITE PLAN

Job # 90239.1 | June 29, 1990

PLATE 2

4.2 Heat Stress

Heat stress may occur due to prolonged working under hot weather conditions, poor ventilation, and extensive work hours without adequate resting periods and replacement of water and salt. Kinds or levels of heat stress are listed below:

Heat Rash: Hot humid conditions; red dermatitis

Heat Cramps: Painful spasms in skeletal muscles and pain in extremities and abdomen caused by profuse sweating and water replacement without adequate salt or electrolyte replacement. Larger muscle groups that are fatigued from use are usually most susceptible.

Heat Exhaustion: Characterized by extreme weakness or fatigue, dizziness, nausea, and headache. The skin is clammy and moist, complexion pale or flushed, and body temperature normal or slightly higher than normal. In serious cases, a person may vomit or lose consciousness. Treatment is rest in a cool place (do not chill) and replacement of body water lost by perspiration. Severe cases may require care for several days. There are no permanent effects.

Heat Stroke: Most severe form of heat stress; mortality rate is 50%. Very serious condition caused by a breakdown of the body's heat regulation mechanism. Signs and symptoms include red, hot dry skin, and body temperature 105 °F or higher. No perspiration, but nausea, dizziness, confusion, or convulsions may occur. Quick treatment is necessary. Body heat should be reduced artificially, but not too rapidly, by soaking the person's clothes with water and fanning them. Alternatively, remove as much clothing as possible; wrap injured in a sheet soaked in water and fan vigorously; treat for shock.

Steps to minimize or monitor heat stress are given in Section 10, Monitoring Procedures and Criteria.

4.3 Other Hazards

Other hazards may include excessive noise and dust exposure during the drilling, and operation of other construction equipment. There are also physical hazards associated with working around drilling equipment and other construction equipment and hazards from various activities such as handling heavy augers during drilling and rotating or moving equipment. Physical hazards include:

- Falling resulting from tripping on objects lying on the ground, stepping into open excavations or boreholes or from uneven terrain,

- Injury from moving equipment such as when heavy equipment is in motion or being operated.

The Contractor shall follow appropriate safety regulations to protect the safety of people working around the drilling equipment. Equipment and machinery to be used on site shall be in good condition and shall be operated by qualified employees according to the manufacturer's instructions.

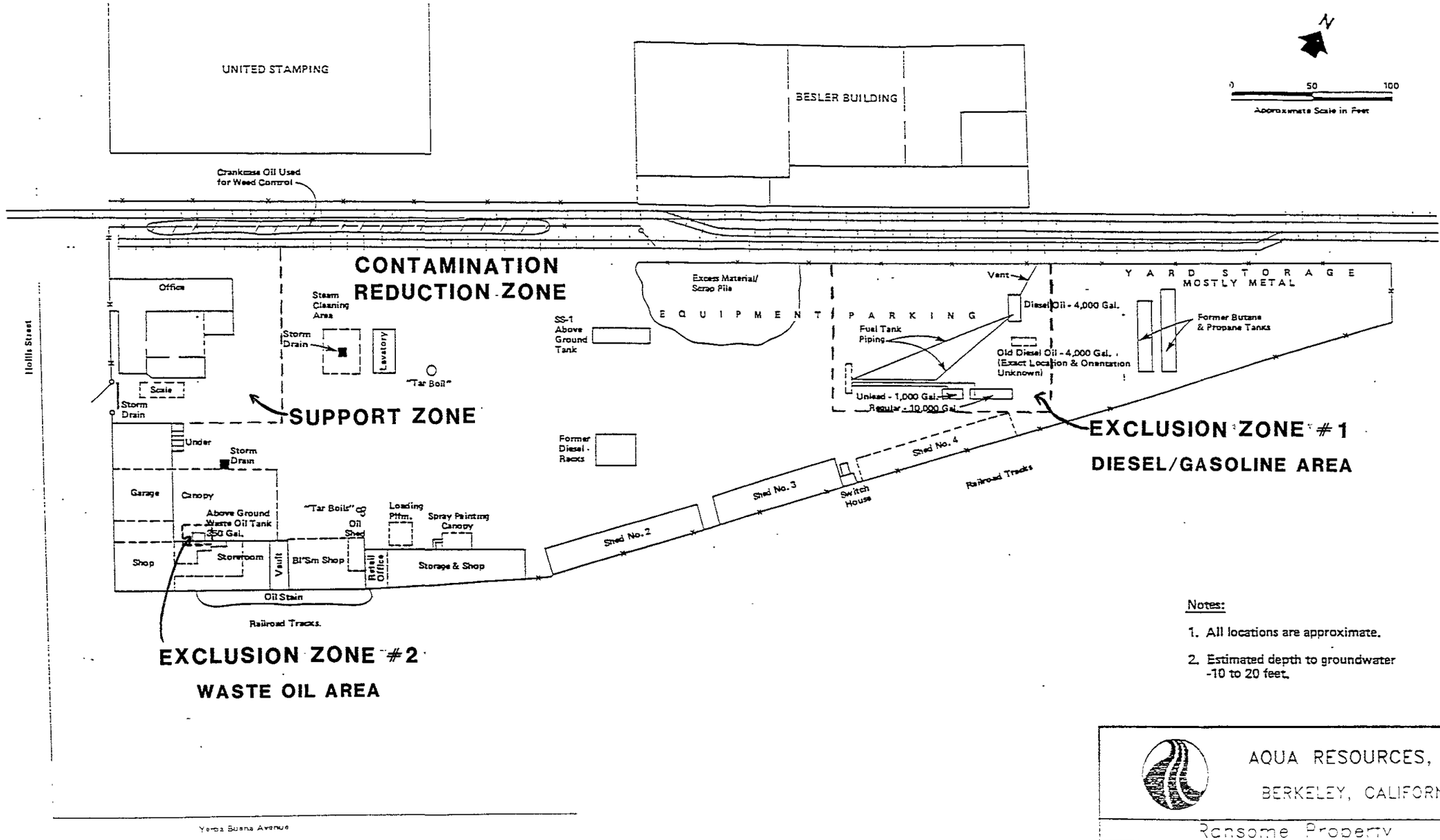
5. SITE CONTROL

The onsite Command Post and staging areas have been established at the parking area located inside the main gate at the northwest end of the site.

Control boundaries have been established and are shown in Plate 3, and the Exclusion Zone (the contaminated area), Contamination Reduction Zone, and Support Zone (clean area) have been identified and designated as follows:

Exclusion Zone:	Area around the gasoline, diesel and waste oil tank excavations.
Contamination Reduction Zone:	Area immediately outside and adjacent to the previous tank excavations.
Support Zone:	Parking area inside and northwest of main gate.

Site maps showing the general location of the Ransome site are attached to this Health & Safety Plan (Plates 1 & 2). Site perimeter of the property is secured by existing fences and gates. NO UNAUTHORIZED PERSON SHALL BE PRESENT WITHIN THE FENCED YARD AT ANY TIME DURING PERFORMANCE OF ACTIVITIES DESCRIBED IN SECTION 2. The Site Safety Officer or his designated Team Leader is responsible for maintaining site security.



Notes:

1. All locations are approximate.
2. Estimated depth to groundwater -10 to 20 feet.

AQUA RESOURCES, INC
BERKELEY, CALIFORNIA

Ransome Property

Exclusion, Contamination Reduction & Support Zones

Job # 90239.1 | June 29, 1990

PLATE 3

6. ONSITE ORGANIZATION AND COORDINATION

Project organization is as follows:

Engineer:	Aqua Resources, Inc. (ARI)
Contractor:	Ensco
Client:	Ransome Company

Personnel and duties at the site are as follows:

Site Safety Officer:	Mark Milani, ARI
Field Team Leader:	Mark Milani, ARI
Field Geologist:	Pat Rodgers, ARI
Contractor:	Bill Harding, Ensco (for backhoe excavation)

Aqua Resources Inc. (ARI) personnel will log the borings, test pits, handle the soil and groundwater samples after collection, provide the necessary coordination and supervision to carry out the proposed works, and will be present at the site to ensure the execution of this Health and Safety Plan.

The Site Safety Officer (SSO) will be responsible for the continuous monitoring of the site environment and observation of safety procedures on site. The SSO has the authority to make, if required by a specific site condition, any changes to this Health and Safety Plan such as level of protection, and boundaries of different zoning. All personnel arriving or departing the site should check in and out with the Site Safety Officer. All activities on site must be cleared through the Site Safety Officer.

When the designated SSO is away from the site, Ms. Pat Rodgers shall be the Alternate Site Safety Officer, ASSO. The ASSO shall have the same authority and shall perform the same tasks as the SSO.

The Contractor will perform drilling/backhoe operations, collect soil samples (driller only), decontaminate drilling equipment, and contain drilling wastes in drums. Soils excavated by backhoe shall be placed on top of existing stockpiles or adjacent to the excavation at a location designated by the Field Team Leader.

7. COMMUNICATION

Site activities on the Contamination Reduction Zone and Support Zones allow for direct voice contact at all times. Voice communication at Exclusion Zone may not be possible due to restriction of the half mask respirator. Where direct voice contact is not possible, personnel shall be briefed on duties to be performed before entering those areas. Hand sign signals shall be used for communication within such areas. Personnel shall leave the Exclusion Zone as soon as the desired duties are accomplished.

Personnel at the site will remain in constant voice communication or within sight of the Field Team Leader or his designated line-of-sight support person.

A Buddy System shall be established for all personnel working within the Exclusion Zone. Each worker shall have a designated co-worker or "buddy". Each of them shall be able to:

1) Provide their partner with assistance whenever needed.
2) Observe their partner for signs of chemical or heat exposure.
3) Periodically check the integrity of their partner's protective clothing.
4) Notify the SSO or others if emergency help is needed.

The following standard hand signals will be used in case voice communication is impossible.

Both arms waving ---------- Someone is injured
Hand gripping throat ---------- Out of air, cannot breathe
Hands on top of head ---------- Need assistance
Thumbs up ---------- OK, I am all right, I understand
Thumbs down ---------- No, negative

8. STANDARD OPERATING PROCEDURES

1) All personnel arriving or departing the site shall log in/out with the SSO.
2) All equipment shall be checked for proper functioning and calibration at the start of each work day.
3) All activities on site must be cleared through the SSO.
4) All personnel leaving Exclusion Zone must decontaminate at the Contamination Reduction Zone.
5) No one shall stay in the Exclusion Zone alone.
6) There shall be no smoking or eating in the Contamination Reduction Zone or in the Exclusion Zone.

9. PERSONNEL PROTECTIVE EQUIPMENT

Based on an evaluation of the potential hazards, the following levels of personnel protection have been designated for the applicable work locations and tasks:

Location	Job Function	Level of Protection
Exclusion Zone	All	D (Level C may be required)
All other areas	All	D

Air monitoring will be performed during conduction of the field work to confirm the level of personal protection required. Air monitoring will be performed using an organic vapor analyzer (OVA).

Specific protective equipment shall be as follows:

Level C Protection (if determined to be required)

- Full face, air-purifying respirator with pesticide cartridge(s) and particulate prefilter(s); or half mask, air-purifying respirator with organic vapor cartridge
- TYVEK chemical-resistant one-piece suit
- Inner and outer gloves made of chemical-resistant materials such as viton, nitrile, or neoprene
- Chemical-resistant safety boots/shoes
- Hard hat
- Eye Protection (safety glassed or goggles)

The OSHA Personal Equipment Standard (29 CFR Part 1910.134) shall be followed when using respirators. A Respiration Protection Program regarding the proper use of air-purifying respirator is presented in Appendix II.

Level D Protection

- *Safety shoes*

- Safety boots/shoes
- Nitrile or Nitrile/PVC outer gloves
- Hard hat, if appropriate
- Eye Protection (safety glasses or goggles)
- Gloves, cloth or leather for general use

Personnel shall also be provided with adequate hearing protection such as ear plugs or ear muffs when performing activities that produce high noise level.

NO CHANGES TO THE SPECIFIED LEVELS OF PROTECTION SHALL BE MADE WITHOUT THE APPROVAL OF THE SITE SAFETY OFFICER.

10. MONITORING PROCEDURES AND CRITERIA

Air monitoring will be performed using an FID or PID and Explosion meter to establish that an IDLH condition does not occur and that PELs are not exceeded that would require increasing the level of personal protection.

Personal monitoring shall be in effect to prevent injury to workers due to excessive exposure to hazardous chemicals, heat stress and noise. The following program of monitoring will be in effect for all personnel engaged in conduct of the work.

- Body temperature monitoring: The expected air temperature range will be 60-70°F. Metabolic heat load due to work activities is not expected to exceed 300 kcal-hour. Personnel shall decrease work if oral temperature is greater than 99.6 °F; do not wear (semi-) impermeable clothing if oral temperature is greater than 100.6 °F. Body temperature shall be taken at the request of the Site Safety Officer or the worker himself, and shall be taken at the beginning of a rest period.
- Heart rate: Decrease work if heartbeat is greater than 110 beats per minute at the beginning of a rest period.
- Body water loss: Measure weight at beginning and end of each day. Weight loss should not exceed 1.5% of total body weight in a work day.

Personnel will be instructed in self heat stress monitoring (awareness of signs such as shortness of breath, excessive perspiration and general discomfort). If personnel self-monitoring indicates that heat stress monitoring is required, the following procedures shall be followed:

- Physiological monitoring frequency shall be every 180 minutes of work.
- Heart Rate: radial pulse during a 30-second period as early as possible in the rest period.
- Oral temperature: measured with a clinical thermometer (3-minutes under the tongue).

Personnel shall read this Health and Safety Plan and be familiar with the symptoms caused by excessive exposure to the various chemicals that may be encountered during the site activities (Section 4.1 Chemical Hazards) and shall stop their activities and report to the SSO should they suspect the development of such symptoms.

11. DECONTAMINATION PROCEDURES

Personnel and equipment leaving the exclusion zone shall be decontaminated. The standard level decontamination protocol shall be used with the following decontamination steps:

(1) Equipment drop

(2) Outer boot wash and rinse

(3) Tape and outer glove removal

(4) Coverall wash/rinse or disposal as required

(5) Remove coverall

(6) Inner glove wash/rinse

(7) Remove respirator

(8) Inner glove removal

(9) Field wash/rinse

The above decontamination steps shall be carried out at the Contamination Reduction Zone. ARI will provide the following decontamination and first aid equipment at the Contamination Reduction Zone: plastic buckets, brush, plastic bags for disposable surgical (inner) gloves and first aid kit.

Soap and water will be provided and used as the decontamination solution.

Decontamination rinse water shall be stored in appropriate containers that are clearly labeled. The decontamination rinse water may have to be analyzed for levels of petroleum hydrocarbons and disposed of as hazardous waste in conformance with all Federal, State and local laws by Ransome Company.

12. EMERGENCY RESPONSE PROCEDURES

12.1. Site Safety Officer

The Site Safety Officer shall record all injuries happened at the site including nature of injuries, response actions to each injury, and cause of injuries, if known. The SSO shall give a precise report to hospital as to extent of decontamination of the injured person and nature of contaminants involved.

12.2. Emergency Medical Care

For any emergency, call "911" first. Alta Bates Hospital, located at Ashby Avenue at Colby Avenue in Berkeley, is approximately 10 minutes from this site. A map showing the location of this facility will be available at the site, and is included in this Health and Safety Plan (Plate 4).

First-aid equipment will be available on site, consisting of:

First-aid kit

Local ambulance service is available by calling 9ll.

First Aid Instructions

None of the chemicals mentioned is expected to be encountered in concentrated form during drilling. In the unlikely event that concentrated chemicals are found at the site and they come in contact with the eyes, then the affected eye will be immediately washed with large amount of water, occasionally lifting the lower and upper lids. Immediate medical

BERKELEY
HOSPITAL
SAN ANTONIO
SITE
OAKLAND
EMERYVILLE
SAN PABLO AVE
SHATTUCK AVENUE
MAC ARTHUR
ASHBY
ALCATRAZ
BERKELEY AQUATIC PARK
EAST SHORE HIGHWAY
Longfellow School
Lincoln School
St Columbia Sch
Golden Gate Jr High Sch
Hawley Sch
Emery High Sch
Yates Sch
Santa Fe School
Washington School
Oakland City College
Clawson School
Poplar Playground
Mc Clymonds High School
Technical High Sch
NAVAL SUPPLY CENTER
AQUA RESOURCES, INC
BERKELEY, CALIFORNIA
Ransome Property
Route to
Alta Bates Hospital
Job # 90239.1
June 29, 1990

PLATE 4

attention will be sought. To reduce the risk of eye injuries, personnel will not be permitted to wear contact lenses while working.

If concentrated chemicals come into contact with the skin, the affected area will be washed with soap and water.

Both the Engineer and the Contractor shall have personnel(s) familiar with first aid and CPR.

EMERGENCY PHONE NUMBERS: (This list is reprinted in Appendix III).

Agency/Facility

Emergency: 911

Police Department: 596-3737

Fire Department: 596-3771

Hospital: 540-1303

Public Health Advisor: Hazard Evaluation System and Information Service, (HESIS), (415) 540-3014

12.3. Emergency Procedures

The following standard emergency procedures will be used by onsite personnel. The Site Safety Officer shall be notified of any onsite emergencies and be responsible for ensuring that the appropriate procedures are followed.

Personnel Injury in the Exclusion Zone or the Contamination Reduction Zone: Upon notification of an injury in the Exclusion Zone or Contamination Reduction Zone, the designated emergency signal (voice contact) shall be sounded. All site personnel shall assemble at the Contamination Reduction Zone. The Site Safety Officer will evaluate the nature of the injury, and the affected person will be decontaminated to the extent possible prior to movement to the Support Zone. If the SSO judges it to be necessary, an ambulance will be called and the designated medical facility will be contacted to receive the case. No person shall reenter the Exclusion Zone until the cause of the injury or symptoms is determined.

Personnel Injury in the Support Zone: Upon notification of an injury in the Support Zone, the Site Safety Officer will assess the nature of the injury. If the cause of the injury or loss of the injured person does not affect the performance of site personnel, operations may continue, and the affected personnel will be conveyed to the designated medical facility, as deemed necessary by the SSO. If the injury increases the risk to others, the SSO may require all activities on site to stop until the added risk is removed or minimized.

Fire/Explosion: Upon notification of a fire or explosion on site, the SSO will order all site personnel to assemble outside the entrance gate of the site. The fire department shall be alerted and all personnel moved to a safe distance from the involved area.

Equipment Failure: If any equipment on site fails to operate properly, the Site Safety Officer shall be notified and he will then determine the effect of this failure on continuing operations on site. If the failure affects the safety of personnel or prevents continued progress for the work, all personnel within the Exclusion Zone or the Contamination Reduction Zone shall proceed to the Support Zone until the situation has been evaluated by the SSO.

Re-entry of Exclusion Zone: In all situations, when an onsite emergency results in evacuation of the Exclusion Zone, personnel shall not reenter until:

- The conditions resulting in the emergency have been corrected.
- The hazards have been reassessed.
- The Site Safety Plan has been reviewed.
- Site personnel have been briefed on any changes in the Site Safety Plan.

13. HEALTH & SAFETY TRAINING AND MEDICAL SURVEILLANCE

All site personnel shall be properly trained for the purpose of this project. The training shall comply with OSHA, 1910.120 (e). This Health and Safety Plan shall be made available to each Field Team Leader, the Site Safety Officer, local hospital, and the Contractor. The Contractor shall be responsible for making his employees familiar with the names and alternates for site safety and health. This includes SSO, ASSO, and Project Team Leader. It is the Contractor's responsibility to ensure that his employees have adequate training in the following:

- names of personnel and alternates responsible for site safety and health;

- safety, health and other hazards present on the site;
- use of Personal Protection Equipment;
- work practices by which the employee can minimize risks from hazards;
- safe use of engineering controls and equipment on the site;
- medical surveillance requirements including recognition of symptoms and signs which might indicate over exposure to hazards; and
- sections 5 through 12 of this Health & Safety Plan.

14. ACKNOWLEDGEMENT

The undersigned have read the above plan and are familiar with its provisions.

	SIGNATURE
Site Safety Officer:	_____
Field Team Leader:	_____
Other Site Personnel:	_____
	_____
	_____
	_____
	_____
	_____
	_____
	_____
	_____
	_____
	_____
	_____
	_____
	_____
	_____
	_____

APPENDIX I

HAZARDOUS SUBSTANCE INFORMATION FORMS

- Explanation of Codes and Abbreviations
- petroleum hydrocarbons

EXPLANATION OF CODES AND ABBREVIATIONS
HAZARDOUS SUBSTANCES INFORMATION FORMS

CHEMICAL NAME AND FORMULA

The chemical name given is usually that found in 29 CFR 1910, Subpart Z, General Industry Standards for Toxic and Hazardous Substances (OSHA). The chemical formula is also provided.

Below the chemical formula is the Chemical Abstract Service (CAS) registry number. This number, in the format xxx-xx-x, is unique for each chemical and allows more efficient searching on other data bases such as the Chemical Substances Information Network (CSIN).

Also included is the NIOSH Registry of Toxic Effects of Chemical Substances (RTECS) number, in the format ABxxxxxxx. RTECS may be useful in obtaining additional information on a chemical.

Under the RTECS number, the U.S. Department of Transportation (DOT) UN or NA identification number and the corresponding guide number have been placed. Their format is xxxx xx and indicates that the chemical is regulated by DOT. The guide number (xx) refers to actions to be taken to stabilize an emergency situation. This information can be found in the DOT Hazardous Materials Emergency Response Guidebook, DOT P5800.3.

SYNONYMS

Several common synonyms, if any, are listed for each chemical in this column.

EXPOSURE LIMITS

The permissible exposure limit (PEL), as found in 29 CFR 1910, Subpart Z, General Industry Standards for Toxic and Hazardous Substances as of March 11, 1984, is listed first. Unless noted otherwise, exposure limits are 8-hour time-weighted average (TWA) concentrations. OSHA ceiling concentrations shall not be exceeded at any time.

IDLH LEVEL

The Immediately Dangerous to Life or Health (IDLH) level is listed in either ppm or mg/m^3. This level represents a maximum concentration from which one could escape within 30 minutes without any escape-impairing symptoms or any irreversible health effects. Where

the notation "Carcinogen" appears, NIOSH has recommended that the substance be treated as a potential human carcinogen.

PHYSICAL DESCRIPTION

A brief description of the appearance and odor of each substance is provided.

CHEMICAL AND PHYSICAL PROPERTIES

A number of important chemical and physical properties are given for each substance:

MW: Molecular weight
UEL: Upper explosive limit in air, % by volume
LEL: Lower explosive limit in air, % by volume
IP: Ionization Potential, Ev
MEC: Minimum explosive concentration for a dust in air, g/l

INCOMPATIBILITIES

Potentially hazardous incompatibilities of each substance are listed.

PERSONAL PROTECTION AND SANITATION

A summary of recommended practices specific to each toxic substance is presented. These recommendations supplement general work practices specific to each toxic substance is presented. These recommendations supplement general work practices (e.g., no eating where chemicals are used).

ROUTE OF HEALTH HAZARD

The toxicologically important routes of entry for each substance are listed.

SYMPTOMS

Potential symptoms as a result of exposure are listed.

FIRST AID

First aid procedures are listed for response to eye and skin contact, inhalation, and ingestion of the toxic substance.

TARGET ORGANS

The organs which are affected by exposure to each substance are listed.

GASOLINES: AUTOMOTIVE (<4.23g lead/gal)

GAT

Common Synonyms	Watery liquid	Colorless to pale brown or pink	Gasoline odor
Motor spirit Petrol	Floats on water. Flammable, irritating vapor is produced		

Stop discharge if possible. Keep people away
Shut off ignition sources and call fire department
Stay upwind and use water spray to "knock down" vapor
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, foam, or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness
Move to fresh air
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Irritating to skin and eyes
If swallowed, will cause nausea or vomiting
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes

Notify local health and wildlife officials
Notify operators of nearby water intakes

1 RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning high flammability
Evacuate area
Disperse and flush

2. LABEL

2.1 Category: Flammable liquid
2.2 Class: 3

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures
3.2 Formula: (Mixture of hydrocarbons)
3.3 IMO/UN Designation: 3.1/1203
3.4 DOT ID No.: 1203
3.5 CAS Registry No: Data not available

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless to brown
4.3 Odor: Gasoline

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Protective goggles, gloves
5.2 Symptoms Following Exposure: Irritation of mucous membranes and stimulation followed by depression of central nervous system. Breathing of vapor may also cause dizziness, headache, and incoordination or, in more severe cases, anesthesia, coma, and respiratory arrest. If liquid enters lungs, it will cause severe irritation, coughing, gagging, pulmonary edema, and, later, signs of bronchopneumonia and pneumonitis. Swallowing may cause irregular heartbeat.
5.3 Treatment of Exposure: INHALATION: maintain respiration and administer oxygen, enforce bed rest if liquid is in lungs. INGESTION: do NOT induce vomiting, stomach should be lavaged (by doctor) if appreciable quantity is swallowed. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.
5.4 Threshold Limit Value: 300 ppm
5.5 Short Term Inhalation Limits: 500 ppm for 30 min
5.6 Toxicity by Ingestion: Grade 2, LD_{50} = 0.5 to 5 g/kg
5.7 Late Toxicity: None
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 0.25 ppm
5.11 IDLH Value: Data not available

6. FIRE HAZARDS

6.1 Flash Point: —36°F C.C.
6.2 Flammable Limits in Air: 1.4%-7.4%
6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: None
6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
6.7 Ignition Temperature: 853°F
6.8 Electrical Hazard: Class I, Group D
6.9 Burning Rate: 4 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 33

8. WATER POLLUTION

8.1 Aquatic Toxicity: 90 ppm/24 hr/juvenile American shad/TL_m/fresh water
91 mg/l/24 hr/juvenile American shad/TL_m/salt water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 8%, 5 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Various octane ratings; military specifications
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester) or pressure-vacuum

10 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U-V-W

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Flammable liquid

11.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: Not pertinent
12.3 Boiling Point at 1 atm: 140—390°F = 60—199°C = 333—472°K
12.4 Freezing Point: Not pertinent
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 0.7321 at 20°C (liquid)
12.8 Liquid Surface Tension: 19-23 dynes/cm = 0.019—0.023 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 49-51 dynes/cm = 0.049—0.051 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: 3.4
12.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.054
12.12 Latent Heat of Vaporization: 130—150 Btu/lb = 71—81 cal/g = 3.0 — 3.4 X 10^5 J/kg
12.13 Heat of Combustion: —18,720 Btu/lb = —10,400 cal/g = 435.1 X 10^4 J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 7.4 psia

NOTES

GASOLINES: AUTOMOTIVE (<4.23g lead/gal)

GAT

Common Synonyms	Watery liquid	Colorless to pale brown or pink	Gasoline odor
Motor spirit Petrol	Floats on water Flammable, irritating vapor is produced		

Stop discharge if possible Keep people away
Shut off ignition sources and call fire department
Stay upwind and use water spray to "knock down" vapor
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area
Extinguish with dry chemical, foam, or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness
Move to fresh air.
If breathing has stopped, give artificial respiration
If breathing is difficult, give oxygen

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS
Fouling to shoreline
May be dangerous if it enters water intakes.

Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning high flammability
Evacuate area
Disperse and flush

2 LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3 CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Miscellaneous Hydrocarbon Mixtures
3.2 **Formula:** (Mixture of hydrocarbons)
3.3 **IMO/UN Designation:** 3.1/1203
3.4 **DOT ID No.:** 1203
3.5 **CAS Registry No.:** Data not available

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to brown
4.3 **Odor:** Gasoline

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective goggles, gloves.
5.2 **Symptoms Following Exposure:** Irritation of mucous membranes and stimulation followed by depression of central nervous system Breathing of vapor may also cause dizziness, headache, and incoordination or, in more severe cases, anesthesia, coma, and respiratory arrest If liquid enters lungs, it will cause severe irritation, coughing, gagging, pulmonary edema, and, later, signs of bronchopneumonia and pneumonitis Swallowing may cause irregular heartbeat
5.3 **Treatment of Exposure:** INHALATION maintain respiration and administer oxygen, enforce bed rest if liquid is in lungs INGESTION, do NOT induce vomiting; stomach should be lavaged (by doctor) if appreciable quantity is swallowed EYES wash with copious quantity of water SKIN wipe off and wash with soap and water
5.4 **Threshold Limit Value:** 300 ppm
5.5 **Short Term Inhalation Limits:** 500 ppm for 30 min
5.6 **Toxicity by Ingestion.** Grade 2, LD_{50} = 0.5 to 5 g/kg
5.7 **Late Toxicity:** None
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin
5.10 **Odor Threshold:** 0.25 ppm
5.11 **IDLH Value:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** —36°F C.C.
6.2 **Flammable Limits in Air:** 1.4%-7.4%
6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** None
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back
6.7 **Ignition Temperature:** 853°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 4 mm/min
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization.** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product)** Data not available
7.8 **Reactivity Group:** 33

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 90 ppm/24 hr/juvenile American shad/TL_m/fresh water
91 mg/1/24 hr/juvenile American shad/TL_m/salt water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 8%, 5 days
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Various octane ratings, military specifications
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester) or pressure-vacuum

10 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U-V-W

11 HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation.**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** Not pertinent
12.3 **Boiling Point at 1 atm:** 140—390°F = 60—199°C = 333—472°K
12.4 **Freezing Point:** Not pertinent
12.5 **Critical Temperature:** Not pertinent
12.6 **Critical Pressure.** Not pertinent
12.7 **Specific Gravity:** 0.7321 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 19-23 dynes/cm = 0.019—0.023 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 49-51 dynes/cm = 0.049—0.051 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** 3.4
12.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.054
12.12 **Latent Heat of Vaporization:** 130—150 Btu/lb = 71—81 cal/g = $3.0 - 3.4 \times 10^5$ J/kg
12.13 **Heat of Combustion:** —18,720 Btu/lb = —10,400 cal/g = 435×10^5 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 7.4 psia

NOTES

OILS: DIESEL

ODS

Common Synonyms	Oily liquid	Yellow brown	Lube or fuel oil odor
Fuel oil 1 D Fuel oil 2 D	Floats on water		

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire.

Combustible
Extinguish with dry chemical, foam, or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Dangerous to aquatic life in high concentrations
Fouling to shoreline
May be dangerous if it enters water intakes

Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

2.1 **Category:** None
2.2 **Class:** Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Miscellaneous Hydrocarbon Mixtures
3.2 **Formula:** Not applicable
3.3 **IMO/UN Designation:** 3.1/1270
3.4 **DOT ID No.:** 1270
3.5 **CAS Registry No.:** Data not available

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Light brown
4.3 **Odor:** Like fuel oil

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment.** Goggles or face shield
5.2 **Symptoms Following Exposure:** If liquid is ingested, an increased frequency of bowel movements will occur
5.3 **Treatment of Exposure:** INGESTION: do NOT induce vomiting. SKIN: wipe off, wash with soap and water. EYES: wash with copious amounts of water for at least 15 min
5.4 **Threshold Limit Value:** No single TLV applicable
5.5 **Short Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 1, LD_{50} = 5 to 15 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin
5.10 **Odor Threshold.** Data not available
5.11 **IDLH Value:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** (1-D) 100°F C.C.; (2-D) 125°F C.C.
6.2 **Flammable Limits in Air:** 1.3-6.0 vol.%
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** (1-D) 350-625°F (2-D) 490-545°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 4 mm/min
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 33

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 204 mg/l/24 hr/juvenile American shad/TL_m/salt water
8.2 **Waterfowl Toxicity:** >20 ml/kg /LD_{50}/mallards
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Diesel Fuel 1-D (ASTM), Diesel Fuel 2-D (ASTM)
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester)

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations.** Combustible liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** Not pertinent
12.3 **Boiling Point at 1 atm:** 550—640°F = 288—338°C = 561—612°K
12.4 **Freezing Point:** 0 to —30°F = —18 to —34°C = 255 to 239°K
12.5 **Critical Temperature.** Not pertinent
12.6 **Critical Pressure:** Not pertinent
12.7 **Specific Gravity:** 0.841 at 16°C (liquid)
12.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
12.12 **Latent Heat of Vaporization:** Not pertinent
12.13 **Heat of Combustion:** —18,400 Btu/lb = —10,200 cal/g = 429 X 10^5 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** Varies

NOTES

ODS

OILS: DIESEL

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot (estimate)
50	52 430
52	52 430
54	52 430
56	52 430
58	52.430
60	52 430
62	52 430
64	52.430
66	52.430
68	52.430
70	52 430
72	52.430
74	52 430
76	52 430
78	52.430
80	52.430
82	52 430
84	52 430

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
10	.429
15	.431
20	.434
25	.436
30	.439
35	.441
40	.444
45	446
50	448
55	.451
60	.453
65	.456
70	458
75	.461
80	.463
85	466
90	.468
95	.471
100	.473
105	.475

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
30	.968
35	966
40	965
45	963
50	962
55	.961
60	.959
65	958
70	957
75	.955
80	.954
85	.952
90	.951
95	.950
100	.948
105	.947
110	946
115	944
120	943
125	.941
130	940

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
100.42	11.950

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
	INSOLUBLE

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch (estimate)
70	.042
75	.049
80	.057
85	.065
90	.076
95	.087
100	.100
105	.114
110	.131
115	.149
120	.170
125	.193
130	.218
135	.247
140	.279
145	314
150	352
155	.395
160	.443
165	.495
170	.552
175	615
180	.683
185	.758
190	841
195	.930

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
	NOT PERTINENT

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
	NOT PERTINENT

OILS, MISCELLANEOUS: MOTOR

OMT

Common Synonyms	Oily liquid	Yellow brown	Lube oil odor
Crankcase oil Lubricating oil Transmission oil	Floats on water		

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
Extinguish with dry chemical, foam or carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

LIQUID
Irritating to skin and eyes
Harmful if swallowed
Remove contaminated clothing and shoes
Flush affected areas with plenty of water
IF IN EYES, hold eyelids open and flush with plenty of water
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk
DO NOT INDUCE VOMITING

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes

Notify local health and wildlife officials
Notify operators of nearby water intakes

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

2.1 **Category:** None
2.2 **Class:** Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Miscellaneous Hydrocarbon Mixtures
3.2 **Formula:** Not applicable
3.3 **IMO/UN Designation:** 3.3/1270
3.4 **DOT ID No.:** 1270
3.5 **CAS Registry No.:** Data not available

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Yellow fluorescent
4.3 **Odor:** Characteristic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield
5.2 **Symptoms Following Exposure:** INGESTION: minimal gastrointestinal irritation; increased frequency of bowel passage may occur. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure
5.3 **Treatment of Exposure:** INGESTION: do NOT lavage or induce vomiting. ASPIRATION: treatment probably not required, delayed development of pulmonary irritation can be detected by serial chest x rays. EYES: wash with copious amounts of water. SKIN: wipe off oil and wash with soap and water
5.4 **Threshold Limit Value:** Data not available
5.5 **Short Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 1; LD_{50} = 5 to 15 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin
5.10 **Odor Threshold:** Data not available
5.11 **IDLH Value:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 275—600°F C.C.
6.2 **Flammable Limits in Air:** Data not available
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 325—625°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 4 mm/min.
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 33

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Various viscosities
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester)

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Not listed
11.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
11.3 **NFPA Hazard Classification:** Not listed

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** Not pertinent
12.3 **Boiling Point at 1 atm:** Very high
12.4 **Freezing Point:** —29.8°F = —34.4°C = 238.8°K
12.5 **Critical Temperature:** Not pertinent
12.6 **Critical Pressure:** Not pertinent
12.7 **Specific Gravity:** 0.84—0.96 at 15°C (liquid)
12.8 **Liquid Surface Tension:** 36-37.5 dynes/cm = 0.036—0.0375 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 33—54 dynes/cm = 0.033—0.054 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
12.12 **Latent Heat of Vaporization:** Not pertinent
12.13 **Heat of Combustion:** —18,486 Btu/lb = —10,270 cal/g = —429.96 X 10^3 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** Data not available

NOTES

OILS, MISCELLANEOUS: MOTOR

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot (estimate)
50	52.430
52	52.430
54	52.430
56	52.430
58	52.430
60	52.430
62	52.430
64	52.430
66	52.430
68	52.430
70	52.430
72	52.430
74	52.430
76	52.430
78	52.430
80	52.430
82	52.430
84	52.430

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F (estimate)
50	.460
52	.461
54	.462
56	.463
58	.464
60	.465
62	.466
64	.467
66	.468
68	.469
70	.470
72	.471
74	.472
76	.473
78	.474
80	.475
82	.476
84	.477
86	.478
88	.479
90	.480
92	.481
94	.482
96	.483
98	.484
100	485

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F (estimate)
35	920
40	.919
45	.918
50	.917
55	.916
60	.915
65	.914
70	.913
75	.912
80	.911
85	.910
90	.909
95	.908
100	.907
105	.906
110	.905
115	.904
120	.903

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
100.42	275.000

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
	INSOLUBLE

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch (estimate)
70	.042
75	049
80	.057
85	.065
90	.076
95	087
100	.100
105	.114
110	.131
115	.149
120	.170
125	.193
130	.218
135	.247
140	.279
145	.314
150	.352
155	.395
160	.443
165	.495
170	.552
175	.615
180	.683
185	.758
190	.841
195	930

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
	NOT PERTINENT

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
	NOT PERTINENT

APPENDIX II
RESPIRATORY PROTECTION PROGRAM

Because of the anticipated hazards of exposure to petroleum hydrocarbons during the execution of the Site Sample Plan, respirators may be required for personnel working in the Exclusion Zone. The OSHA Personal Equipment Standard (CFR Part 1910.134), attached to the end of this appendix, shall be followed when using a respirator. The respirator and cartridge to be used shall be NIOSH/MSHA certified which are approved for use in atmospheres containing specific chemicals up to designated concentration, AND NOT FOR IDLH ATMOSPHERE. The respirator and cartridge to be used in this Plan shall be pesticide type with particulate prefilter, and can be used only when the ambient atmosphere contains sufficient oxygen (19.5%). The following procedures shall be observed when using respirators:

1) Respirator fit test shall be performed to ensure the "fit" or integrity of the facepiece-to-face seal of a respirator. Appendix D of the OSHA lead standard (29 CFR Part 1910.1025) contains a quality respirator fit testing protocol and is attached to the end of this appendix.
2) A respirator shall not be worn when the following conditions prohibits a tight facepiece-to-face seal: facial hair, scars, hollow temples, very prominent cheekbones, deep skin creases, dentures or missing teeth, and the chewing of gum and tobacco.
3) A cartridge may be used up to its expiration date as long as it was not opened previously. It shall not be opened when they are not for immediate use and shall be discarded after use and should not be used for longer than one shift or when breakthrough occurs, whichever comes first.
4) When warning signals of cartridge breakthrough such as odor or irritation are detected, or when the respirator has an approved end-of-service-life indicator which indicates the sorption capacity of the cartridge has been exhausted, personnel shall leave the Exclusion Zone, decontaminated, and replace the cartridge(s) on the respirator.
5) The Contractor shall provide their employees who are required to enter the Exclusion Zone, including emergency situations, with certified respirators and cartridges and shall supervise and ensure the proper use of these respirators by their employees.

APPENDIX III
EMERGENCY PHONE NUMBERS:

Agency/Facility Emergency: 911

Police Department: 596-3737

Fire Department: 596-3771

Hospital: 540-1303

Public Health Advisor: Hazard Evaluation System and Information Service, (HESIS), (415) 540-3014.

Aqua Resources Incorporated: 2030 Addison Street, Suite 500, Berkeley, California (415) 540-6954

Ensco: 41674 Christy Street, Fremont, California (415) 659-0404