PHASE I - PRELIMINARY SITE INVESTIGATION STUDY

Exxon Service Station No. 7-3446
200 Nellen Avenue
Corte Madera, California

Prepared For:

Exxon Company, U.S.A.
2300 Clayton Road
Concord, California 94520

Alton Geoscience, Inc.

Project No. 30-190

July 24, 1990

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This report was based on currently available data and was developed in accordance with current hydrogeologic and engineering practices.

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1.0 INTRODUCTION AND BACKGROUND

Exxon Company, U.S.A. retained Alton Geoscience to conduct a Phase I - Preliminary Site Investigation Study at Exxon Service Station No. 7-3446, located at 200 Nellen Avenue, Corte Madera, California. The site location is shown in Figure 1, and a site plan is shown in Figure 2.

1.1 Purpose and Scope

This Phase I - Preliminary Site Investigation Study was performed in accordance with the guidelines and regulations of the Marin County Health and Human Services Department (MCHHSD) and the San Francisco Regional Water Quality Control Board (RWQCB), as well as the specifications set forth in Exxon Company's standard scope of work for Phase I - Preliminary Investigation. The preliminary investigation study was conducted to determine the nature and extent of suspected hydrocarbon contamination in the subsurface, if any.

The scope of the investigative work included the following tasks:

1. Installation of exploratory soil borings and ground water monitoring wells.

2. Collection and analysis of soil and ground water samples.

3. Analysis of field data and laboratory results.

4. Preparation of this technical report presenting the results, findings, and recommendations of the investigation.

The results of these tasks provide the basis for evaluating the potential presence of contaminants in soil and ground water, and the need for further investigation.

1.2 Site Description

The site, located at 200 Nellen Avenue, Corte Madera, California, is presently an operating service station on the southwest corner of the intersection of Nellen Avenue and Fifer Avenue. Three underground product storage tanks occupy a single cavity on the southern portion of the site and one waste oil tank is located on the western corner. The location and layout of the underground storage tanks are shown in Figure 2, Site Plan. The sizes and contents of the single-wall, steel underground storage tanks are as follows:

Tank Size (Gallons)	Product Stored	Year Installed
8,000	Unleaded Gasoline	1967
8,000	Premium Unleaded Gasoline	1967
8,000	Regular Gasoline	1967
550	Waste Oil	1967

The site is located at an elevation of approximately 25 feet above mean sea level, as shown in Figure 1, Site Vicinity Map. San Francisco Bay is the largest surface body of water in the area, located approximately 3/4 of a mile east of the site. The Madera Creek, which flows in an easterly direction, is about 1/4 of a mile north of the site.

1.3 Project Background

During routine maintenance and repair of the facility, water was detected in the existing underground gasoline storage tanks. A helium test was performed to determine the point of water entry into the tanks and piping system. Helium was introduced into the tank/piping system and was detected escaping from a vapor recovery line near the northern pump island.

The area over the storage tanks was excavated to access the tanks for maintenance. Ground water was encountered at a depth of approximately 2 feet below grade. A 1/2-inch layer of free product was observed on the water in the excavation. It was assumed that the product had originated from overspill during refilling of the storage tanks. The water/product, pumped from the excavation to lower the water level for maintenance, was hauled by a licensed hazardous waste transporter to the appropriate disposal facility.

1.4 Regional Geology and Hydrogeology

The site is situated in central Corte Madera, in the Ross Valley Basin, about 3/4 of a mile from San Francisco Bay, on Quaternary alluvial deposits underlain by the Franciscan Formation. Mount Tamalpais is located 5 miles to the west and the San Pablo fault trace is 5 miles to the northeast.

The geologic units in the county can be divided into broad classifications: (1) loosely consolidated surficial Quaternary deposits which are, at most, a few hundred feet thick, and (2) moderately to highly consolidated rocks formed from a few million to over 100 million years ago and which may be as much as several tens of thousands of feet thick.

In addition to age, these units differ in thickness, rock type, mode of origin, structure, and water-bearing characteristics.

Included in the surficial deposits are alluvium and bay mud, most of which is only a few thousand years old. Alluvium is made up of lenses of sand, gravel, and clay eroded from the older units and deposited on the floors of many of the major valleys by stream activity. Sand and gravel represent stream channel deposits that formed where water action was strong, while clay formed on floodplains where there were no strong currents. Alluvial deposits thicken both towards the center of a valley and in the downstream direction.

Bay mud is jelly-like, sticky clay which settled out under quiet water conditions in San Francisco Bay, and which underlies most of the low-lying land along the margins of the bay.

A predominant formation in the region is the Franciscan Formation, a Mezoic-aged melange of highly indurated marine sediments (sandstone, shale, and chert), marine volcanics (collectively called greenstone), intrusive serpentine, and metamorphic rocks. This formation is generally highly deformed and sheared with blocks of various lithologies in a matrix of clay minerals. Regionally, surface and ground water flow towards San Francisco Bay.

2.0 FIELD METHODS

The procedures and methods used during field activities were in accordance with applicable regulatory requirements and procedures, outlined in Appendices A and B. To assess the extent of hydrocarbon contamination in the soil, six soil borings were drilled to depths of approximately 10 to 25 feet below grade, and soil samples were collected for analysis. Three of the borings were converted into ground water monitoring wells from which water samples were collected for analysis to assess the impact of hydrocarbon constituents on the quality of the shallow ground water.

2.1 Soil Borings and Sampling

On April 17, 1990, prior to commencement of drilling activities, Well Permit No. 529651 was obtained from the Marin County Health and Human Services Department (MCHHSD). A copy of the well permit is presented in Appendix A.

On May 8th and 9th, 1990, Alton Geoscience supervised the drilling of six soil borings. Soil Borings SB-1, SB-2, and

SB-3 were drilled using a 4-inch-diameter, solid-flight auger; SB-1 to a depth of approximately 25 feet, and SB-2 and SB-3 to a depth of 10 feet below grade. The other three borings, MW-1, MW-2, and MW-3, were drilled using 8-inch-diameter, hollow-stem augers to depths of approximately 25 feet below grade for installation of ground water monitoring wells. Drilling activities were performed by West Hazmat Drilling Corporation of Rancho Cordova, California, using a CME 75 drilling rig.

During drilling, soil samples were collected at 5-foot intervals from 5 feet below grade. The soil samples were obtained through a split-spoon sampler lined with stainless steel tubes. The samples recovered for analysis were covered with Teflon sheeting and polyurethane caps, labeled, and placed immediately in an iced cooler. A description of drilling procedures, soil sampling protocol, and copies of boring logs are presented in Appendix B.

2.2 Ground Water Monitoring Well Construction

Three of the soil borings were completed as Ground Water Monitoring Wells MW-1, MW-2, and MW-3. The wells were constructed of clean, 4-inch-diameter, flush-threaded, Schedule 40 polyvinyl chloride (PVC) casing with blank and screened sections (0.020-inch slots) to a depth of approximately 25 feet below grade. Well installation procedures and construction details are presented in Appendix C.

2.3 Monitoring Well Development and Sampling

Well development and sampling were conducted on May 18, 1990, using a 4-inch-diameter bailer. Prior to sampling, each monitoring well was purged by pumping approximately 10 casing volumes of ground water. Water samples were collected after pH, conductivity, and temperature were observed to stabilize. The samples were then decanted from the bailer into clean containers and transported in an iced cooler to a state-certified laboratory for analysis following proper chain of custody procedures.

Well development and sampling procedures were conducted in accordance with the RWQCB and the MCHHSD guidelines, and followed the standard protocol described in Appendix D. Water sampling field survey forms documenting field observations during well development and purging are also presented in Appendix D.

2.4 Ground Water Level Monitoring and Surveying

The monitoring wells were surveyed on May 17, 1990, in reference to a common datum selected onsite, with an assumed elevation of 25 feet above mean sea level. The purpose of the survey was to determine the top of casing elevations of the three monitoring wells for use in calculating the water table elevation at each well and determining the ground water flow direction and gradient.

Ground water level monitoring and survey data collected on May 17, 1990 are presented in Table 1. A ground water elevation contour map based on interpretation of the monitoring data is shown in Figure 3.

3.0 ANALYTICAL METHODS

All laboratory analyses of soil and ground water samples were performed by a California state-certified analytical laboratory, using standard test methods of the U.S. Environmental Protection Agency (EPA) and the California Department of Health Services. Anametrix, of San Jose, California, analyzed the soil samples, and Superior Analytical Laboratory, of Martinez, California, analyzed the ground water samples. A listing of the analytical methods used is presented in Appendix E.

3.1 Soil Analysis

Soil samples from Soil Boring SB-1 were analyzed for halogenated volatile organic compounds (HVOC) by EPA Method 601/8010, total petroleum hydrocarbons as gasoline (TPH-G), and total petroleum hydrocarbons as diesel (TPH-D), both by EPA Method 8015, total oil and grease (TOG) by EPA Method 503E, and benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8020. Soil samples from SB-2, SB-3, MW-1, MW-2, and MW-3 were all analyzed for TPH-G and BTEX.

The results of the laboratory analysis of soil samples are presented in Table 2. The official laboratory reports and chain of custody records are included in Appendix E.

3.2 Water Analysis

Ground water samples collected from Monitoring Wells MW-1, MW-2, and MW-3 were analyzed for TPH-G with BTEX distinction. The results of the laboratory analysis of ground water samples are presented in Table 3. The official laboratory reports and chain of custody records are included in Appendix E.

4.0 SITE GEOLOGY AND HYDROGEOLOGY

A brief description of the pertinent information on the site geology and hydrogeology is presented below.

4.1 Site Geology

The soil borings showed a lithology of shale, silty clay, sandy clay, and bay mud beneath the site. Shale was encountered throughout Soil Boring SB-1. In SB-2, silty clay was encountered in the first 5 feet below grade, and bay mud in the last 5 feet of the boring. In SB-3, sandy clay was encountered in the first 5 feet below grade, and clay in the last 5 feet of the boring.

Silty clay was encountered in the uppermost 10 feet of MW-1, MW-2, and MW-3, underlain with varying types of soil to the total depth of the boring, ranging from shale in MW-1 to bay mud, silty clay, or sandy clay in MW-2 and MW-3.

4.2 Site Hydrogeology

The ground water elevations from Monitoring Wells MW-1, MW-2, and MW-3, as measured on May 18, 1990, were used to develop the ground water elevation contour map shown in Figure 3. The data indicates a northwesterly ground water flow direction, with an average gradient of approximately 0.071 foot per foot. The stabilized depth to ground water in the wells ranged from 3.8 to 7.8 feet below grade.

5.0 DISCUSSION OF RESULTS

The results of the field activities and laboratory analysis of soil and ground water samples collected during this investigation are presented in Tables 2 and 3 and are discussed below.

5.1 Soil

As part of this site investigation study, a total of 12 soil samples, 2 samples per boring at 5-foot intervals, were collected and analyzed to assess the nature and extent of hydrocarbon contamination in the subsurface soil. The results of the laboratory analysis are summarized in Table 2, and discussed below.

- Soil samples from the uppermost 10 feet below grade in all the borings had no detectable levels of TPH-G and no detectable to very low levels of BTEX constituents.

- Only the soil samples from SB-1 and MW-2 had low detectable levels of toluene and/or xylenes.

- A trace amount of trichloroethene (TCE) was detected in the sample from SB-1 at a depth of 10 feet below grade, at a concentration of 0.0013 parts per million (ppm).

5.2 Ground Water

The results of the laboratory analysis of ground water samples are summarized in Table 3 and discussed below.

- All the ground water samples from MW-1, MW-2, and MW-3 had no detectable concentrations of gasoline-range TPH.

- Of the BTEX constituents, only toluene and xylenes were detected in the water sample from MW-3 at levels of 0.6 and 1.0 parts per billion (ppb), respectively. Both of these levels are well below the current state primary maximum contaminant levels (MCLs) for drinking water.

6.0 FINDINGS AND CONCLUSIONS

The findings and conclusions of the Phase I - Preliminary Site Investigation Study are summarized below:

1. Soil types encountered at the site during drilling consisted of shale, silty clay, sandy clay, and bay mud.

2. The stabilized depth to ground water at the site ranges from approximately 3.8 to 7.8 feet below grade.

3. The ground water elevation contour map, developed from the water level and survey data, indicates a northwesterly ground water flow direction beneath the site, with an average gradient of approximately 0.071 foot per foot.

4. Only low levels of toluene and xylenes were detected in the soil samples. These hydrocarbon constituents were detected at 10 feet below grade in SB-1 and at 5 feet below grade in MW-2.

5. The nature and level of the hydrocarbon constituents in the soil do not appear to pose a significant threat to public health or ground water.

6. It appears that both the soil and shallow ground water onsite have not been significantly impacted by petroleum hydrocarbon constituents.

7. Based on the findings of this study, no further site characterization or investigation is necessary at this time since there is no apparent hydrocarbon contamination of the soil and ground water onsite.

TABLE 1

SURVEY AND WATER LEVEL MONITORING DATA

May 1990

Well Number	Elevation (Feet)*	Depth to Water (Feet)	Water Level Elevation (Feet)*
MW-1	25.00	4.49	20.51
MW-2	23.02	3.80	19.22
MW-3	21.83	7.76	14.07

Note:

*Elevation in feet relative to a common datum (MW-1) with an assumed elevation of 25 feet above mean sea level, as measured on May 18, 1990 by Alton Geoscience.

TABLE 2

RESULTS OF
LABORATORY ANALYSIS OF SOIL SAMPLES

May 1990

Boring No.	Sample Depth (ft)	TPH-G	TPH-D	TOG	B	T	E	X	VOC
		(Concentrations in Parts Per Million)							
SB-1	5.0	ND	ND	ND	ND	ND	ND	ND	ND
	10.0	ND	ND	ND	ND	0.006	ND	ND	0.0013*
SB-2	5.0	ND	--	--	ND	ND	ND	ND	--
	10.0	ND	--	--	ND	ND	ND	ND	--
SB-3	5.0	ND	--	--	ND	ND	ND	ND	--
	10.0	ND	--	--	ND	ND	ND	ND	--
MW-1	5.0	ND	--	--	ND	ND	ND	ND	--
	10.0	ND	--	--	ND	ND	ND	ND	--
MW-2	5.0	ND	--	--	ND	0.006	ND	0.007	--
	10.0	ND	--	--	ND	ND	ND	ND	--
MW-3	5.0	ND	--	--	ND	ND	ND	ND	--
	10.0	ND	--	--	ND	ND	ND	ND	--

Notes:

TPH-G = Total Petroleum Hydrocarbons as Gasoline
TPH-D = Total Petroleum Hydrocarbons as Diesel
B = Benzene
T = Toluene
E = Ethylbenzene
X = Total Xylenes
TOG = Total Oil and Grease
VOC = Volatile Organic Compounds
ND = Not Detected; detection limit varies with compound
-- = Not analyzed
* = Trichloroethene (TCE) was detected in SB-1 10 feet below grade, at 1.3 parts per billion

TABLE 3

RESULTS OF
LABORATORY ANALYSIS OF GROUND WATER SAMPLES

May 1990

Monitoring Well No.	TPH-G	B	T	E	X
	(Concentrations in Parts per Billion)				
MW-1	ND<50	ND<0.3	ND<0.3	ND<0.3	ND<0.3
MW-2	ND<50	ND<0.3	ND<0.3	ND<0.3	ND<0.3
MW-3	ND<50	ND<0.3	0.6	ND<0.3	1.0

Notes:

TPH-G = Total Petroleum Hydrocarbons as Gasoline
B = Benzene
T = Toluene
E = Ethylbenzene
X = Total Xylenes
ND = Nondetectable with detection limit

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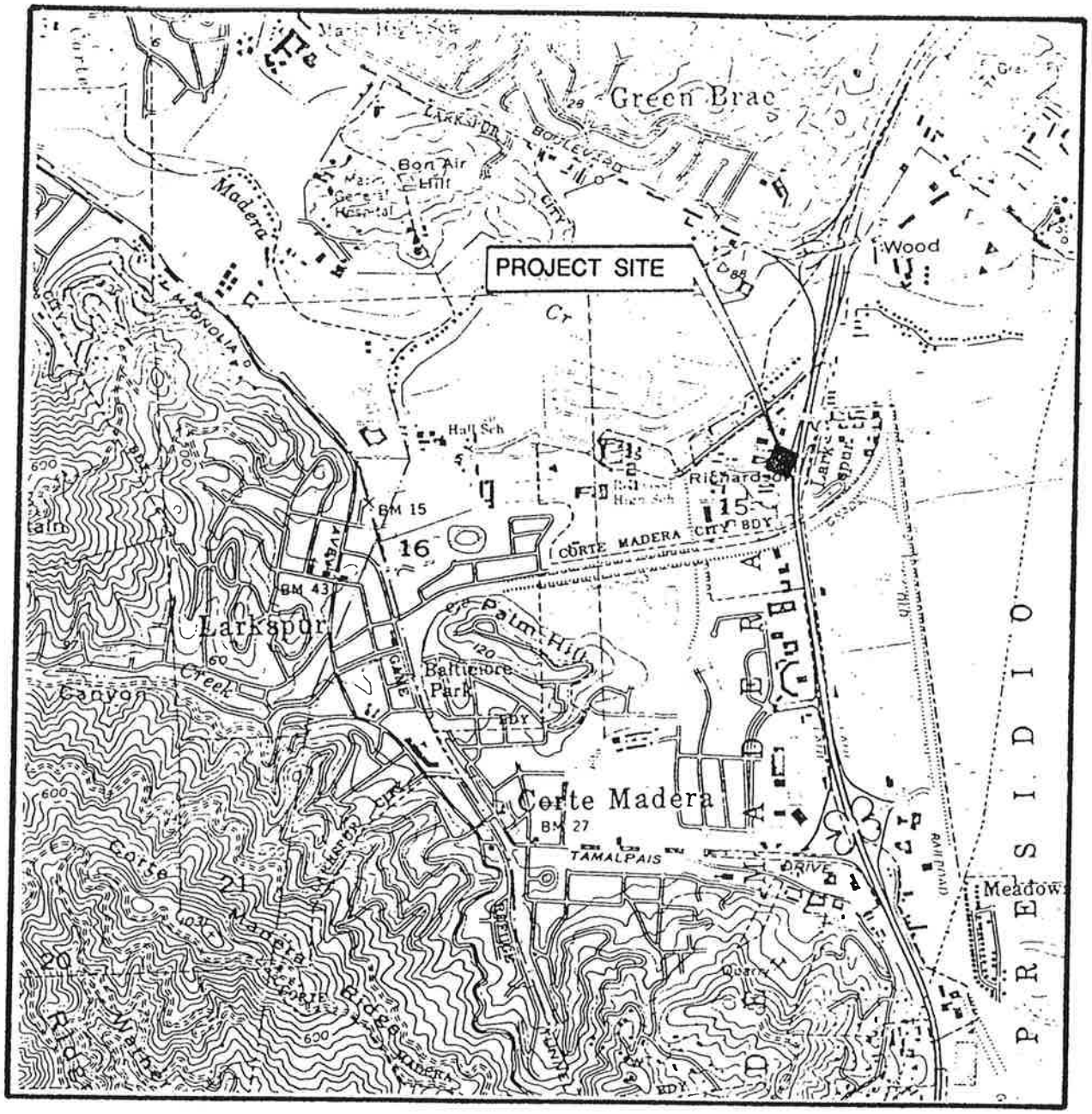
FIGURES



Source: U.S. Geological Map,San Rafael Quadrangle, California. 7.5 minute series. Photorevised 1980.

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0 1000 2000

SCALE IN FEET

FIGURE 1 VICINITY MAP

ALTON GEOSCIENCE
1000 Burnett Ave., Ste 140