

**FOURTH QUARTER 2008  
GROUNDWATER MONITORING AND  
PRODUCT EXTRACTION REPORT AND  
ANNUAL SUMMARY**

**EMERYBAY CONDO PHASE I PARKING GARAGE  
6400 CHRISTIE AVENUE  
EMERYVILLE, CALIFORNIA**

*Prepared for:*

**BAY CENTER INVESTOR LLC  
6475 CHRISTIE AVENUE, SUITE 550  
EMERYVILLE, CA 94608**

**January 2009**

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*Prepared for:*

**BAY CENTER INVESTOR LLC  
6475 CHRISTIE AVENUE, SUITE 550  
EMERYVILLE, CA 94608**

*Prepared by:*

**STELLAR ENVIRONMENTAL SOLUTIONS, INC.  
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BERKELEY, CALIFORNIA 94710**

**January 16, 2009**

Project No. 2007-65

January 16, 2009

Ms. Sarah Irving  
Bay Center Investor, LLC  
6475 Christie Avenue, Suite 550  
Emeryville, CA 94608

Subject: Fourth Quarter 2008 Groundwater Monitoring and Product Extraction Report and  
Annual Summary - EmeryBay Phase I Condo Parking Garage  
6400 Christie Avenue, Emeryville, CA

Dear Ms. Irving:

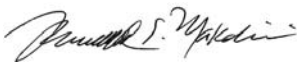
Enclosed is the Stellar Environmental Solutions, Inc. report summarizing the site activities conducted between October 2008 and December 2008 (specifically, 2 product extraction events and the Fourth Quarter 2008 groundwater-monitoring event). This project is being conducted for Bay Center Investor, LLC, c/o Harvest Properties (property owner), and follows previous sampling events—conducted by Groundwater Technology, Inc. in 1988, 1989, and 1991; by PES Environmental, Inc. in 2004 and 2006; and by SES in 2007 and 2008.

There is currently no directive from the regulatory agency, Alameda County Department of Environmental Health (ACEH), regarding the frequency of groundwater sampling. However, a new case officer, Barbara Jakub, was assigned to the site and is reviewing the historical information.

This report summarizes the ninth sampling event conducted at the site since 1988. In accordance with regulatory requirements, an electronic copy of this report has been uploaded to ACEH and to the State Water Resources Control Board's GeoTracker system.

I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report are true and correct to the best of my knowledge. If you have any questions regarding this report, please contact us at (510) 644-3123.

Sincerely,



Richard S. Makdisi, R.G., R.E.A.  
Principal



Teal Glass, R.E.A.  
Project Manager



cc: Ms. Barbara Jakub, Alameda County Department of Environmental Health

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## **1.0 INTRODUCTION**

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### **PROJECT BACKGROUND**

The subject property, located at 6400 Christie Avenue in Emeryville, California, is owned by Bay Center Investor, LLC, for which Stellar Environmental Solutions, Inc. (SES) provides environmental consulting services. The site has undergone fuel tank-related investigations and remediation since 1988 (by SES since 2007). All known environmental documents for the subject property are listed in the References and Bibliography section (Section 7.0) of this report. Previous remediation and investigation activities are outlined in the final subsection of this chapter.

### **SITE AND VICINITY DESCRIPTION**

The project site is located at 6400 Christie Avenue in Emeryville, California (see Figure 1). The project site, which slopes to the south, is wholly developed with an open ground-floor parking area and apartment complex known as the Emery Bay Phase I Condos and parking garage. The area of monitoring and product extraction is primarily located in the northeastern portion of the parking garage. Figure 2 is a site plan. The site is bordered to the east by the Emery Bay Phase II Condos and parking garage, to the north by 65<sup>th</sup> Avenue, beyond Christie Avenue and to the west by the Bay Center Offices, and to the south by 64<sup>th</sup> Avenue. The surrounding area is developed with apartment complexes, offices, and commercial stores.

### **PREVIOUS INVESTIGATIONS**

Historical groundwater well analytical results are presented in Appendix A, and are discussed in detail in Section 5.0 of this report.

The subject property parcel was developed as early as 1958 with the Garrett Motor Freight Station, associated with Delta Lines, Inc. The Delta Lines complex contained an “Oil and Gas” building, located at the site of the present-day Emery Bay Phase I Condo complex and parking garage. The building remained on the property until 1986, when it was demolished to build the present-day structures. Twelve underground fuel storage tanks (UFSTs) containing diesel and gasoline were removed from the Emery Bay Phase I and Phase II Condo complex parcels in 1987, at which time soil and groundwater contamination was discovered.



Image courtesy of the U.S. Geological Survey

**SITE LOCATION ON AERIAL PHOTO**

**6400 Christie Ave.  
Emeryville, CA**

By: MJC

JANUARY 2008

**Figure 1**



2007-565-01



The subsurface contamination originated from the trucking terminal that was operated by the Garrett Freight Line and Delta Lines, and existed at the site of the Bay Center Apartments before its development in the late 1980s. Site investigations identified a total of 12 UFSTs in three areas of the trucking terminal. These UFST areas were referred to as: 1) Tank Pits A and B (each containing one 10,000-gallon diesel tank); 2) Tank Pit TC-1 (four 12,000-gallon diesel tanks, two 10,000-gallon diesel tanks, and one 6,000-gallon gasoline tank); and 3) Tank Pit WO-1 and WO-2 (one 6,000-gallon tank, one 4,000-gallon tank, and one 1,000-gallon tank). Nine UFSTs were located beneath the current footprint of the Emery Bay Phase I Condo complex, while three were beneath the Emery Bay Phase II Condo complex. Figure 2 shows the historical locations where the tanks were removed.

To address the contamination in the garage area of the Emery Bay Phase I Condo complex, a light non-aqueous phase liquid (LNAPL) groundwater pump-and-treat system was installed by Groundwater Technology, Inc. (GTI) in 1989. The system extracted approximately 1 million gallons of groundwater, yielding approximately 100 gallons of LNAPL from recovery well RW-1 from July 1990 to March 1991. Three monitoring wells had previously been installed in 1985. GTI installed (and repaired) several more monitoring wells between 1987 and 1990, for a total of seven monitoring wells and one extraction well by 1990. The system and groundwater monitoring wells were designed and monitored as a condition of discharge permits granted by the East Bay Municipal Utility District (EBMUD) and the Bay Area Air Quality Management District (BAAQMD). The first groundwater monitoring event for MW-1 through MW-6 occurred in December 1988. The second monitoring event, which also included MW-E and RW-1, was conducted in March 1989. Subsequently, the groundwater extraction system operated by GTI was closed in late 1990 when corrosion and other mechanical problems caused the system to fail. Recovery of LNAPL continued manually on RW-1 until 1991, and a third groundwater sampling event occurred in February 1991. In 1994, the GTI recovery system was abandoned. Appendix A contains the historical analytical results. Figure 3 shows the locations of the monitoring wells and trenches.

No groundwater monitoring events had occurred at the site between 1991 and 2004, when PES was retained to evaluate and implement remediation of the residual contamination at the TC-1 (former location of seven UFSTs) Emery Bay Phase I Condo complex area. (Note: Harding Lawson Associates conducted soil and groundwater sampling on the Phase II Apartment complex area during this time, but not for the purpose of product extraction or remediation.) In 2004, PES installed an additional 10 groundwater monitoring wells (monitoring wells MW-1 and MW-2 were either abandoned or paved over with asphalt during construction), bringing the current total to 17 monitoring wells and 1 extraction well in the Phase I parking garage area. The first groundwater monitoring event for the current wells was conducted in March 2004, and the second event was conducted in December 2006.



A previous SES report (SES, 2007) fully discusses previous site remediation and investigations, site geology and hydrogeology, and residual site contamination. Tabular summaries of historical groundwater well water elevations and analytical results are included in Appendix A.

## **OBJECTIVES AND SCOPE OF WORK**

This report discusses the following activities conducted/coordinated by SES in the current annual monitoring period:

- Collecting water levels in site wells to determine groundwater flow direction
- Sampling site wells for contaminant analysis
- Evaluating hydrochemical and groundwater elevation trends in the context of plume stability and case closure assessment
- LNAPL passive product extraction from Trenches A and C, and active product extraction on the groundwater monitoring wells, trench sump wells, and recovery well RW-1

## **REGULATORY OVERSIGHT**

The original groundwater extraction system installed at the Emery Bay Phase I Condo parking garage removed contaminated groundwater, treated it through a two-phase carbon filtration unit, and then discharged the treated water to the municipal storm sewer system. The original regulatory agencies overseeing the site were the BAAQMD and EBMUD. Sampling of the monitoring wells for groundwater treatment system discharge was required per the EBMUD permit guideline (account #500-54011) and the BAAQMD air discharge guideline (No. 32325). However, after the treatment system failed in 1991, the permits were no longer required; thus, little to no regulatory oversight of the hydrocarbon plume occurred between 1991 and 2004.

Currently, the Alameda County Department of Environmental Health (ACEH) is the Local Oversight Program (LOP) agency providing oversight of Leaking Underground Storage Tank (LUST) sites in the city of Emeryville. SES met with the previous case officer Barney Chan (who was then transferred to another section of ACEH) to discuss remedial activities and steps toward site closure (Chan, 2007). Mr. Chan indicated that, while a more vigorous approach to monitoring and remediation was desired, he never had access to historical investigations at the site; no previous site documentation had been provided to ACEH or uploaded to the State Water Resources Control Board's (State Water Board's) GeoTracker website (as required since 2004). A subsequent letter from ACEH to the previous owner and consultant (PES) requested the uploading of historical documents and GeoTracker-compliant monitoring well survey data.

SES has since uploaded all historical documents to the ACEH ftp website and the State Water Board GeoTracker website. Historically, the site was included in the Garret Freight Lines Spills, Leaks, Investigations, and Cleanups (SLIC) site under the Regional Water Quality Control Board (Water Board) global ID SLT2O05561 and ACEH case number RO0002799. Therefore, all site documents were uploaded under these ID numbers. However, this site encompasses adjacent properties, such as the Bay Center Offices and a recently developed apartment complex south of 64<sup>th</sup> Street. In addition, the SLIC listing is based on metals contamination discovered in soils on the Bay Center site, and does not reflect the leaking UFST remediation currently underway at the Emery Bay Phase I Condos. There is also a GeoTracker LUST listing for the Emery Bay Marketplace at 64<sup>th</sup> and Christie; however, this listing is most likely associated with the Emeryville Market located south of 64<sup>th</sup> Avenue.

This SES report follows previous groundwater sampling events conducted by GTI in 1988, 1989, and 1991; two groundwater monitoring events conducted by PES in 2004 and 2006; and work by SES in 2007 and 2008.

SES met with the new ACEH case officer, Barbara Jakub, on November 20, 2008. During the meeting, several options for moving the site towards “no further action” were discussed. As a result, SES submitted a letter to ACEH on November 24, 2008 requesting that the sampling frequency and active product removal events be changed from quarterly to semi-annual. SES also noted our intent to complete a preferential pathway study and indoor air investigation during the 2009-2010 calendar year.

Electronic data format (EDF) files will be successfully uploaded to the GeoTracker database, in accordance with the State Water Board’s requirements for EDF submittals.

## **2.0 PHYSICAL SETTING**

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The following evaluation of the physical setting of the site—including topography, drainage, and geologic and hydrogeologic conditions—is based on previous (1986 through 2006) site investigations conducted by others, and site inspections and subsurface data collection by SES in 2007 and 2008.

### **TOPOGRAPHY AND DRAINAGE**

The mean elevation of the property is about 13 feet above mean sea level, and the general topographic gradient in the vicinity of the property is to the southwest, although the regional gradient is to the west-southwest.

The nearest receiving water body is San Francisco Bay, located approximately 700 feet to the west of the subject property. East of the site lies the Oakland Hills, which rise to an elevation of approximately 1,000 feet and are situated 2.5 miles east of the subject property. The subject property is not listed within a 100- or 500-year flood zone.

Storm drains from the roof collect storm runoff for discharge onto the asphalt-paved parking lots. Storm sewers collect drainage from the parking lot, as well as from Christie, 64<sup>th</sup>, and 65<sup>th</sup> Streets, which discharges into San Francisco Bay. SES noted several storm drains, in the parking lot area and on the surrounding streets.

### **GEOLOGY**

The subject property area is underlain with material mapped “Qhbm,” designated early pleistocene alluvium that is moderately consolidated, deeply weathered, poorly sorted, irregularly interbedded clay, silt, sand, and gravel. A geotechnical survey conducted in 1985 revealed that the upper 15 to 20 feet of soil consisted of a combination of fill and soft bay sediment. The upper 1 to 2½ feet of soil was generally pavement and imported fill. This is underlain by approximately 20 feet of firm soil consisting of primarily dense silty sand with intermittent layers of silty and sandy clay. Stiff to very stiff clay was encountered below a depth of approximately 40 feet and extended to the depth of the borings, approximately 101.5 feet (Geomatrix, 1988). The closest major fault, the Hayward Fault, is located about 3 miles east of the property. While the site is located in a seismically active area, it is not within an Alquist-Priolo Special Studies active fault zone, the legislatively defined

zone of restricted land use 200 feet around an active fault due to the high probability of ground rupture.

## **GROUNDWATER HYDROLOGY**

Regulatory agency records indicate that the direction of shallow groundwater flow in the site vicinity is to the west-northwest, toward San Francisco Bay. Water levels in this area are influenced by tidal patterns. According to current and historical water level data obtained from onsite monitoring wells, the depth to groundwater ranges from approximately 6 to 11 feet below ground surface (bgs). Groundwater elevations during this event ranged from 6.97 to 9.91 feet above mean sea level. For the 2008 year, the average groundwater gradient, and the gradient for the latest December 2008 monitoring event, was 0.001 foot/foot.

Figure 4 is a groundwater elevation map from the recent groundwater monitoring event (activities discussed in Section 4.0).



### **3.0 DECEMBER 2008 GROUNDWATER MONITORING AND SAMPLING ACTIVITIES**

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This section presents the groundwater sampling and analytical methods for the most recent event. Table 1 summarizes monitoring well construction and groundwater monitoring data. Groundwater analytical results are summarized in Section 4.0.

#### **SAMPLING METHODS AND ACTIVITIES**

Activities for this event include:

- Measuring static water levels in all 18 wells
- Collecting post-purge groundwater samples from the 18 wells for laboratory analysis of the following contaminants:
  - benzene, toluene, ethyl benzene, and xylenes (BTEX)
  - methyl tertiary-butyl ether (MTBE)
  - total petroleum hydrocarbons as gasoline (TPHg)
  - total petroleum hydrocarbons as diesel (TPHd)

The site monitoring well sampling locations are shown on Figure 3. Well construction information and water level data are summarized in Table 1. Appendix B contains the groundwater monitoring field records.

#### **CURRENT MONITORING EVENT**

Groundwater monitoring well water level measurements, purging, sampling, and field analyses were conducted on December 29 and 30, 2008 by Blaine Tech Services under the supervision of SES personnel. Groundwater sampling was conducted in accordance with State of California guidelines for sampling dissolved analytes in groundwater associated with leaking UFSTs. As the first task of the monitoring event, static water levels and free product levels were measured in the 18 wells using an electric water level indicator. The depth of free product was recorded, and the water level was adjusted to reflect the groundwater elevation.

**Table 1**  
**Groundwater Monitoring Well Construction and Groundwater Elevation Data**  
**6400 Christie Avenue, Emeryville, California**

Well	Well Depth (feet bgs)	Screened Interval	Top of Well Casing Elevation <sup>(a)</sup>	Depth to Free Product (TOC)	Thickness of Free Product (feet)	Groundwater Elevation (December 29, 2008)
MW-3	25	5 to 20	16.65	7.49	0.87	8.29
MW-4	25	5 to 20	16.29	NA	NA	8.87
MW-5	25	5 to 20	16.72	NA	NA	6.97
MW-6	25	5 to 20	16.82	NA	NA	9.91
MW-7	20	5 to 20	17.73	NA	NA	7.13
MW-8	16	5 to 16	17.84	8.89	0.69	8.26
MW-9	20	5 to 20	17.84	NA	NA	8.01
MW-10	20	5 to 20	17.83	8.74	0.23	8.86
MW-11	20	5 to 20	17.76	NA	NA	7.42
MW-12	20	5 to 20	17.83	NA	NA	8.85
MW-13	20	5 to 20	17.66	9.65	0.89	7.12
MW-14	20	5 to 20	17.60	NA	NA	8.90
MW-15	20	5 to 20	17.80	8.36	0.83	8.61
MW-16	20	5 to 20	17.74	NA	NA	8.29
MW-17	20	5 to 20	18.17	9.11	0.14	8.92
MW-18	20	5 to 20	16.35	NA	NA	7.74
MW-E	47	7 to 40	17.47	NA	NA	7.15
RW-1	30	unknown	16.70	NM	NM	NM
TA-E	11-13	6-8 to 11-13	17.20	NM	NM	NM
TA-M	11-13	6-8 to 11-13	17.21	NM	NM	NM
TA-W	11-13	6-8 to 11-13	17.28	NM	NM	NM
TB-E	11-13	6-8 to 11-13	17.24	NM	NM	NM
TB-M	11-13	6-8 to 11-13	17.30	NM	NM	NM
TB-W	11-13	6-8 to 11-13	17.33	NM	NM	NM
TC-E	11-13	6-8 to 11-13	17.07	NM	NM	NM
TC-M	11-13	6-8 to 11-13	17.37	NM	NM	NM
TC-W	11-13	6-8 to 11-13	17.32	NM	NM	NM

Notes:

- (a) Relative to mean sea level.
- (b) Depth to groundwater could not be determined because free product density would not allow a clear delineation. Elevation is based on depth to free product.
- (c) The quantity of free product may be an overestimation due to the presence of tar.

bgs = below ground surface

TOC = below top of casing

NA = not applicable (no free product in well)

NM = depth to groundwater and/or free product could not be determined due to the presence of tar

MW-3 through MW-6 and MW-E are 2-inch PVC. MW-7 through MW-18 are ¾-inch PVC. RW-1 is 10-inch PVC.

Approximately 49 gallons of purge water and equipment decontamination rinse water from the current groundwater sampling event was containerized onsite in a labeled 55-gallon drum. All groundwater purged during active and passive product removals was containerized in a 1,100-gallon onsite aboveground storage tank (AST) and will be disposed of along with the purge water when these containers reach capacity.

## **4.0 REGULATORY CONSIDERATIONS, ANALYTICAL RESULTS AND DISCUSSION OF FINDINGS**

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This section presents analytical results of the most recent monitoring event, preceded by a summary of relevant regulatory considerations. Appendix C contains the certified analytical laboratory report and chain-of-custody record.

### **REGULATORY CONSIDERATIONS**

As specified in the East Bay Plain Groundwater beneficial Use Evaluation Report by the San Francisco Bay Region Water Quality Board (Water Board, 1999), all groundwater is considered a potential source of drinking water unless otherwise indicated by the Water Board, and is assumed to ultimately discharge to a surface water body and potentially impact aquatic organisms. The subject property is listed as occurring within Zone B, designated as groundwater that is unlikely to be used as drinking water resource. The basin is shallow in this area, with depths of less than 300 feet. Groundwater in this area is used for backyard irrigation, industrial supply, and commercial irrigation. There is a low likelihood that this water will be used as a public water supply in the near future.

The Water Board publishes ESLs for residential and commercial/industrial properties where groundwater is/is not a potential drinking water resource. As stipulated in the ESL document (Water Board, 2008), ESLs are not cleanup criteria; rather, they are conservative screening-level criteria designed to be protective of both drinking water resources and aquatic environments in general. The groundwater ESLs are composed of one or more components—including ceiling value, human toxicity, indoor air impacts, and aquatic life protection. Exceedance of ESLs suggests that additional remediation and/or investigation may be warranted, such as monitoring plume stability to demonstrate no risk to sensitive receptors in the case of sites where drinking water is not threatened.

Because the subject property is a residential property where groundwater is not a potential drinking water resource (as stipulated above), the contaminant levels at the site will be compared to the ESLs for these criteria.

Contaminants detected above the ESLs during this sampling event include gasoline, diesel, benzene, toluene, ethylbenzene, and total xylenes. In general, concentrations of gasoline have decreased in the majority of the wells from the last sampling event; however, concentrations of diesel have remained the same overall, with concentrations increasing in some wells and decreasing in others.

## GROUNDWATER SAMPLE RESULTS

Table 2 and Figure 5 summarize the contaminant analytical results of the current monitoring event samples.

### Hydrocarbon Contaminants

Hydrocarbon concentrations in numerous wells have reported concentrations significantly in excess of the Water Board Environmental Screening Level (ESL) in this fourth consecutive quarterly sampling event.

Gasoline was detected in MW-3, MW-7, MW-8, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-17, MW-E, and RW-1 above the ESL where groundwater is not a drinking water resource (210 micrograms per liter [ $\mu\text{g/L}$ ]). Gasoline was also detected in MW-9 and MW-16, but at concentrations below the ESL. The highest concentration (2,700,000  $\mu\text{g/L}$ ) was observed in MW-13. This is a new historic maximum concentration for this well. Overall, gasoline concentrations remained relatively the same as the last quarter, with the source area wells exhibiting increases and downgradient wells remaining the same or decreasing. The same is true with the Q4 2008 concentrations as compared to the Q4 2007 concentrations; the source-area well concentrations demonstrated an increase while downgradient and crossgradient well concentrations remained the same or decreased.

Figure 6 shows an isoconcentration contour map of TPHg concentrations in groundwater based on the December 2008 monitoring well analytical results. As stated above, increases as compared to the Q3 2008 monitoring event were observed in source area wells MW-7, MW-10, MW-12, MW-13, MW-15, MW-17, and RW-1; decreases were observed in downgradient and cross-gradient wells MW-3, MW-8, MW-9, MW-11, MW-14, MW-16, and MW-E; and concentrations in perimeter wells MW-4, MW-5, MW-6, and MW-18 remained the same. The same is true when comparing the concentrations to the December 2007 sampling event, with source area wells MW-7, MW-9, MW-12, MW-13, MW-15, MW-E, and RW-1 exhibiting increases; downgradient and cross-gradient wells MW-3, MW-5, MW-8, MW-10, MW-11, MW-14, MW-16, and MW-17 showing decreases; and perimeter wells MW-4, MW-6, and MW-18 remaining the same.

**Table 2**  
**Groundwater Sample Analytical Results – December 29 and 30, 2008**  
**6400 Christie Avenue, Emeryville, California**

Well ID	Analytical Results						
	TPHg	TPHd	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE
MW-3	<b>240</b>	<b>2,300</b>	<0.5	<0.5	1.1	<0.5	<2.0
MW-4	<50	<b>730</b>	<0.5	<0.5	<0.5	<0.5	<2.0
MW-5	<50	<b>5,200</b>	0.61	<0.5	<0.5	<0.5	<2.0
MW-6	<50	<b>1,400</b>	1.0	<0.5	<0.5	<0.5	<2.0
MW-7	<b>2,200</b>	<b>8,700</b>	<b>640</b>	100	<b>43</b>	<b>185</b>	<4.0
MW-8	<b>19,000</b>	<b>7,600</b>	<b>6,800</b>	110	<b>380</b>	<b>236</b>	<50
MW-9	95	<b>7,800</b>	4.0	0.54	<0.5	<0.5	<2.0
MW-10	<b>2,900</b>	<b>3,200</b>	<b>550</b>	45	15	56	<20
MW-11	<b>2,100</b>	<b>7,800</b>	<b>270</b>	14	7.6	15.6	<2.0
MW-12	<b>19,000</b>	<b>3,600</b>	<b>7,900</b>	<b>140</b>	<b>72</b>	<b>124</b>	<50
MW-13	<b>2,700,000</b>	<b>1,100,000</b>	<b>23,000</b>	<250	<b>40,000</b>	<b>45,000</b>	<1,000
MW-14	<b>2,300</b>	<b>2,800</b>	<b>830</b>	27	<b>45</b>	30.7	<10
MW-15	<b>20,000</b>	<b>3,000</b>	<b>7,600</b>	95	<b>300</b>	84.2	<50
MW-16	60	<b>8,800</b>	11	2.8	<0.5	0.53	<2.0
MW-17	<b>7,100</b>	<b>3,200</b>	<b>1,100</b>	<b>530</b>	<b>190</b>	<b>390</b>	<10
MW-18	<50	<b>9,300</b>	<0.5	<0.5	<0.5	<0.5	<2.0
MW-E	<b>9,100</b>	<b>9,400</b>	<b>3,400</b>	110	<b>180</b>	<b>182</b>	<50
RW-1	<b>1,100,000</b>	<b>54,000</b>	<b>500</b>	<250	<b>3,200</b>	<b>530</b>	<1,000
ESLs <sup>(a)</sup>	<b>100 / 210</b>	<b>100 / 210</b>	<b>1.0 / 46</b>	<b>40 / 130</b>	<b>30 / 43</b>	<b>20 / 100</b>	<b>5.0 / 1,800</b>

Notes:

<sup>(a)</sup> Water Board Environmental Screening Levels for residential sites where groundwater is/is not a drinking water resource (Water Board, 2008).

MTBE = methyl tertiary-butyl ether

TPHd = total petroleum hydrocarbons – diesel range (equivalent to total extractable hydrocarbons – diesel range)

TPHg = total petroleum hydrocarbons – gasoline range (equivalent to total volatile hydrocarbons – gasoline range)

All concentrations are expressed in micrograms per liter (µg/L), equivalent to parts per billion (ppb).

Results listed in **bold-face type** are at or above the ESLs where groundwater is not a drinking water resource.





Diesel was detected in all site wells above the ESL of 210 µg/L (where groundwater is not a drinking water resource). The highest concentration (1,100,000 µg/L) was observed in MW-13. This concentration is the same as the historic high observed during the March 2008 event. Overall, diesel concentrations increased as compared to both the Q3 2008 (11 of 18 wells) and Q4 2007 (12 of 18 wells) sampling events. Decreases in diesel concentrations as compared to the Q3 2008 event were observed in MW-7, MW-8, MW-9, MW-10, MW-15, and MW-17. Decreases in diesel concentrations as compared to the Q4 2007 event were observed in MW-3, MW-9, MW-10, MW-15, MW-16, and MW-18.

Figure 7 is an isoconcentration contour map of TPHd concentrations in groundwater based on the December 2008 monitoring well analytical results. Figure 8 plots the change in diesel concentrations in the two downgradient wells (MW-5 and MW-6) from February 1991 (the terminus of the pump-and-treat system) to the December 2008 sampling event. Figure 9 plots the change in diesel concentrations in source area wells MW-11 and MW-12 from their first sampling event in December 2006 to the December 2008 sampling event. Figure 10 plots the change in crossgradient wells MW-18 and MW-3 from December 2006 to date.

In MW-7, MW-8, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-17, MW-E, and RW-1, concentrations of benzene exceeded the ESL of 46 µg/L where groundwater is not a drinking water resource. Benzene was also found in MW-5, MW-6, MW-9, and MW-16, but at concentrations below the ESL.

Toluene was detected above the ESL of 130 µg/L in monitoring wells in MW-12 and MW-17. Ethylbenzene was detected above the 43-µg/L ESL (where groundwater is not a drinking water resource) in monitoring wells MW-7, MW-8, MW-12, MW-13, MW-14, MW-15, MW-17, MW-E, and RW-1. Total xylene concentrations in monitoring wells MW-7, MW-8, MW-12, MW-13, MW-17, MW-E, and RW-1 were above the 100-µg/L ESL where groundwater is not a drinking water resource. MTBE was not detected above the laboratory detection limit in any of the monitoring wells.

### **Quality Control Sample Analytical Results**

Laboratory quality control (QC) samples (e.g., method blanks, matrix spikes, surrogate spikes, etc.) were analyzed by the laboratory in accordance with the requirements of each analytical method. All laboratory QC sample results and sample holding times were within the acceptance limits of the methods (Appendix C).









## **5.0 FREE-PHASE HYDROCARBON PRODUCT REMEDIATION SYSTEM**

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This section describes the extraction of the historical free product in the Emery Bay Phase I Condo parking garage, the construction details of the current LNAPL remediation system located on the northeastern portion of the garage, and the most recent product removal activities conducted in November and December 2008. Table 3 summarizes the product removed from the skimmers during these events. Appendix E summarizes historical product removal. Figure 11 compares the amount of total product removed on a yearly basis from 2004 to the present.

### **LNAPL REMEDIATION SYSTEM CONSTRUCTION**

In an attempt to maximize free product removal, PES constructed three trenches, each containing three sump wells, in the northeastern area of the Emery Bay Phase I Condo parking garage. Historically, this area has had the highest concentrations of contamination and accumulation of free product. The trenches (TA, TB, and TC) extend to depths of approximately 12.5 to 13 feet bgs, while the collection sumps (TA-W, TA-M, TA-E, TB-W, TB-M, TB-E, TC-W, TC-M, and TC-E) extend to approximately 11 to 13 feet bgs. The sumps were constructed using 10-inch-diameter schedule 40 polyvinyl chloride (PVC) casing. Blank casing was used from approximately 0.5 feet bgs to between 6 and 8 feet bgs. Slotted 0.06-inch PVC was used from between 6 and 8 feet bgs to 6 inches from the total depth of the trench. The trenches were then backfilled with high-porosity, high-permeability gravel designed to promote LNAPL migration (PES, 2007). Passive skimmers, manufactured by QED Environmental Systems (of Oakland, California) were then placed in each of the sumps in Trench A and in one of the sumps (TC-E) in Trench C.

The skimmers operate by floating on the surface of the water. Water and free product collect in a filtration reservoir, which allows water to pass through. A tube connected to the reservoir then filters the collected free product into a collection reservoir located below the water surface. The reservoir can be emptied by opening a valve located on the bottom of the cylindrical shaped reservoir. Each of these skimmers is attached to the sump lid by a rope, and can be removed and transferred to another sump as needed.

**Table 3**  
**Trench Product Extraction**  
**November and December 2008**

Trench ID	Number of Skimmers in Well	Total Product Removed (gallons)		
		November 7	December 29	Total
TA-E	2	0.1	0.0003	0.1003
TA-M	2	0.03	0.08	0.11
TA-W	2	NA	NA	NA
TB-E	0	NM	NM	NM
TB-M	0	NM	NM	NM
TB-W	0	NM	NM	NM
TC-E	1	NM	0.03	0.03
TC-M	0	NM	NM	NM
TC-W	0	NM	NM	NM
<b>Total Product Removed</b>		<b>0.13</b>	<b>0.1103</b>	<b>0.2403</b>

Note:

NM = No skimmer was located in the well, or no product was present, not measured.

NA = Car parked over well, no access.

**HISTORICAL FREE PRODUCT EXTRACTION**

As mentioned under the “Previous Investigations” subsection in Section 1.0, in approximately 1986, contaminated soil and groundwater were discovered during the removal of 12 UFSTs from the Emery Bay Phase I and Phase II parcels. To dewater the excavation during the Phase I and Phase II Condo construction, a groundwater extraction and remediation system was installed by GTI in 1988. Approximately 1 million gallons of water yielding 100 gallons of hydrocarbon product was removed from RW-1 during its operation (PES, 2007). However, corrosion and other mechanical problems caused the system to fail in 1991, and it was decommissioned in 1994. In February 2008, SES removed all of the old parts of the system from the well vault.

In 2004, PES began manual extraction on RW-1, and was reported to have removed approximately 48 gallons of LNAPL (PES, 2004a)—although it is unclear whether the removed material was pure product or product mixed with water. To accelerate free product removal, PES constructed a new LNAPL hydrocarbon remediation system (described below) between April and May 2004 (PES, 2007). Several extraction events were conducted by PES from May 2004 through March 2007; the extraction events yielded a total of approximately 51 gallons of LNAPL. No extraction events were conducted by PES in 2005; approximately 50 gallons of hydrocarbons was removed in 2006; and



approximately 0.6 gallon of hydrocarbons was removed by PES between January and November 2007. In November and December 2007, after SES was retained for the project, the skimmer system only yielded 2.82 gallons. Figure 11 graphs the comparison of free product extraction on a yearly basis.

It should be noted that no historical product extraction reports were provided to SES by the previous owner or by PES. Therefore, there is little to no information on how active product extraction occurred during 2004 and 2006. The amount of free product removed during 2004 and 2006 appears to have been high, as only 100 gallons of free product was obtained from actively pumping over 1 million gallons of water continuously between 1989 and 1991.

### **NOVEMBER 2008 PRODUCT REMOVAL EVENT**

Historical yield from the trench recovery system has been unproductive, with the 1-liter passive skimmer collection reservoirs not filling up completely, or filling up with water rather than product. The highest hydrocarbon product yield has occurred from active pumping on recovery well RW-1 or at various other wells. SES conducted passive skimmer product removal on the trench wells in November and December 2008, and active pumping on the trench wells, recovery well RW-1, and select monitoring wells during the November 2008 removal event. A total of approximately 250 gallons of groundwater and 1.30 gallons of free product, were removed during the November 2008 active product removal event, as well as 0.13 gallon removed passively from the skimmers. A sample taken from the AST on December 31, 2008 contained concentrations of TVHg at 5,100 µg/L and TEHd at 53,000 µg/L. Based on the total amount of groundwater removed, 250 gallons, SES calculated approximately 0.01 pounds of gasoline and 0.11 pounds of diesel were removed with the purged groundwater.

An additional 0.1103 gallon was removed passively from the skimmers in December 2008. Table 3 shows the allocation of free product removed from the collection skimmers in Trenches A and C. Table 4 shows the total amount of product actively removed by pumping based on the total amount of groundwater/product removed for the November 2008 extraction event. The removal activities occurred as follows:

- On November 7, 2008, SES removed a total of 0.13 gallons of LNAPL from the skimmers in TA-E and TA-M (TA-W was blocked by a car). Approximately 15 gallons were removed from TC-M and TC-W. Approximately 20 gallons were removed from TC-E. Approximately 100 gallons were removed from RW-1. Twelve gallons total were removed after purging MW-3 three times. Ten gallons were removed from MW-17, 1.5 gallons from MW-13, 10 gallons from MW-12, 15 gallons from MW-8, and 0.5 gallons from MW-16. SES removed 10 gallons from each of the Trench B wells; TB-W, TB-M, and TB-E.

- On December 29, 2008, Blaine Tech, under the supervision of SES personnel, removed 0.1003 gallon from TA-E, 0.08 gallon from TA-M, and 0.03 gallon from TC-E. TC-E was blocked by a car during this event as well. Two skimmers were located both in TA-E and TA-M. Of those two skimmers, only one contained liquid and more than half of that liquid was water. The one skimmer located in TA-M was also over half filled with water. Visible product was still present in the wells.
- All of the purge water and free product extracted during these events was containerized onsite in the aboveground 1,100-gallon AST located in the northeastern gated area of the garage. When the AST reaches capacity, SES will have the liquid transported off-site to a recycling facility.

**Table 4**  
**Active Product Extraction**  
**November 2008**

Well	Total Gallons of Product Removed During November 2008 Event	Well	Total Gallons of Product Removed During November 2008 Event
MW-3	0.078	MW-17	0.06
MW-5	NP	MW-18	NP
MW-6	NP	MW-E	NP
MW-7	NP	RW-1	0.6
MW-8	0.009	TA-E	NP
MW-9	NP	TA-M	NP
MW-10	NP	TA-W	NP
MW-11	NP	TB-E	0.06
MW-12	0.06	TB-M	0.06
MW-13	0.009	TB-W	0.06
MW-14	NP	TC-E	0.12
MW-15	NP	TC-M	0.09
MW-16	0.003	TC-W	0.09
<b>Total</b>			<b>1.3</b>

Notes:

NP = not purged

Product removal estimates are based on the total amount of free product measured in the purge tank (1.30 gallons) rather than on the total amount of groundwater purged (250 gallons), which yields 0.006 gallon of product per 1 gallon of purge water.

**DISCUSSION**

As mentioned under the “Historical Free Product Extraction” subsection of this chapter, no product extraction was conducted by PES in 2005. “Product” removal in 2006 was reported at a significant 52 gallons by PES; however, it was not achieved through collection from the trench hydrocarbon skimmers, but rather through active pumping; in addition, the “product” referred to by PES appears to actually have been a mixture of petroleum product and water. The PES report provides no documentation (e.g., manifests) of the removal of actual recovered petroleum product. The recovery by PES from the start of 2007 through October 2007 (when SES assumed environmental consulting activities) was limited to 0.6 gallon collected from the skimmers. In addition, there had been no removal of free product from well RW-1 since 2004, at which time approximately 50 gallons of free-floating product was apparently removed by active pumping. The majority of this petroleum product apparently was removed by active pumping and removal activities rather than from the trench well skimmers. Much of this may also have been a mixture of water and hydrocarbons. Thus, we

conclude that the trench recovery system on its own has never been particularly effective. In 2007, passive extraction of free product through trench well skimmers removed only 3.41 gallons. SES removed approximately 5.65 gallons of free product from these passive skimmers during the 2008 removal events. Approximately 10.34 gallons were removed by active pumping on wells during 2008.

As demonstrated by the analytical data, active pumping on certain wells has generally reduced gasoline concentrations; however, wells not included in the pumping schedule showed a lower or no decrease. Diesel concentrations seem to be less affected by active pumping, even in wells that were included in the pumping schedule, such as RW-1. More active remediation will likely be required on this site to reduce the concentrations to levels acceptable to the regulatory community and to achieve eventual regulatory closure. However, with the exception of the current program of LNAPL removal from the skimmers and wells, no additional active remedies are proposed until a more cost effective and productive method of removal is found.

## **6.0 SUMMARY, CONCLUSIONS, AND PROPOSED ACTIONS**

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### **FINDINGS AND CONCLUSIONS**

- The subject property parcel was developed as early as 1958 with the Motor Freight Station, associated with Delta Lines, Inc. The Delta Lines complex contained an “Oil and Gas” building, located at the site of the present-day Emery Bay Phase I Condo complex and parking garage. In 1986, the building was demolished, and 12 UFSTs containing diesel and gasoline were removed from the Emery Bay Phase I and Phase II Condo complex parcels. Soil and groundwater contamination was discovered.
- In response to the contamination, a LNAPL groundwater pump-and-treat system was installed in 1989, but failed in 1991. Active pumping of free product began again in 2004, and a product extraction system consisting of passive product removal was installed in 2006. Groundwater monitoring events have been sporadically conducted since 1988; quarterly groundwater monitoring events were conducted for the first time in 2008.
- The site currently contains 17 monitoring wells, 1 recovery well, and 9 product extraction trench wells. This is the ninth sampling event conducted since 1988.
- Site geological conditions consist of a combination of fill and soft bay sediment to between 15 and 20 feet bgs, covered by approximately 1 to 2½ feet of pavement and imported fill. This is underlain by approximately 20 feet of firm soil consisting of primarily dense silty sand with intermittent layers of silty and sandy clay. Stiff to very stiff clay extends from a depth of approximately 40 feet to approximately 102 feet.
- The groundwater direction during this monitoring event was found to be to the west-northwest, toward San Francisco Bay.
- Groundwater elevations in the December 2008 monitoring event ranged from 6.97 to 9.91 feet above mean sea level, and the groundwater gradient is approximately 0.001 foot per foot.
- Current contaminants of concern include TPHg, TPHd, and BTEX. Current groundwater concentrations exceeded the ESLs for these contaminants in groundwater. No MTBE was detected above the laboratory detection limit in any of the monitoring wells during this event.

- Gasoline was detected in MW-3, MW-7, MW-8, MW-10, MW-11, MW-12, MW-13, MW 14, MW 15, MW-17, MW-E, and RW-1 above the ESL where groundwater is not a drinking water resource (210 micrograms per liter [ $\mu\text{g/L}$ ]). Gasoline was also detected in MW-9 and MW-16, but at concentrations below the ESL. The highest concentration (2,700,000  $\mu\text{g/L}$ ) was observed in MW-13. This is a new historic maximum concentration for this well.
- Overall, gasoline concentrations remained relatively the same as the last quarter, with the source area wells exhibiting increases and downgradient and crossgradient wells remaining the same or decreasing. The same is true with the Q4 2008 concentrations as compared to the Q4 2007 concentrations; the source-area well concentrations demonstrated an increase while downgradient and crossgradient well concentrations remained the same or decreased.
- Diesel was detected in all site wells above the ESL of 210  $\mu\text{g/L}$  (where groundwater is not a drinking water resource). The highest concentration (1,100,000  $\mu\text{g/L}$ ) was observed in MW 13. This concentration is the same as the historic high observed during the March 2008 event.
- Overall, diesel concentrations increased as compared to both the Q3 2008 (11 of 18 wells) and Q4 2007 (12 of 18 wells) sampling events.
- In MW-7, MW-8, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-17, MW-E, and RW-1, concentrations of benzene exceeded the ESL of 46  $\mu\text{g/L}$  where groundwater is not a drinking water resource. Benzene was also found in MW-5, MW-6, MW-9, and MW-16, but at concentrations below the ESL.
- Toluene was detected above the ESL of 130  $\mu\text{g/L}$  in monitoring wells in MW-12 and MW 17. Ethylbenzene was detected above the 43- $\mu\text{g/L}$  ESL (where groundwater is not a drinking water resource) in monitoring wells MW-7, MW-8, MW-12, MW-13, MW-14, MW-15, MW-17, MW-E, and RW-1. Total xylene concentrations in monitoring wells MW-7, MW-8, MW-12, MW-13, MW-17, MW-E, and RW-1 were above the 100- $\mu\text{g/L}$  ESL where groundwater is not a drinking water resource. MTBE was not detected above the laboratory detection limit in any of the monitoring wells.
- SES conducted passive skimmer product removal on the trench wells in November and December 2008, and active pumping on the trench wells, recovery well RW-1, and select monitoring wells during the November 2008 removal event. A total of 0.2403 gallon was removed from the sump well skimmers in Trench A during the November and December 2008 events. A total of 5.65 gallons were removed during the entire 2008 year from the sump well skimmers.
- A total of approximately 250 gallons of groundwater, yielding 1.3 gallons of free product, 0.01 pound of gasoline, and 0.11 pound of diesel were removed during the November 2008

active product removal event. Approximately 10.34 gallons of free product were removed by active pumping of wells during the 2008 year.

- The trench recovery system, where free product is designed to collect in 1-liter skimmers, is effective in removing small amounts of free product, but is not effective in decreasing the size of the plume overall. Pumping at various wells is critical to maintaining some dynamic equilibrium so that the plume does not migrate outbound.
- While it is unclear what has caused the dramatic spike in contaminant concentrations between the December 2006 and December 2008 sampling events, it does appear that active product removal facilitates decreasing concentrations in downgradient wells; effectively preventing further downgradient migration to the perimeter wells. The dramatic spike in the source area concentrations indicates that a large mass of residual contamination remains; perhaps trapped in the vadose zone and desorbing into the groundwater during drought like conditions such as those exhibited during the 2006-2008 years. However, further data is needed to confirm this hypothesis.

## **RECOMMENDATIONS**

- After completing a full round of quarterly monitoring events for the 2008 year, the groundwater hydrology and general contaminant concentration trends have been delineated. As recommended in the November 2008 meeting with ACEH, SES recommends changing the groundwater monitoring frequency from quarterly to semi-annual to be conducted in March and September.
- Both active and passive free product removal events should be continued to ascertain their effectiveness in reducing the plume size over time; however, based on the slow hydrological gradient (0.001 foot per foot), the same amount of free product can be removed in semi-annual events as opposed to quarterly events. Therefore, SES will reduce the active product removal frequency to twice a year. However, passive product removal will be continued on a quarterly basis, as the skimmers tend to fill up with water and/or product during a 3-month period.
- Active product removal events will be coordinated with sampling events to occur one to two days before sampling. This will determine the rate of free-product recharge and the effectiveness of active removal on the dissolved hydrocarbon fraction.
- Electronic uploads to ACEH's ftp system and the State Water Board's GeoTracker system should be continued as required.

## 7.0 REFERENCES AND BIBLIOGRAPHY

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- Aqua Science Engineers (Aqua), 1986a. Hydrocarbon Contamination Abatement Plan for Bay Center, Emeryville, CA. May 23.
- Aqua Science Engineers (Aqua), 1986b. Report – Soil Sampling and Determination of Hydrocarbon Contamination from Tank Removal at the Bay Port Development, 64<sup>th</sup> and Lacoste Street, Emeryville, CA. May 27.
- Aqua Science Engineers (Aqua), 1986c. A Proposal for Installing a Fuel Contamination and Recovery System. August 27.
- Aqua Science Engineers (Aqua), 1986d. Phase II – Extent of Groundwater Contamination Investigation, Bay Center. August 27.
- Aqua Science Engineers (Aqua), 1986e. Project Report – Soils Gas Investigation, Bay Center. August 27.
- Aqua Science Engineers (Aqua), 1986f. Request for Additional Information Regarding Aeration and Sampling Soils Contaminated with Motor Fuel Hydrocarbons. Information addressed to the Alameda County Health Care Services, Hazardous Materials Unit. July 28.
- Aqua Science Engineers (Aqua), 1986g. Additional Information Regarding Aeration and Sampling Soils Contaminated with Motor Fuel Hydrocarbons. July 11.
- Bay Area Air Quality Management District (BAAQMD), 1987. Letter to the Martin Company authorizing the contaminated groundwater and oil recovery system. April 13.
- Chan, Barney, 2007. Project Officer, Alameda County Department of Environmental Health. Personal communication to Richard Makdisi of Stellar Environmental Solutions, Inc. April 10.
- Creps, Rob, 2007. PES Environmental, Inc. Project Manager for the Phase I Apartment Complex Remediation. Personal communication to Teal Glass and Richard Makdisi of Stellar Environmental Solutions, Inc. April 19.

- Earth Metrics, Inc., 1986a. Draft Soils Contamination Characterization for Garret Freight Lines Emeryville Site, 64<sup>th</sup> Street and Lacoste, Emeryville, CA. March 14.
- Earth Metrics, Inc., 1986b. Environmental Assessment for the Proposed Bay Center Apartment Complex in the Redevelopment Project Area of the City of Emeryville. May.
- Earth Metrics, Inc., 1986c. Draft Work Plan for Soils Contamination Characterization of Bay Center Site, Emeryville, CA. May 19.
- Earth Metrics, Inc., 1986d. Soils and Groundwater Contamination Characterization of Bay Center Site, Emeryville, CA. August 20.
- Earth Metrics, Inc., 1987. Safety Plan for Bay Center Offices and Apartments in Emeryville, CA. September 15.
- Geomatrix, 1988. Observation and Testing of Earthwork Construction, Bay Center Apartments. May 20.
- Groundwater Technology, Inc. (GTI), 1987a. Letter to Alameda County Health Department Hazardous Materials Division citing irregularities in the Aqua Science Laboratory Results. August 19.
- Groundwater Technology, Inc. (GTI), 1987b. Report of Further Subsurface Hydrocarbon Investigation, Emeryville, CA, Bay Center Project. September 8.
- Groundwater Technology, Inc. (GTI), 1989a. Well Replacement and Groundwater Assessment Report, Bay Center Project, Emeryville, CA. June.
- Groundwater Technology, Inc. (GTI), 1989b. Water Treatment System Start-Up Report, Bay Center Project, Christie and 64<sup>th</sup> Streets, Emeryville, CA. April 10.
- Groundwater Technology, Inc. (GTI), 1990a. First Quarter Sampling Event. Laboratory Analyses at the Bay Center Project. July 24.
- Groundwater Technology, Inc. (GTI), 1990b. Letter to the Bay Center Apartment Associates detailing problems with the groundwater extraction system. August 14.
- Groundwater Technology, Inc. (GTI), 1990c. Quarterly Report, Bay Center Apartment Associates, Bay Center Project, Christie and 64<sup>th</sup> Streets, Emeryville, CA. October 31.
- Groundwater Technology, Inc. (GTI), 1991a. Quarterly Report, Bay Center Project, Christie and 64<sup>th</sup> Streets, Emeryville, CA. January.

Groundwater Technology, Inc. (GTI), 1991b. Quarterly Status Report. April 15.

Harding Lawson Associates (HLA), 1991. Preliminary Hazardous Materials Site Assessment. December 16.

Harding Lawson Associates (HLA), 1992a. Results of Soil and Groundwater Investigation. May 6.

Harding Lawson Associates (HLA), 1992b. Hazardous Waste Management Plan. May 26.

Harding Lawson Associates (HLA), 1992c. Conceptual Design of Venting System, Emerybay II Apartments. November 24.

Harding Lawson Associates (HLA), 1993. Results of Soil Sampling, Emerybay II Apartments. April 21.

Harding Lawson Associates (HLA), 1994. Results of Services During Construction, Emerybay Apartments – Phase II. May 19.

Johnson, Mark, 2007. Project Officer, Regional Water Quality Control Board. Personal communication to Teal Glass of Stellar Environmental Solutions, Inc. April 11.

Martin Company, 1986a. Letter to Lowell Miller of Alameda County Health Care Services documenting agreements for the construction workplan involving contaminated soil. June 5.

Martin Company, 1986b. Letter to Tom Owens of Emeryville Community Developers, Inc. documenting recognized contamination issues. May 21.

Martin Company, 1986c. Letter to Rafat Shahid of Alameda County Health Care Services documenting agreement of drum removal. May 16.

Martin Company, 1986d. Letter to the State Water Resources Control Board documenting unused underground storage tanks. December 11.

PES Environmental, Inc. (PES), 2004a. Status Report, Investigation of Subsurface Petroleum Hydrocarbon Residuals. Bay Center Apartments, Christie Avenue and 64<sup>th</sup> Street, Emeryville, CA. April 5.

PES Environmental, Inc. (PES), 2004b. Investigation for Missing Wells. April 5.

PES Environmental, Inc. (PES), 2004c. Status Report. August 30.

- PES Environmental, Inc. (PES), 2007. Construction Implementation and Semi-Annual Operations Report. Free-Phase Hydrocarbon Product Remediation System. EmeryBay Commercial Association, Christie Avenue and 64<sup>th</sup> Street, Emeryville, CA. March 30.
- Regional Water Quality Control Board (Water Board), 1999. East Bay Plain Groundwater Basin Beneficial Use Evaluation Report.
- Regional Water Quality Control Board (Water Board), 2008. Environmental Screening Levels for residential properties on shallow soils where groundwater is a drinking water resource / is not a drinking water resource. Written February 2005, revised May 2008.
- Stellar Environmental Solutions, Inc. (SES), 2007. Phase I Environmental Site Assessment – 6425-6475 Christie Avenue, Emeryville, CA. April 17.
- Stellar Environmental Solutions, Inc. (SES), 2008a. 2007 Annual Groundwater Monitoring and Product Extraction Report. EmeryBay Condo Phase I Parking Garage – 6400 Christie Avenue, Emeryville, CA. January 28.
- Stellar Environmental Solutions, Inc. (SES), 2008b. Quarter One 2008 Groundwater Monitoring and Product Extraction Report. EmeryBay Condo Phase I Parking Garage – 6400 Christie Avenue, Emeryville, CA. May 7.
- Stellar Environmental Solutions, Inc. (SES), 2008c. Second Quarter 2008 Groundwater Monitoring and Product Extraction Report. EmeryBay Condo Phase I Parking Garage – 6400 Christie Avenue, Emeryville, CA. July 18.
- Stellar Environmental Solutions, Inc. (SES), 2008d. Third Quarter 2008 Groundwater Monitoring and Product Extraction Report. EmeryBay Condo Phase I Parking Garage – 6400 Christie Avenue, Emeryville, CA. October 15.

## 8.0 LIMITATIONS

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This report has been prepared for the exclusive use of Bay Center Investor LLC and Harvest Properties, their authorized representatives and assigns, and the regulatory agencies. No reliance on this report shall be made by anyone other than those for whom it was prepared.

The findings and conclusions presented in this report are based on a review of previous investigators' findings at the site, as well as site investigations conducted by SES in 2007. This report has been prepared in accordance with generally accepted methodologies and standards of practice. The SES personnel who performed this limited remedial investigation are qualified to perform such investigations and have accurately reported the information available, but cannot attest to the validity of that information. No warranty, expressed or implied, is made as to the findings, conclusions, and recommendations included in the report.

The findings of this report are valid as of the date of this report. Site conditions may change with the passage of time, natural processes, or human intervention, which can invalidate the findings and conclusions presented in this report. As such, this report should be considered a reflection of the current site conditions as based on the activities completed.

## **APPENDIX A**

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### **Historical Groundwater Well Analytical Results**

## **APPENDIX B**

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### **Groundwater Monitoring Field Data Sheets**

## **APPENDIX C**

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# **Analytical Laboratory Report and Chain-of-Custody Record**

## **APPENDIX D**

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### **Historical Groundwater Elevation Data**

## **APPENDIX E**

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### **Historical Product Extraction Data Table**