aqua science engineers inc.

August 27, 1986

PHASE II - EXTENT OF GROUNDWATER CONTAMINATION INVESTIGATON, BAY CENTER

THE MARTIN COMPANY
4256 Hacienda Drive Suite 101
Pleasanton, CA 94566

Submitted
By

AQUA SCIENCE ENGINEERS
P.O. Box 535
San Ramon, CA 94583

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX

I. OVERVIEW

PHASE II - EXTENT OF GROUNDWATER CONTAMINATION INVESTIGATION, BAY CENTER

The extent of groundwater contamination at the Bay Center development was conducted in July and August, 1986. The purpose of the investigation was to: (1) determine the extent of contamination on-site, and (2) determine the location and levels of contaminants.

A total of 37 groundwater samples were collected. A total of 34 samples were analyzed for total hydrocarbons expressed as motor fuels, benzene, toluene, and xylene. These samples were analyzed according to EPA 5020/8015. Groundwater analysis for pesticides, CAM metals, organochlorines, and acid/base organics was conducted on three samples from wells located close to a former motor fuel tank pit, directly to the west of the tnak pit, near Lacoste Street, and one sample between the wells, on Christy Street.

The results indicate that the: (1) highest groundwater contaminates, ranging in concentrations from 460 ppm to 100 ppm, are located east of Christy Street and close to the former motor fuel tank pit; (2) motor fuel contaminates are contained on site; and (3) concentrations of contaminates found can be treated using air stripping and carbon filtration.

The Regional Water Control Board (RWQCD) is currently requiring site owners to investigate the extent of groundwater contaminaton (Phase II investigation) and to develop cleanup procedures (Phase III) where contaminates ahve been found in groundwater. The major concerns of the RWQCB are the : (1) potential threat to groundwater, and (2) concentrations of contaminants that may be allowed as part of a groundwater cleanup discharge considering various beneficial uses. Discharge of treated groundwater to surface waters and its impact to beneficial uses is covered under the National Pollution Discharge Elimination System (NPDES permit) process. Any dischagre to surface waters from groundwater treatment at Bay Center will require an NPDES permit. Discharge requirements vary, depending upon the potential beneficial use impacted and pollutants restricted from any discharge, such as PCB. Present Board policy is to evaluate each site on an case-by-case basis. For the purposes of cleanup, Best Management Practices (BMP) were developed to provide cleanup practices and, based of the efficiency of the BMP (air stripping and carbon filtration), establishing discharge limits that will protect beneficial uses. The Phase III proposal to treat groundwater at Bay Center incorperates effective BMPs.

Overall, beneficial uses of concern to the Board are (1) acute and chronic toxicity of the contaminants to aquatic life; (2) recreation,

which would include water contact; and (3) groundwater recharge for drinking water. Certain assumptions must be made regarding the impact to beneficial uses of motor fuel contamination detected at Bay Center and the subsequent treatment and discharge of the treated groundwater to surface water. Levels of protection range from no discharge to strict discharge where groundwater recharge is a beneficial use, to groundwater not being used for recharge. Bay Center clearly falls into the catagory of groundwater not being used for recharge. In general, the Board indicates that concentrations of constituants of 0.100 ppm (0.01 ppm for toluene) will in general not impact aquatic life and recreation. These concentrations are readily achievable with air stripping and carbon filtration

II. BACKGROUND

During the period 1960 to 1985 Garrett Freightlines operated a truck terminal at 64th and Lacoste Street in Emeryville, CA. The site was used as a municipal dump for nonspecific solid waste between 1940 and 1960. The site is currently under development by the Martin Co. with the intention of constructing an office complex upon it. Part of the construction plans called for removing all underground motor fuel tanks used by the previous owners. A total of 12 tanks (8 diesel, 1 gasoline and 3 waste oil) were removed from three tank pits located on the northeastern and eastern portions of the property.

Soil and groundwater contamination was discovered during tank removal. In responce to the contamination present, the Martin Co. directed Aqua Science Engineers, Inc. (ASE) to determine the extent of fuels cointainations both on-site and beyond the property boundries. A horizonal and verticle definition of motor fuel groundwater contamination began July 15, 1986 and was completed August 7, 1986. The Phase II involved placing 37 borings located over the site. Groundwater samples were analyzed for hydrocarbons expressed as motor fules, benzene, toluene, and xylene.

A characterization to determine the extent of site-wide soils contamination was conducted by Earth Metrics. Ancillary to the soils investigation by Earth Metrics, two groundwater monitoring wells were installed and water samples taken and analyzed.

III. GEOLOGY

The following sections, was exerpted from a report by Earth Metrics, Soil and Groundwater Contamination Characterization of Bay Center Site , August 20, 1986.

The hills above Emeryville consist of Tertiary sediments and volcanics overlying Jurassic-Cretaceous bedrock of the Franciscan Assemblage. The hills are part of the California Coast Range, and result from repeated episodes of deformation by folding and faulting over the last three million years. This uplift contributed to rapid erosion and deposition of a thick sequence of poorly consolidated alluvial fan deposits. Fluctuation is sea level, as a result of continental glaciation,

accelerated this process. As much as 540 feet of this late Tertiary early Quaternary sediment is believed to overlie bedrock in the Emeryville area.

The oldest alluvial fan deposits consist of poorly consolidated interbedded silts, sands and gravels known as the Alameda Formation (QA). These in turn are overlain by 10 to 15 feet of alluvium and stream deposited sands and silts of the Temescal formation. North of Powell Street in the area of the project site, the Temescal sands and silts are overlain by 30 feet of Merritt sand, a generally fine grained and well sorted beach and windblown sand deposit. Overlying these sands in this area are 10 to 20 feet of Bay Mud.

Since the late 1800s the Emeryville shoreline has been progressively extended baywards by imported fill. Approximately one third of the land area of the City of Emerywille presently consists of fill placed over bay mud. The composition of the fill is highly variable, and in general it appears to consist of imported clayey and/or sandy soils combined with construction and industrial waste materials (City of Emeryville, Emeryville
Redevelopment Project Draft EIR, 1977).

Bore holes north of the project site indicate that thicknesses of the artificial fill material in this area range from approximately 15 to 25 feet (City of Emeryville, 1975). Boring logs from the project site suggest that artificial fill materials is probably not much greater than 15 feet overlying bay mud (Geomatrix, 1986). Analysis of these logs suggests stratification of the fill material. The upper 1.5 to 4.0 feet of fill on the subject site consists of asphalt, aggregate base, and imported select fill. The underlying three to five feet of fill consists of a heterogeneous mixture of clay and sand with assorted miscellaneous debris including metal, glass, brick, and burnt wood. Maximum concentrations of these materials appear at approximately six feet below grade.

Logs of the soils borings reveal materials that are part of the historic municipal use of the subject site for land disposal. Metal and slag could have originated from early industrial used located in Emeryville/Oakland, such as Judson Steel and scrap yard. Brick, glass, and wood could have been transported from building demolition sites in Emeryville. Burnt materials could have been disposed on the subject site from fire damaged buildings.

Historic municipal disposal of scrap metal, spent welding rods, and other ferrous materials is probabvle. Iron was tested in twelve (12) samples and determined to be in the range of 6,700 mg/kg to 140,000 mg/kg. Metal was visually confirmed in the boring logs. Owing to the shallowness of the fill overlying the Bay Mud, rain and moisture had been oxidizing solid metal and leaching metallic ions for a period of several years, prior to encapsulation of the subject site with asphaltic pavement by Garrett Freight Lines.

At depths greater than six feet below grade, clay content of the fill

material is seen in the bore logs to increase substantially. At approximately ten to 12 feet, a layer of oily slag and organic material is seen in numerous bore hole locations throughout the site. Petroleum odors are also reported from numerous samples taken at this depth.

IV. METHODS

DRILLING, WELL CONSTRUCTION, SAMPLING AND ANALYSIS DETAILS

DRILLING

The drill rig used for placing borings to collect groundwater samples and well installation was a GeoSpace 1200 supplied by Aqau Science Engineers. An eight-inch hollow stem auger was used on the GeoSpace rig. Drill auger lengths and bits were thoroughly steam cleaned and air dried at the site between borings to reduce the chance of cross contamination.

MONITORING WELL PLACEMENT

Monitoring wells MWA, MWC and MWD shown in Figure 1 were used to determine direction of groundwater flow (a minimum of three wells are required). Well MWB was not used in defining the direction of groundwater flow because its location is outside the fence boundry and would possibly be subject to vandalism.

MONITORING WELL CONSTRUCTION

Two inch diameter PVC was used in borings and converted to monitoring wells. Well screen with .020 in. slots was used and the annular space around the well screen was backfilled with washed aquarium sand. A sanitary seal was provided with approximately six in. of bentonite pellets above the sand followed by neat cement which was poured to the surface. Street boxes were grouted in place and elevated approximately 1/2 in. above the ground surface to prevent surface water from entering the wells.

SOIL SAMPLING

Since the soil investigation had recently been conducted by Earth Metrics, ASE collected soil samples during drilling for archiveable purposes only. During drilling, soils were sampled with a California Split Spoon sampler holding four 2 inch diameter x 4 in. brass tubes and a spacer. The tubes were washed with detergent and rinsed with distilled water at the site. In sampling, the central tubes were removed for analysis. The ends were wrapped in aluminum foil, capped, taped, identified by date, depth and number, logged on a chain of custody form and placed in an ice chest for transport to cold storage.

WATER SAMPLING

Water samples from the boring wells were analyzed for motor fuel hydrocarbons, benzene, toulene, and xylene. EPA method 5020/8015 was

used for the analysis.
Water samples were taken with a steam cleaned teflon bailer, washed with TSP, rinsed with tap water and then distilled water. WESCO Laboratories of Novato, CA. performed the chemical analysis.

V. GROUNDWATER ELEVATION AND FLOW DIRECTION

The direction of groundwater flow (Figure 1) was determined using a Stevens Continuous Chart Recorder (Model 68 Type F) over a six day period. These data are presented in Table 1. The depth to groundwater ranges from about 6.5 feet to 8.0 feet. The data indicate that the direction of groundwater flow in the vicinity of the Bay Center office complex development is generally toward the south and southwest. The calculated horizonal hydraulic gradient is approximately 0.003 ft./ft.

The current data is sufficient to adequately evaluate short-term variations in groundwater elevation of flow direction. However, periodic measurements of groundwater elevations should be planned to monitor longer-term local or regional trends and seasonal fluctuations in groundwater elevation and flow.

VI. GROUNDWATER QUALITY

A site-wide determination of groundwater quality was conducted in July, 1986. A total of 37 borings to groundwater were placed throulghout the site to determine: (1) the extent of motor fuel contamination and; (2) the possibility of contaminants travelling off-site. Groundwater samples were sent to WESCO Laboratories (Novato, CA.) for analysis.

Samples were analyzed for total hydrocarbons, expressed as motor fuels, benzene, toluene, and xylene. Analytical results from the groundwater samples are presented in Table 2; laboratory data are presented in Appendix A. Results of each groundwater sample is shown in Figure 1. Due to the motor fuel contanination found during the tank removal in May 1986, our primary focus was a determination of concentrations of motor fuels present in groundwater throughout the site. During this investigation, no other constituents in the water were addressed by ASE. However, it recently came to our attention that water quality samples collected from wells MWA, MWB and boring W9 installed for Earth Metrics yield contaminants not previously addressed. As part of the soil investigation conducted by Earth Metrics, groundwater samples taken from MWA, MWB, W9, and W15 were analyzed for CAM metals, GC/MS and pesticides). The results are shown in Table 3.

MOTOR FUEL CONTAMINATION:

The water quality analzses confirmed that groundwater east of Christy Street and in the vicinity of the three tank pits contains elevated concentrations of motor fuel hydrocarbons (Figure 1). Additionally, groundwater away from the tank pits, on A Pad, and contiguous to Christy Street contain slightly elevated concentrations of motor fuels. Examination of the data set for motor fuel hydrocarbons suggests that the extent of contamination is contained on-site.

Perimeter borings along the fence line (which would indicate off-site travel of contaminants) of the property indicate that the motor fuel contaminants found in the groundwater are below levels of concern.

Total hydrocarbons expressed as motor fuels ranged from < 0.05 ppm to 460 ppm in MWA, close to Tank Pit 1. Concentrations of motor fuels found on A Pad were 20 ppm and 1.5 ppm in borings close to Lacoste Street and 65th. Slightly elevated concentrations of motor fuels were found alond Christy Street, boring # W9 and # ASE-F.

Concentrations of benzene in most cases were below the level of detection (0.001 ppm). A review of the benzene concentrations detected ranged from 0.002 ppm in ASE-B to 41.0 ppm in MWA. Benzene detected in MWA approaches the level of saturation (5.0 %) associated with contaminated water arising from motor fuels. Concentrations above the detection level except for MWA ranged from 0.002 ppm to 0.101 ppm and are well below the concentrations found to cause acute and chronic toxitity to fresh water fish and impact recreation use. These concentrations would be considered within accectable levels in the site area.

Toluene was detected at concentrations of 0.002 ppm to 0.077 ppm. In general, concentrations were below the level of detection of 0.001 ppm. Toluene concentrations above the level found to be acute to fresh water fish (0.020 ppm) are found in boring # 20 (0.029 ppm), # 16 (0.077 ppm), # 2.5 (0.025 ppm).
Xylene was detected at concentrations ranging from 0.002 ppm to 5.1 ppm. As with benzene and toulene, most groundwater concentrations were below the level of detection (0.001 ppm). Boring # 2.5 and MWA had detectable levles above 1.0 ppm, at 2.5 ppm and 5.1 ppm respectively.

Xylene concentrations above 0.050 ppm were detected in boring # 27 (0.058 ppm), # 1.5 (0.215 ppm), and # 8.5 (0.092 ppm). With the exception of MWA, xylene concentrations are below levels found to be acutely toxic to fresh water fish (3.8 ppm).

OTHER GROUNDWATER CONTAMINATES:

Samples were collected by Earth Metrics in July, 1986. Laboratory results, received by ASE August 11, 1986 indicate constituents detected in groundwater that are of concern. Most noteworthy is the presence of pesticides, particurally DDT, DDD, and DDE, and the organochlorine PCB. An summary of selected organic compounds detected in groundwater is shown in Figure 1.

The highest concentrations of volatile organics were found in MWA, immediately downgradient form Tank Pit 1. At this location, PCB was detected at 7.2 ppm, slighlty higher than the soluble threshold limit concentration (STLC) of 5.0 ppm. The sum of the concentrations for the pesticide DDE+DDD+DDT found in MWA (1.1 ppm), MWB (0.97 ppm), and W9 (1.58 ppm) exceed the STLC of 0.10 ppm.

Selected soil samples collected by Earth Metrics were analyzed for

organic compounds and CAM metals. Review of the data suggests that lead concentrations found in the soil are irradic do not correlate well with where lead contaminants were found in groundwater. Soils with detected levels of DDT and hydrocarbons were found in two areas: (1) near the former fuel tank pit, and (2) to the intersectin of Christy and 64th, in the direction of groundwater flow.

The acid/base organics napthalene, phenanthrene, pyrene, benzo-a-anthracene, and the CAM metal lead were found the monitoring well close the the former fuel tank pit (MWA). Of the acid/base organics only pyrene was detected in MWB in addition to lead. Lead and arsenic were found in W9, along Christy Street in addition to the acid/base organics benzo-anthracene, phalate, fluorene, napthalene, phenanthrene, pyrene, benzo-pyrene, benzo-fluoranthene, chrysene, and indeno-pyrene.

TABLE 1.

Groundwater Elevation Over a Six Day Period

Well No.	Groundwater Elevation (feet MSL)					
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
MWD	6.25	6.25	6.25	6.25	6.25	6.28
MWC	6.67	6.71	6.75	6.59	6.59	6.70
MWA	7.97	8.04	8.03	8.02	8.08	8.13

TABLE 2.

Results of groundwater samples - Bay Center

Sample No.	Total Hydrocarbons as Motor Fuels (ppm)	Benzene (ppm)	Toluene (ppm)	Xylene (ppm)
1.5	1.5	0.011	0.011	0.215
2.5	20.0	0.007	0.025	2.120
3.5	<0.05	<0.002	<0.008	<0.005
4.0	<0.05	<0.001	<0.003	<0.012
5.0	<0.05	<0.001	<0.001	<0.001
5.5	<0.05	<0.001	<0.001	<0.001
6.0	<0.05	<0.001	<0.001	<0.001
7.0	<0.05	<0.001	<0.001	<0.001
7.5	0.17	<0.001	<0.001	<0.001
8.5	<0.05	0.033	<0.001	0.092
14.5	<0.05	0.003	<0.001	0.019
15.5	<0.05	<0.001	<0.001	<0.001
16.0	8.6	<0.001	0.077	5.1
17.0	<0.05	<0.001	<0.001	<0.001
18.0	<0.05	<0.001	<0.001	<0.001
20.0	<0.05	<0.001	0.029	0.044
21.5	59.0	0.009	0.011	0.030
22.0	7.9	<0.001	0.008	0.009
23.0	3.3	<0.001	<0.001	<0.001
25.0	<0.05	<0.001	0.004	<0.001
26.5	<0.05	<0.001	<0.001	<0.001
27.0	0.54	<0.001	0.014	0.058
30.0	10.2	<0.001	<0.001	<0.001
"A"	<0.05	<0.001	<0.001	<0.001
Pad B	<0.05	<0.001	<0.001	<0.001
65th - Lacoste	1.5	0.005	0.019	0.013
ASE-A	0.39	0.017	0.011	0.037
ASE-B	0.15	0.002	0.006	0.007
ASE-C	0.11	<0.001	0.004	0.005
ASE-D	<0.05	<0.001	0.003	0.003
ASE-E	<0.05	<0.001	<0.001	<0.001
ASE-F	2.1	0.057	0.002	0.002
ASE-G	3.1	0.052	0.003	0.003
ASE-H	<0.05	<0.001	<0.001	<0.001
ASE-J	<0.05	<0.001	<0.001	<0.001
ASE-K	7.4	<0.001	<0.001	<0.001
ASE-L	<0.05	<0.001	<0.001	<0.001

TABLE 3

Other Groundwater Contaminantes

	WATER SAMPLES (MG/L) MWA-WS	MWB-WS	W9
Pesticides			
α - BHC	4.4	4.6	0.19
β - BHC		0.12	ND
γ - BHC	0.27	0.048	ND
δ - BHC		0.25	ND
* DDE (0.10 STLC, 1.0 TTLC)	0.29	0.31	0.75
* DDD (0.10 STLC, 1.0 TTLC)	0.33	0.51	0.42
* DDT (0.10 STLC, 1.0 TTLC)	0.48	0.15	0.41
Other Organochlorines			
* PCB-1206 (5.0 STLC, 50 TTLC)	7.2	ND	ND
Volatile Organics			
Benzene	41,000	ND	9
Ethyl benzene	4,200	ND	ND
Toluene	22,000	ND	ND
Acid/Base Neutrals			
Benzo-a-anthracene	63	ND	10
Benzyl-butyl-phthalate	80	ND	ND
Bi-3,2-ethyl-hexyl-phthalate	ND	ND	34
Di-ethyl-phthalate	ND	ND	ND
Di-n-butyl-phthalate	ND	ND	ND
Fluoranthene	6	ND	25
Fluorene	33	ND	ND
Napthalene	1,100	ND	12
Phenanthrene (C14H10)	83	ND	22
Pyrene (C16H10)	8	13	28
Benzo-a-pyrene	ND	ND	15
Benzo-b-fluoranthene	ND	ND	10
Benzo-k-fluoranthene	ND	ND	10
Chrysene (C18H12) (Benzo-a-phenanthrene	ND	ND	14
Indeno-1,2,3-cd-pyrene	ND	ND	15
Aliphatic hydrocarbons C15-C35	ND	ND	ND

APPENDIX A

LABORATORY RESULTS OF GROUNDWATER SAMPLES FOR BAY CENTER

WESCO Laboratories

RECEIVED
AUG 13 1986
AQUA SCIENCE ENG.

Date: August 11, 1986
Client: AquaScience
Submitted by: D. Schulz
Report to: AquaScience
WESCO Job #: AQS 8672

Client Job/P.O. #: Bay Center/3363
Date collected: 8-4-86
Date submitted: 8-4-86
& type of sample(s): 11 Waters

Lab No.	Client ID	Motor Fuels (mg/l)	Benzene (mg/l)	Toluene (mg/l)	Xylene (mg/l)	Type Fuel
4986	Boring #ASE-A	0.39	0.017	0.011	0.037	Aged Gas
4987	Boring #ASE-B	0.15	0.002	0.006	0.007	"
4988	Boring #ASE-C	0.11	<0.001	0.004	0.005	"
4989	Boring #ASE-D	< 0.05	<0.001	0.003	0.003	Gasoline
4990	Boring #ASE-E	< 0.05	<0.001	<0.001	<0.001	"
4991	Boring #ASE-F	2.1	0.057	0.002	0.002	Aged Gas
4992	Boring #ASE-F	2.1	0.079	0.007	0.007	"
4993**	Boring #ASE-G	4.0	0.004	0.003	0.003	Diesel
4994**	Boring #ASE-G	2.3	0.101	0.002	0.003	"
4995	Boring #ASE-H	< 0.05	<0.001	<0.001	<0.001	Gasoline
4996	Boring #ASE-H	< 0.05	<0.001	<0.001	<0.001	"
4997	Boring #ASE-J	< 0.05	<0.001	<0.001	<0.001	"
4998	Boring #ASE-J	< 0.05	<0.001	<0.001	<0.001	"
4999**	Boring #ASE-K	7.3	<0.001	<0.001	<0.001	Diesel
5000**	Boring #ASE-K	7.5	<0.001	<0.001	<0.001	"
5001*	Boring #ASE-L	< 0.05	<0.001	<0.001	<0.001	Gasoline
5002*	Boring #ASE-L	< 0.05	<0.001	<0.001	<0.001	"
	METHODS: Note 1					

NOTES:

Note 1 - EPA Methods 5020/8015/8020.
* Unidentified volatile organic compound present.
** Oily substance present on sample surface.

M. L Will
Analytical Supervisor

14 Gail Drive Suite A
Novato, California 94947 415 883-8425

WESCO Laboratories

Date: August 7, 1986

Client: AquaScience

Submitted by: Prull

Report to: AquaScience

WESCO Job #: AQS 8671

RECEIVED
AUG 15 1986
AQUA SCIENCE ENG.

Client Job/P.O. #: 3354

Date collected: 7-25-86

Date submitted: 8-1-86

& type of sample(s): 11 Water

Lab No.	Client ID	Motor Fuel (mg/l)	Benzene (mg/l)	Toluene (mg/l)	Xylene (mg/l)	Fuel Type
4949	Water 15-5	< 0.05	< 0.001	< 0.001	< 0.001	Gasoline
4950	Water 23	3.3	< 0.001	< 0.001	0.004	Aged Gas
4951	Water Pad B	< 0.05	< 0.001	< 0.001	< 0.001	Gasoline
4952	Water 7.5	0.17	< 0.001	< 0.001	< 0.001	Aged Gas
4953	Water 25	< 0.05	< 0.001	< 0.001	< 0.001	Gasoline
4954	Water 3.5	< 0.05	0.002	0.008	0.005	Gasoline
4955	Water ASE-E	< 0.05	< 0.001	< 0.001	< 0.001	Gasoline
4956	Water ASE-B	0.6	< 0.001	< 0.001	< 0.001	Aged Gas
4957	Water ASE-A2	0.36	0.036	< 0.001	0.013	Aged Gas
4958	Water ASE-C	< 0.05	< 0.001	< 0.001	< 0.001	Gasoline
4959	Water ASE-D	< 0.05	< 0.001	< 0.001	< 0.001	Gasoline
	METHOD: Note 1					

NOTES:

Note 1 - EPA Method 5020/8015/8020.

Analytical Supervisor

34 Galli Drive, Suite A
Novato California 94947 415 883-6425

WESCO Laboratories

Date: July 29, 1986

Client: AquaScience

Submitted by: Terry Carter

Report to: AquaScience

WESCO Job #: AQS 8669

RECEIVED
AUG 01 1986
AQUA SCIENCE ENG.

Client Job/P.O. #: 3549 Bay Center

Date collected: 7-25-86

Date submitted: 7-25-86

& type of sample(s): 6 Gas

Lab No.	Client ID	Motor Fuel (g/m3)	Benzene (g/m3)	Toluene (g/m3)	Xylene (g/m3)	Fuel Type	Methane (g/m3)
4889	Gas ASE #21.5	< 0.02	< 0.001	< 0.001	< 0.001	Gasoline	1.13
4890	Gas ASE #22	< 0.02	< 0.001	< 0.001	< 0.001	"	1.53
4891	Gas ASE #25	< 0.02	< 0.001	< 0.001	< 0.001	"	1.53
4892	Gas ASE #26.5	< 0.02	< 0.001	< 0.001	< 0.001	"	3.6
4893	Gas ASE #45A	< 0.02	< 0.001	< 0.001	< 0.001	"	0.81
4894	Gas PAD B	0.24	< 0.001	< 0.001	0.006	Aged Gas	15.0

Lab No.	Client ID	Methane (ppm)
4889	Gas ASE #21.5	1570
4890	Gas ASE #22	2130
4891	Gas ASE #25	2130
4892	Gas ASE #26.5	5000
4893	Gas ASE #45A	1100
4894	Gas PAD B	20900
	METHOD: Note 1	

NOTES:

Note 1 - Direct injection GC-FID/PID.

Analytical Supervisor

14 Galli Drive, Suite A
Novato, California 94947 415 883-6435
A Division of Western Ecological Services Company

WESCO Laboratories

RECEIVED
JUL. 30 1986
AQUA SCIENCE ENG.

Date: July 28, 1986

Client: AquaScience

Submitted by: Terry Carter

Report to: AquaScience

WESCO Job #: AQS 8666

Client Job/P.O. #: 3544 Bay Center

Date collected: 7-22-86

Date submitted: 7-23-86

& type of sample(s): 11 Air
8 Water

Lab No.	Client ID	Motor Fuels (mg/l)	Benzene (mg/l)	Toluene (mg/l)	Xylene (mg/l)	Fuel Type	
4865	Bay Center #16	8.6	< 0.001	0.077	5.1	Aged Gas	
4866**	Bay Center #25	< 10	< 0.001	0.004	< 0.001	Diesel	
4867	Bay Center #22	7.9	< 0.001	0.008	0.009	Diesel	
4868	Bay Center #20	< 0.05	< 0.001	0.029	0.044	Gasoline	
4869	Bay Center #21.5	59	0.009	0.011	0.030	Diesel*	
4870	Bay Center #27	0.54	< 0.001	0.014	0.058	Aged Gas	
4871	Bay Center #26.5	< 0.05	< 0.001	< 0.001	< 0.001	Gasoline	
4872	Bay Center #1.5	1.5	0.011	0.011	0.215	Diesel	

Lab No.	Client ID	Motor Fuels (g/m3)	Benzene (g/m3)	Toluene (g/m3)	Xylene (g/m3)	Fuel Type	Methane (g/m3)
4873	Bay Center #7	< 0.02	< 0.001	< 0.001	< 0.001	Gasoline	1.6
4874	Bay Center #20	< 0.02	< 0.001	< 0.001	< 0.001	Gasoline	1.86
4875	Bay Center (Pad "C" Corner)	0.75	< 0.001	0.002	0.047	Aged Gas	0.63
4876	Bay Center #1.5	< 0.02	< 0.001	< 0.001	< 0.001	Gasoline	8.8
4877	Bay Center (Pad "A")	< 0.02	< 0.001	< 0.001	< 0.001	Gasoline	4.14
4878	Bay Center #16	0.42	< 0.001	0.005	0.456+	Aged Gas	58.7
4879	Bay Center #6	< 0.02	< 0.001	< 0.001	< 0.001	Gasoline	0.8
4880	Bay Center #4.5	< 0.02	< 0.001	< 0.001	< 0.001	Gasoline	0.05
4881	Bay Center #30	< 0.02	< 0.001	< 0.001	< 0.001	Gasoline	0.65
4882	Bay Center #18	< 0.02	< 0.001	< 0.001	< 0.001	Gasoline	8.0
4883	Bay Center #17	< 0.02	< 0.001	< 0.001	< 0.001	Gasoline	0.54

Lab No.	Client ID	Methane (ppm)
4873	Bay Center #7	2200
4874	Bay Center #20	2600
4875	Bay Center (Pad "C" Corner)	870
4876	Bay Center #1.5	12300
4877	Bay Center (Pad "A")	5800
4878	Bay Center #16	81800
4879	Bay Center #6	1100
4880	Bay Center #4.5	70
4881	Bay Center #30	900
4882	Bay Center #18	11200
4883	Bay Center #17	800
	METHOD: Note 1	

NOTE 1 - EPA Methods 5020/8015/8020.
* Closest available matching standard is diesel fuel.
** Sample contained oily surface sheen.
+ Discrepancy resulting from use of different analytical methods.

Analytical Supervisor

14 Galli Drive, Suite A
Novato, California 94947 415 883-6423

WESCO Laboratories

Date: July 23, 1986

Client: AquaScience

Submitted by: Dave Schultz

Report to: AquaScience

WESCO Job #: AQS 8663

Client Job/P.O. #: 3533
Bay Center

Date collected: 7-18-86

Date submitted: 7-18-86

& type of sample(s): 7 Water

Lab No.	Client ID	Motor Fuel (mg/l)	Benzene (mg/l)	Toluene (mg/l)	Xylene (mg/l)	Fuel Type
	Bay Center,					Aged
4838	65 & La Costa	1.5	0.005	0.019	0.013	Gasoline
4839	Bay Center #2.5	20	0.007	0.025	2.12	"
4840	Bay Center #4	< 0.05	< 0.001	0.003	0.012	"
4841	Bay Center #5	< 0.05	< 0.001	< 0.001	< 0.001	"
4842	Bay Center #8.5	< 0.05	0.033	< 0.001	0.092	"
4843	Bay Center #14.5	< 0.05	0.003	< 0.001	0.019	"
4844	Bay Center "A"	< 0.05	< 0.001	< 0.001	< 0.001	"
	METHODS: Note 1					

RECEIVED
JUL 28 1986
AQUA SCIENCE ENG.

NOTES:

Note 1 - EPA Method 5020/8015/8020.

Analytical Supervisor

14 Gale Drive, Suite A
Novato, California 94947 415 883-6425

WESCO Laboratories

Date: July 23, 1986

Client: AquaScience

Submitted by: Dave Schultz

Report to: AquaScience

WESCO Job #: AQS 8665

Client Job/P.O. #: 3541
Bay Center

Date collected: 7-18-86

Date submitted: 7-21-86

& type of sample(s): 6 Water

Lab No.	Client ID	Motor Fuel (mg/l)	Benzene (mg/l)	Toluene (mg/l)	Xylene (mg/l)	Fuel Type
4859	Waters #17	< 0.05	< 0.001	< 0.001	< 0.001	Gasoline
4860	Waters #18	< 0.05	< 0.001	< 0.001	< 0.001	"
4861	Waters #5.5	< 0.05	< 0.001	< 0.001	< 0.001	"
4862	Waters #6	< 0.05	< 0.001	< 0.001	< 0.001	"
4863	Waters #7	< 0.05	< 0.001	< 0.001	< 0.001	"
4864	Waters #30	10.2	< 0.001	< 0.001	< 0.001	Diesel*

RECEIVED
JUL 28 1986
AQUA SCIENCE ENG.

METHODS: Note 1

NOTES:

Note 1 - EPA Methods 5020/8015/8020.
*Closest available match for this compound is diesel fuel.

Analytical Supervisor

3 Gall Drive, Suite A
Novato, California 94947 415 883-6425

SEQUOIA Analytical Laboratory
2549 Middlefield Road
Redwood City, CA 94063 • (415) 364-9222

Groundwater Technology Laboratory
4080 Pikelane, Suite D
Concord, CA 94520
Attn: Joyce Miley

Date Sampled: 12/19/86
Date Received: 12/22/86
Date Extracted: 12/30/86
Date Reported: 01/08/87
Project #20-8200

Sample Number

6121508

Sample Description
Bay Center - Emeryville,
MWE, New Well, Water Sample

PRIORITY POLLUTANTS

VOLATILE ORGANIC COMPOUNDS
results in ppb

Acrolein	<100	trans-1,2-Dichloroethene	< 0.5
Acrylonitrile	<100	1,2-Dichloropropane	< 0.5
Benzene	4400	1,3-Dichloropropene	< 0.5
Bromomethane	< 0.5	Ethylbenzene	1700
Bromodichloromethane	< 0.5	Methylene chloride	< 0.5
Bromoform	< 0.5	1,1,2,2-Tetrachloroethane	< 0.5
Carbon tetrachloride	< 0.5	Tetrachloroethene	< 0.5
Chlorobenzene	< 0.5	1,1,1-Trichloroethane	< 0.5
Chloroethane	< 0.5	1,1,2-Trichloroethane	< 0.5
2-Chloroethylvinyl ether	< 0.5	Trichloroethene	< 0.5
Chloroform	< 0.5	Toluene	6600
Chloromethane	< 0.5	Vinyl chloride	< 0.5
Dibromochloromethane	< 0.5	1,2-Dichlorobenzene	< 0.5
1,1-Dichloroethane	< 0.5	1,3-Dichlorobenzene	< 0.5
1,2-Dichloroethane	< 0.5	1,4-Dichlorobenzene	< 0.5
1,1-Dichloroethene	< 0.2		

SEQUOIA ANALYTICAL LABORATORY

Arthur G. Burton
Laboratory Director

sls

NOTE: Method 624 of the EPA was used for this analysis.