October 13, 1998 1204.00-004

Mr. Scott Seery
Hazardous Materials Specialist
Local Oversight Program
Alameda County Department of Environmental Health
1131 Harbor Bay Parkway
Alameda, California 94502-6577

98 OCT 14 AM 10:7

Subject: Erratum and Addendum to the Risk Management Plan, Polvorosa Business Park, San Leandro, California

Dear Mr. Seery:

Levine·Fricke·Recon Inc. (LFR), on behalf of Chamberlin Associates, has prepared this erratum and addendum to the Risk Management Plan (RMP) for the subject property located at 1555 Doolittle Drive in San Leandro, California ("the Site"). The erratum makes certain corrections to the RMP, which you identified in a telephone call with LFR on June 25, 1998. The addendum responds to comments in your letter dated August 14, 1998, in which you requested that we review historical depth-to-water measurements, plume geometry, local geology, and locations of buried utilities to evaluate the potential for residual concentrations of petroleum hydrocarbons in groundwater to migrate away from the Site along utility trenches.

Erratum

This erratum corrects the following items in the RMP:

- On page 3, Section 2.2.3, the fourth bullet item should read as follows: "Low levels of benzene (0.0006 to 0.0009 parts per million [ppm]) were detected in monitoring well LF-14 during all sampling events."
- On page 6, Section 4.1, second paragraph, the last sentence should be replaced with the following sentence: "The City of San Leandro will notify contractors to prepare health and safety plans before conducting excavations."

Addendum to the RMP

This addendum evaluates the potential for residual concentrations of total petroleum hydrocarbons characterized as diesel (TPHd) in groundwater to migrate away from the Site along preferential pathways, including underground utility trenches. LFR reviewed historical depth-to-water data, groundwater analysis results, geologic logs of soil borings, a geologic cross section, and as-built

plans of underground utilities to evaluate the potential for migration of residual concentrations of TPHd in groundwater. The results of this evaluation are described below.

Historical Depth-to-Water Measurements

Historical depth-to-water measurements at the Site have ranged from approximately 6 to 11 feet below ground surface (bgs). Groundwater elevations have ranged from approximately 1.6 feet above mean sea level (msl) to 4.2 feet msl. Groundwater elevation contours for May 26, 1995, the most recent date on which groundwater-level measurements were collected, are shown in Figure 1. The general direction of groundwater flow at the Site is to the north (see Section 2.2.3 of the RMP).

Groundwater Quality Data

Groundwater quality data collected during four quarterly monitoring events, conducted from September 1994 through May 1995, are summarized in Section 2.2.3 of the RMP. Figure 2 shows groundwater quality analysis results for May 26, 1995, the most recent date on which groundwater samples were collected at the Site. As shown in Figure 2, the highest concentration of TPHd in May 1995 was detected in monitoring well MW-3 (34 ppm), and lower concentrations of TPHd were detected in wells MW-8 (15 ppm) and LF-14 (11 ppm) on this date. A low concentration of benzene (0.0009 ppm) was detected in downgradient well LF-14 on this date.

Local Geology

LFR's review of boring logs and a geologic cross section shows that the local subsurface geology consists of primarily silty clay from the ground surface to depths ranging from approximately 6 to 10 feet bgs. Some areas of sand and gravel or gravelly clay fill, extending from the ground surface to depths of approximately 5 to 6 feet bgs, were encountered in the borings for wells MW-5 and LF-12. The silty clay unit is underlain by a layer of primarily silty or clayey sand, at depths ranging from approximately 6 to 14 feet bgs. The bottom of this unit was not encountered in one boring, MW-2, which was drilled to a depth of approximately 21 feet bgs. At other locations, this unit is underlain by silty clay.

Groundwater was encountered in borings drilled by LFR at depths ranging from approximately 7 to 12 feet bgs, consistent with historical groundwater-level measurements in wells at the Site. LFR's review of available geologic information and historical groundwater elevation data did not reveal any preferential pathways for groundwater affected with petroleum hydrocarbons to migrate away from the Site.

Underground Utilities

LFR reviewed a site grading plan and utility plans showing the locations and depths of underground storm drains, sanitary sewers, and water lines. These plans indicate that the depth of

these utilities does not exceed 5 feet bgs in the vicinity of Building C at the Site (Figure 1). Because the historical depth to groundwater at the Site has been greater than 6 feet bgs, underground utilities do not provide a preferential pathway for petroleum hydrocarbons in groundwater to migrate away from the Site.

Conclusions

Based on our review of historical groundwater elevation and quality data, geologic information, and utility plans, we conclude that underground utility lines do not provide a preferential pathway for groundwater affected with residual petroleum hydrocarbons to migrate away from the Site.

If you have any questions, please call either of the undersigned at (510) 652-4500.

Sincerely,

REGISTERED PROFESSIONAL ENGINEER
THEODORE SPLITTER
No. 29718
CIVIL
STATE OF CALIFORNIA

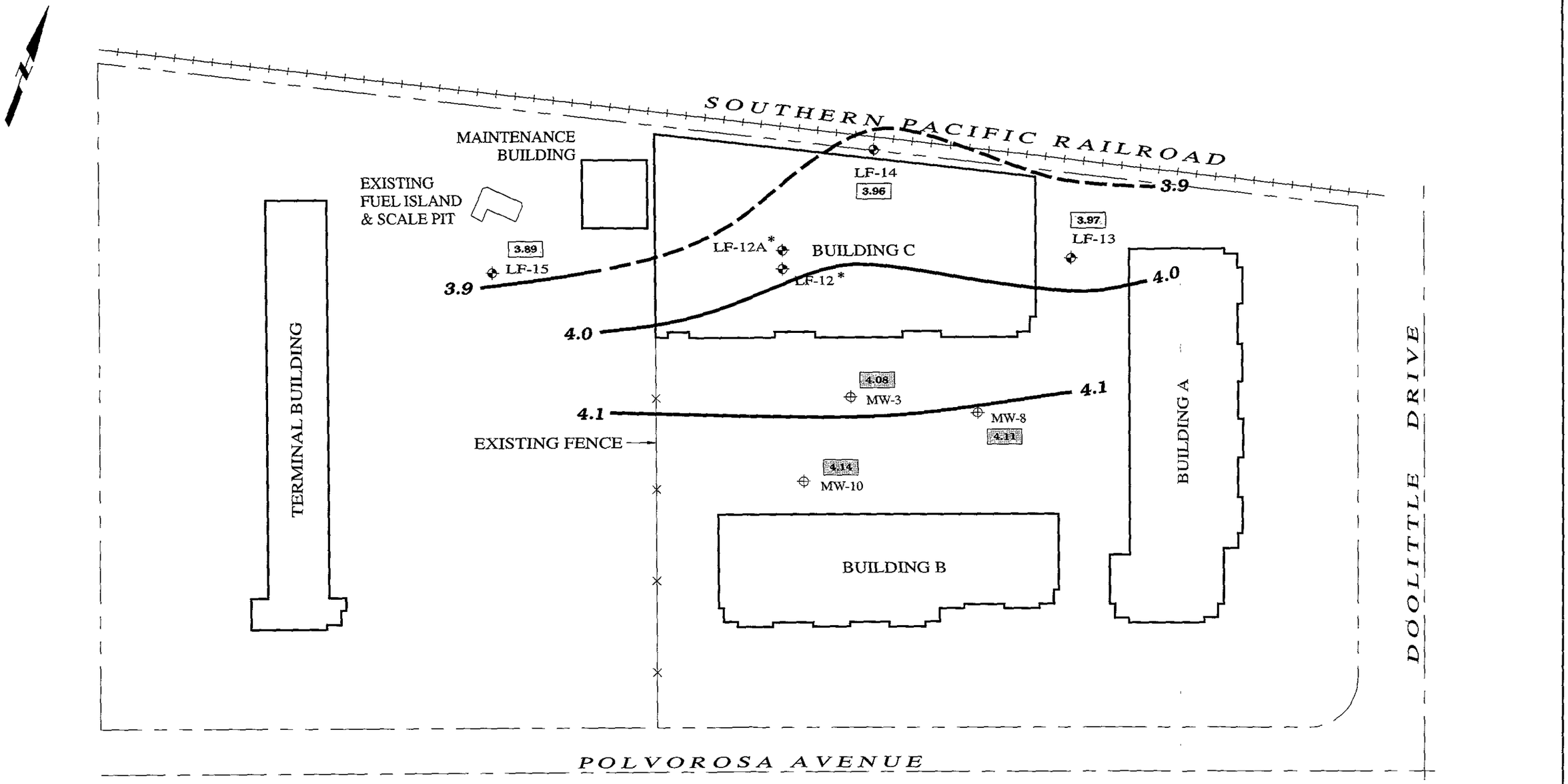
Ted Splitter, P.E.
Principal Engineer

Taylor Bennett

Taylor Bennett, R.G.
Senior Project Hydrogeologist

Attachments

cc: Ravi Arulanantham, Regional Water Quality Control Board
Steve Chamberlin, Chamberlin Associates



EXPLANATION

- Approximate well location (installed by Levine-Fricke-Recon)
- Approximate well location (installed by others)
- 4.14 Groundwater elevation (feet above mean sea level)
- 4.0 Groundwater elevation contour dashed where inferred (feet above mean sea level)
- * Water levels in these wells were not considered in the elevation contouring due to presence of floating product

0 40 80 FEET

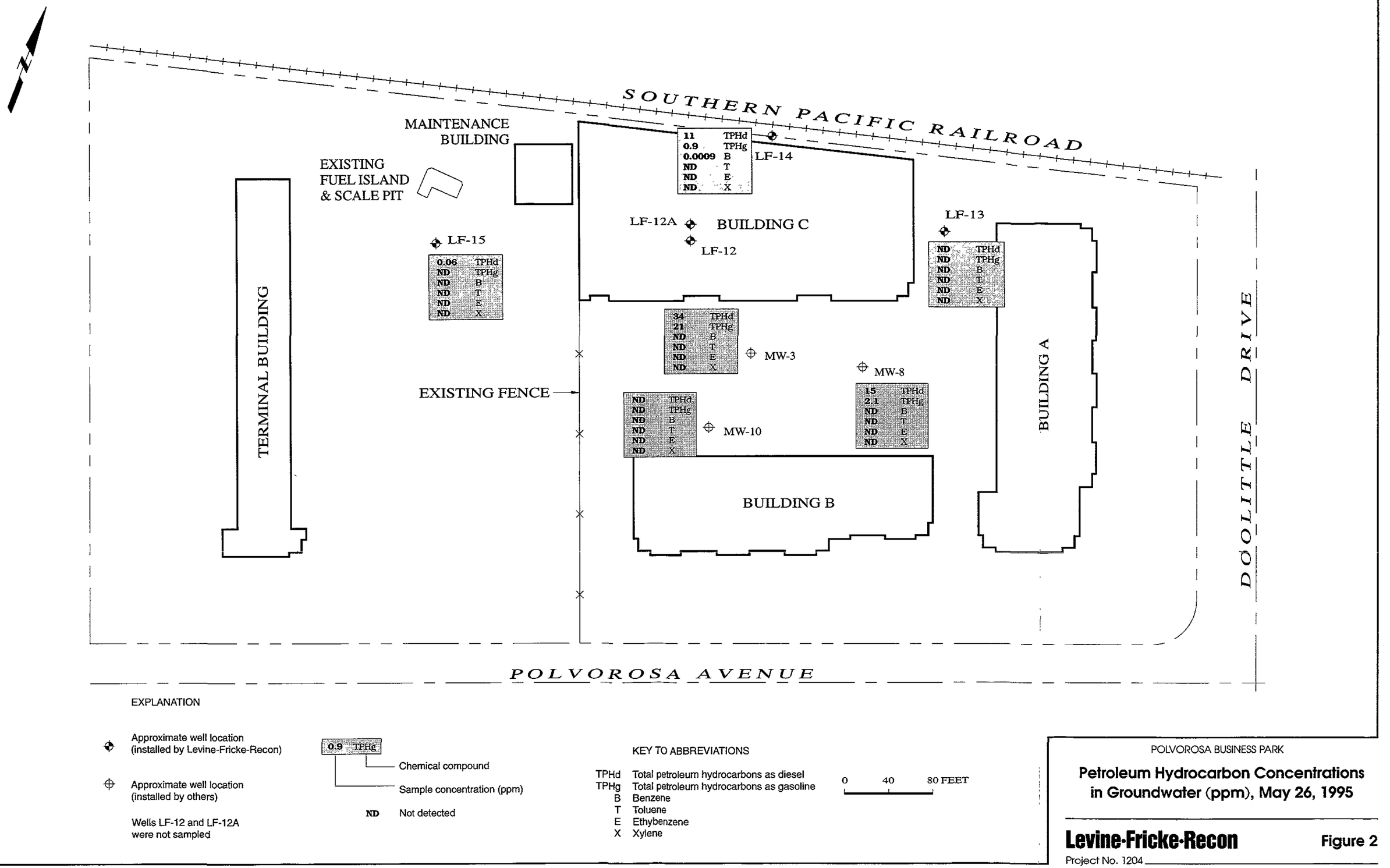
POLVOROSA BUSINESS PARK

Groundwater Elevation Contours
May 26, 1995

Levine-Fricke-Recon Figure 1

Project No. 1204

1204G01.cdr 100598



EXPLANATION

- Approximate well location (installed by Levine-Fricke-Recon)
- Approximate well location (installed by others)

Wells LF-12 and LF-12A were not sampled

0.9 TPHg
- TPHg: Chemical compound
- 0.9: Sample concentration (ppm)

ND Not detected

KEY TO ABBREVIATIONS

TPHd	Total petroleum hydrocarbons as diesel
TPHg	Total petroleum hydrocarbons as gasoline
B	Benzene
T	Toluene
E	Ethybenzene
X	Xylene

0 40 80 FEET

POLVOROSA BUSINESS PARK

Petroleum Hydrocarbon Concentrations in Groundwater (ppm), May 26, 1995

Levine-Fricke-Recon Figure 2

Project No. 1204

1204QC01.cdr 100598

Risk Management Plan
Polvorosa Business Park
1555 Doolittle Drive
San Leandro, California

May 6, 1998
1204.00-004

Prepared for
Chamberlin Associates
32990 Alvarado Niles Road, Suite 990
Union City, California 94587

Levine·Fricke·Recon
ENGINEERS, HYDROGEOLOGISTS & APPLIED SCIENTISTS

May 6, 1998 1204.00-004

Mr. Scott Seery
Hazardous Materials Specialist
Local Oversight Program
Alameda County Department of Environmental Health
1131 Harbor Bay Parkway
Alameda, California 94502-6577

Subject: Risk Management Plan, Polvorosa Business Park, San Leandro, California

Dear Mr. Seery:

Enclosed is the Risk Management Plan for the subject property located at 1555 Doolittle Drive in San Leandro, California ("the Site"). The document has been prepared by Levine · Fricke · Recon Inc. (LFR) on behalf of Chamberlin Associates, in response to your request at a meeting with representatives of the Regional Water Quality Control Board, Chamberlin Associates, and LFR in 1997.

The Risk Management Plan describes the long-term management activities to be undertaken to mitigate potential risks to human health and the environment associated with residual concentrations of petroleum hydrocarbons in soil and groundwater at the Site.

If you have any questions, please call either of the undersigned.

Sincerely,

Ted Splitter, P.E.
Principal Engineer

Taylor Bennett, R.G.
Senior Project Hydrogeologist

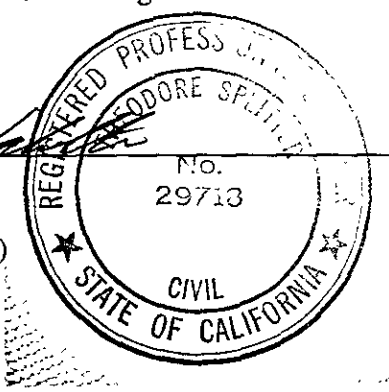
Enclosure

cc: Ravi Arulanantham, RWQCB

CONTENTS

CERTIFICATION

All engineering information, conclusions, and recommendations in this document have been prepared under the supervision of and reviewed by a Levine · Fricke · Recon Inc. (LFR) California Professional Engineer.



5/6/98

Ted Splitter
Principal Engineer
Civil Engineer (41985)

Date

EXECUTIVE SUMMARY

The Risk Management Plan (RMP) has been prepared in accordance with the recommendations of the Regional Water Quality Control Board (RWQCB) and Alameda County Department of Environmental Health (ACDEH) to manage potential risks from residual petroleum hydrocarbons in soil and groundwater at the Polvorosa Business Park site, located at 1555 Doolittle Drive in San Leandro, California ("the Site"). The RMP is consistent with a commercial/industrial land use and is protective of human health and the environment, including water quality.

The Site is currently zoned for commercial and industrial uses. No further development or change in use of the Site is currently planned. Total petroleum hydrocarbons (TPH) as diesel (TPHd) and gasoline (TPHg) and low concentrations of benzene, toluene, ethylbenzene, and total xylenes (BTEX) were detected in soil and groundwater at the Site (LFR 1996).

The long-term RMP includes the following precautions.

- The Site owner will not use groundwater beneath the Site without first securing approval from RWQCB and ACDEH staff.
- California well construction standards will provide protection against the use of potentially hydrocarbon-affected shallow groundwater.
- City of San Leandro administrative procedures will notify any applicants for building, changes of use, or zoning permits for the Site or adjacent downgradient properties regarding the potential presence of petroleum hydrocarbons at the Site, and will refer such applicants to the RMP.

At the request of the ACDEH, LFR prepared a Risk-Based Corrective Action (RBCA) evaluation for the Site (LFR 1997). The RBCA evaluation was derived from the American Society for Testing and Materials (ASTM) Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites (ASTM standard method E 1739-95). The RBCA evaluation used Site data to develop site-specific target levels (SSTLs), which were then compared to concentrations of petroleum hydrocarbons at the Site to evaluate potential risks to human health.

The RBCA evaluation found that measured concentrations of benzene and toluene in soil and groundwater at the Site were well below the SSTLs. Based on the results of the RBCA evaluation, LFR recommended no further corrective action at the Site. This recommendation is consistent with current State of California guidelines, since benzene has not been detected at concentrations greater than 1 milligram per liter (mg/l) at the Site and the Site is greater than 750 feet from the nearest drinking water well.

1.0 INTRODUCTION

This Risk Management Plan (RMP) is submitted by Levine · Fricke · Recon Inc. (LFR) on behalf of Chamberlin Associates for the Polvorosa Business Park, located at 1555 Doolittle Drive in San Leandro, California ("the Site;" Figure 1).

On the basis of the current and planned continuing commercial and industrial land use of the Site, the Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) and Alameda County Department of Environmental Health (ACDEH) have recommended completion of an RMP. The RMP will facilitate regulatory site closure by providing a framework to manage residual concentrations of petroleum hydrocarbons in soil and groundwater at the Site in a manner that is protective of human health and the environment, including water quality.

The RMP will remain in effect unless it is proposed to change the current land use or to demolish the existing buildings at the Site. At such time, the RWQCB and ACDEH may require a reevaluation of the soil and groundwater conditions at the Site, and may require further remedial measures to address residual petroleum hydrocarbons.

The RMP contains the following elements:

- site background information, including a summary of previous investigation results and remedial measures already implemented
- summary of the results of a Risk-Based Corrective Action (RBCA) evaluation
- long-term plan to mitigate potential risks to human health and the environment from residual concentrations of petroleum hydrocarbons in soil and groundwater

2.0 SITE BACKGROUND

Section 2.1 describes the Site's physical characteristics and history. Section 2.2 summarizes the results of previous investigations and groundwater remediation activities.

2.1 Site Description and History

The Site consists of approximately 11.6 acres on the northwest corner of Doolittle Drive and Polvorosa Avenue in San Leandro, California (Figure 1). The Site is generally flat with a slight slope toward the west. The Site is occupied by a business park development. Prior to development, the Site was used as a truck terminal by several different owners from 1959 to 1986.

In 1986, the terminal buildings were demolished, and seven underground storage tanks (USTs) were removed from the central area of the present Building C in September

1986 (see Figure 2). The removed tanks included four 10,000-gallon diesel USTs, two 10,000-gallon gasoline USTs, and one motor oil UST of unknown size (Blaine 1986). It was evident upon removal of the USTs that a release of petroleum hydrocarbons had occurred.

Since the business park buildings were constructed in 1986, no further development of the property has occurred or is planned. Future land use is expected to remain commercial and industrial.

2.2 Previous Soil and Groundwater Investigations and Remediation

Following removal of the USTs in 1986, several phases of investigation were conducted at the Site to assess the lateral and vertical extent of petroleum hydrocarbons in soil and groundwater and to assess the hydraulic properties of the shallow groundwater-bearing zone. A summary of the chronology of events is presented in a letter report from Hazardous Materials Mitigation Professionals (HMMP) dated May 20, 1988. A letter dated October 26, 1994 from LFR to the ACDEH lists all the technical reports associated with the assessment and remediation activities at the Site, as well as a chronology of LFR activities at the Site as of that date. The following sections summarize the results of these investigations and remediation efforts.

2.2.1 Soil Quality Investigations

Analyses of soil samples collected from soil borings SB-1 through SB-5 and well borings MW-1 through MW-9 in 1986 indicate the presence of total petroleum hydrocarbons (TPH) as diesel (TPHd) and as gasoline (TPHg) in the soil beneath what is now Building C and the central parking lot between Buildings A, B, and C (Figure 2). Soil samples were taken at 5.5 and 10.5 feet below ground surface (bgs). The water level during the time of sampling was at 10 feet bgs; therefore, the samples collected at 10.5 feet bgs were saturated. Results of the analytical tests for petroleum hydrocarbons range from a low of "not detected" in soils from locations MW-5, MW-7, and MW-9 to 2,800 parts per million (ppm) TPHd under Building C. Three samples contained concentrations of TPHd exceeding 1,000 ppm. All three of these samples were collected at depths of 10.5 feet bgs. Two of the locations are under Building C and one is in the central parking lot. Figure 2 presents the test results for TPH at the respective sample depths and locations.

The soil samples collected in 1986 were also tested for benzene, toluene, and xylene (BTX) at depths of 5.5 and 10.5 feet. Generally, the chemical test results were relatively low for BTX. The only slightly elevated concentration was 0.77 ppm of benzene taken at 10.5 feet bgs in soil boring SB-1, which is now under Building C in one of the former tank location areas.

The soil analysis results indicate that concentrations of TPH and BTX were generally lower at depths of 5.5 feet than at depths of 10.5 feet, suggesting that soils at depths shallower than 5.5 feet are not likely to be significantly affected by TPH and BTX.

2.2.2 Groundwater Remediation

In 1989, LFR installed a product recovery/groundwater extraction system, which was in operation until 1993. Approximately 766,000 gallons of groundwater were extracted. The total volume of product recovered was approximately 283 gallons. The depth of free product was reduced from the initially measured 1.8 feet in well LF-12 in September 1988 to 0.05 foot in September 1994 (LFR 1988, 1994).
— actually reduced to 0.02' (¼") by 5/95

2.2.3 Groundwater Monitoring

LFR conducted quarterly groundwater monitoring at the Site from September 1994 through June 1995 (LFR 1994, 1995a, b and c). The following summarizes the groundwater monitoring results:

- Depth to groundwater levels measured in site monitoring wells ranged from approximately 6 to 11 feet bgs. The general direction of groundwater flow at the Site, according to the most recent data (LFR 1995c), is to the north under a horizontal hydraulic gradient of approximately 0.001 foot/foot (ft/ft).
- Approximately 0.02 foot of free petroleum product was measured in monitoring well LF-12 in May 1995. The depth of free product decreased from the 0.05 foot measured during the first quarterly monitoring event in September 1994.
- The groundwater samples collected from monitoring wells MW-3, MW-8, MW-10, LF-13, and LF-15 were below method detection limits for benzene, toluene, ethylbenzene, and total xylenes (BTEX) for the last two sampling events (March and May 1995).
- Low levels of benzene (0.0006 to 0.0009 parts per ~~billion [ppb]~~ million (ppm)) were detected in monitoring well LF-14 during all sampling events.
- The groundwater samples collected from monitoring wells MW-10 and LF-13 were below method detection limits for TPHd and TPHg during all sampling events.
- Monitoring well MW-3 had the highest levels of TPHg (21 ppm) and TPHd (38 ppm) detected in the last quarter (May 1995). These values were significantly lower than those detected during the first quarter (58 ppm TPHg and 87 ppm TPHd, in September 1994).
- Low concentrations of TPHg and TPHd were consistently detected in monitoring wells MW-8 (2.1 ppm and 15.0 ppm maximum, respectively) and LF-14 (1.7 ppm and 13.0 ppm maximum, respectively), during all sampling events.

The laboratory reported that the TPHg detected in the groundwater samples was not typical of a gasoline chromatogram (LFR 1995c). This information, coupled with the low incidence of BTEX compounds in the groundwater samples, suggests that the reported TPHg was likely the lighter fraction of hydrocarbons present in diesel.

2.2.4 Subsurface Investigation at Adjacent Property

A limited subsurface investigation was performed in September 1997 by Nova Environmental Services, Inc. (Nova) at the adjacent property, located at 1501 Doolittle Drive in San Leandro, California, north of the Site. Six soil borings were advanced using a Geoprobe drill rig, and grab groundwater samples were collected from each of the six boreholes. The results of this investigation are summarized below (Nova 1997):

- No organic vapors were detected in soil in five of the six soil borings, using a field photoionization detector (PID).
- TPHg, TPHd, and BTEX were not detected in grab groundwater samples collected from five of the six soil borings.
- Organic vapors were detected at low concentrations, ranging from 50 to 200 ppm, at depths from 4 to 12 feet bgs in soil boring GP-4. This soil boring is the nearest of the six soil borings to Building C at the Site.
- TPHd and TPHg were detected at low concentrations of 2.0 ppm and 0.5 ppm, respectively, in the grab groundwater sample collected from soil boring GP-4.

These investigation results are consistent with previous groundwater monitoring results (Section 2.2.3) and suggest that very little migration of petroleum hydrocarbons from the Site to the adjacent property at 1501 Doolittle Drive has occurred.

3.0 SUMMARY OF THE RBCA EVALUATION

At the request of the ACDEH, LFR prepared an RBCA evaluation for the Site (LFR 1997). The RBCA evaluation was based on the American Society for Testing and Materials (ASTM) Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites (ASTM standard method E 1739-95). The RBCA evaluation was submitted on March 19, 1997, and was revised in response to comments from the ACDEH. The revised RBCA evaluation is presented in Appendix A.

In accordance with ASTM standard method E 1793-95, the RBCA evaluation used a tiered approach to evaluate potential risks to human health. The Tier 1 evaluation compared concentrations of petroleum hydrocarbons in soil and groundwater at the Site to risk-based screening levels (RBSLs). The Tier 2 evaluation used additional Site data to develop site-specific target levels (SSTLs), which were then compared to concentrations of petroleum hydrocarbons at the Site to evaluate potential risks to human health. The following sections summarize the results of the RBCA evaluation.

3.1 Results of Tier 1 RBCA Evaluation

The Tier 1 RBCA evaluation identified two significant transport mechanisms:

- volatilization and atmospheric dispersion (through landscaped areas around the buildings)
- volatilization, migration of vapors through the building foundation, and enclosed-space (indoor air) accumulation

Because no further development of the Site is planned and future land use is expected to remain commercial and industrial, the potential receptors at the Site were characterized as commercial/industrial workers and construction workers.

The Tier 1 RBCA evaluation found that concentrations of benzene and toluene in soil and groundwater exceeded the RBSLs for the volatilization into indoor air (see Appendix A). However, to further evaluate whether residual concentrations of benzene and toluene at the Site pose an acceptable risk, LFR completed a Tier 2 evaluation to derive SSTLs, as discussed below.

3.2 Results of Tier 2 RBCA Evaluation

SSTLs were calculated using a combination of default assumptions and site-specific data gathered during previous soil and groundwater investigations at the Site (see Appendix A). The Tier 2 RBCA evaluation found that measured concentrations of benzene and toluene in soil and groundwater at the Site were well below the SSTLs. Expected concentrations of benzene and toluene in soil and groundwater adjacent to a fresh diesel sheen, based on equilibrium partitioning, were also well below the SSTLs, indicating that residual concentrations of benzene and toluene in soil and groundwater at the Site do not pose a significant risk to commercial/industrial workers or construction workers.

Based on the results of the Tier 2 RBCA evaluation, LFR recommended no further corrective action at the Site. This recommendation is consistent with proposed state of California guidelines, since benzene has not been detected at concentrations greater than 1 milligram per liter (mg/l) at the Site and the Site is greater than 750 feet from the nearest drinking water well.

4.0 RISK MANAGEMENT

The RMP addresses precautions that will be undertaken for mitigation of any risks to human health and the environment. The hypothetical risk to commercial/industrial workers and construction workers was evaluated in the RBCA analysis (see Section 3.0 and Appendix A).

As described in the RBCA analysis, the relevant potential exposure pathway for on-site personnel is inhalation of chemicals volatilizing from soil and groundwater. The risk analysis confirms that under relevant exposure scenarios, the potential risk to on-site personnel from inhalation of chemicals volatilizing from soil or groundwater is negligible.

Any future construction that may modify potentially affected soil, building foundations, or pavement must be completed in a manner that is consistent with the RMP. Components of the RMP are as follows:

- establish protocols for on-site workers engaged in possible future subsurface excavation activities (e.g., utility repairs, work on building foundations, changes to paved areas) to define adequate protective measures (Section 4.1)
- preclude use of groundwater beneath the Site unless the current owners request and the RWQCB and ACDEH staff approve the use of groundwater (Section 4.2)

4.1 Protocols for Future Subsurface Activities

Contractors need to be made aware of risks, and apply applicable H&S precautions.

Workers engaged in possible future subsurface excavation activities (e.g., utility repairs, work on building foundations, changes to paved areas) will be required to define adequate protective measures. For subsurface work to be performed on the Site, workers will be health and safety trained and will use the appropriate level of personal protective equipment.

NO!

Workers engaged in subsurface excavation activities on the Site will be required to prepare site-specific health and safety plans consistent with state and federal Occupational Safety and Health Administration standards for hazardous waste operations (California Code of Regulations, Title 8, Section 5192 and 29 Code of Federal Regulations 1910.120, respectively) and any other applicable health and safety standards. The health and safety plans will be submitted to the ACDEH and the RWQCB for review.

Because any possible future subsurface excavation activities are not expected to extend deeper than 5 feet bgs, and shallow soils at the Site do not appear to be significantly affected (see Section 2.2.1), no soil sampling or air monitoring will be required unless visibly stained soils or noticeable hydrocarbon odors are encountered.

4.2 Groundwater Use at the Site

Groundwater in the Site vicinity is not currently being extracted for human uses. The Site owner will not use groundwater beneath the Site without first securing approval from RWQCB and ACDEH staff.

California well standards require that all water supply wells be located an adequate horizontal distance from known or potential sources of contamination, and must have a

20-foot minimum depth of annular seal. Industrial or community water supply wells must have a 50-foot minimum depth of annular seal. Since only the shallow groundwater (at depths less than 20 feet) at the Site is affected by petroleum hydrocarbons, the state well standards will provide adequate protection against the use of potentially affected groundwater at and in the vicinity of the Site.

The Alameda County Department of Public Works (ACDPW) currently will not issue permits to install new water supply wells in the City of San Leandro ("the City") because groundwater underlying approximately half of the City's land is affected by chemicals from USEPA Superfund sites in the area (telephone conversation with LFR on April 13, 1998). Since permits to install new water supply wells within the City are not being approved by the ACDPW, groundwater use is not permitted.

No further monitoring of groundwater is proposed, since monitoring conducted in 1994 to 1995 indicated that TPH and BTEX concentrations in groundwater are either stable or decreasing, and no significant migration of these chemicals in groundwater has occurred.

5.0 LONG-TERM COMPLIANCE

The City has established administrative procedures providing that this RMP be reviewed before the issuance of any building, changes in use, or zoning permits to any owner at the Site and for adjacent sites, and that this RMP be implemented during the permitted activity. These procedures are as follows.

- The City processes all permit applications for building, changes in use, and zoning through the Development Services Department, a "one-stop-shop."
- The Development Services Department maintains a file on properties by street address which is screened for all building permits, changes in use permits, and zoning applications.
- The RMP will be placed in the Development Services Department file for the Site and adjacent downgradient properties.
- The City will refer all applicants for building, changes in use, and zoning permits for the Site and adjacent downgradient properties to the RMP.

ok

Therefore, all such applicants will be notified regarding the potential presence of petroleum hydrocarbons and the provisions of the RMP as part of the permitting process. In addition, the Site owner will notify the ACDEH and RWQCB of any proposed changes in use.

6.0 CONCLUSIONS

Results of groundwater monitoring in 1994 and 1995 showed that groundwater remediation efforts have been effective in reducing concentrations of petroleum hydrocarbons in groundwater. Results of the RBCA evaluation showed that residual concentrations of petroleum hydrocarbons in soil and groundwater at the Site do not pose a significant risk to commercial/industrial workers or construction workers. Implementation of the long-term precautions described in the RMP will facilitate regulatory closure of the Site by providing a framework to manage residual concentrations of petroleum hydrocarbons in soil and groundwater in a manner that is protective of human health and the environment. Therefore, LFR recommends that the fuel leak case be closed.

REFERENCES

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Levine · Fricke · Recon Inc. (LFR). 1988. Report on Hydrogeologic Assessment. Polvorosa Business Park Site, San Leandro, California. Prepared for Rouse and Associates. November 1.

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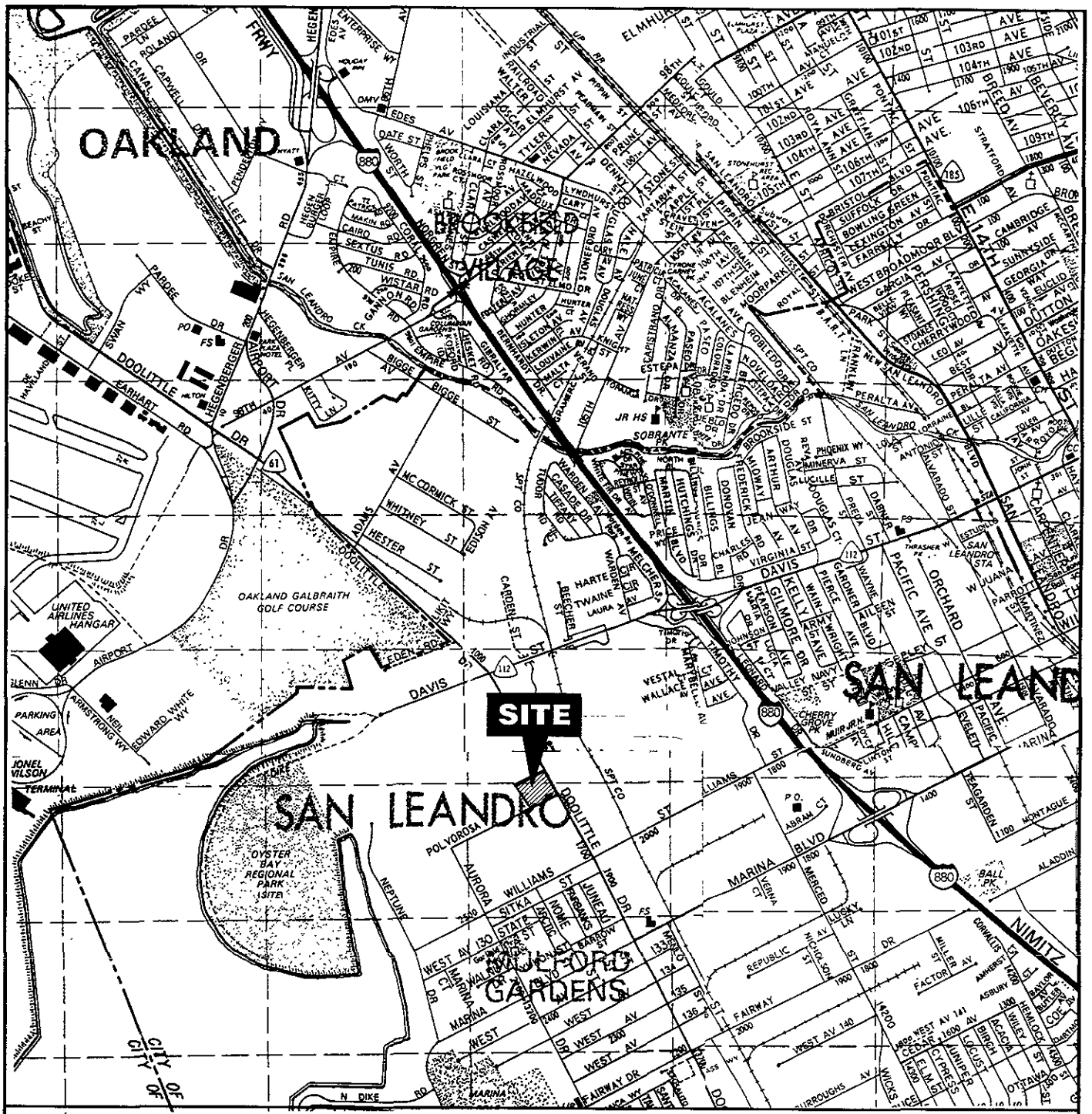
_____. 1997. Risk-Based Corrective Action (RBCA) Evaluation for Polvorosa Business Park, San Leandro, California. Prepared for Alameda County Department of Environmental Health. March 19.

Nova Environmental Services, Inc. 1997. Limited Subsurface Investigation Report, 1501 Doolittle Drive, San Leandro, California. Prepared for J.P. Morgan Investment Company. October 10.



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POLVOROSA BUSINESS PARK

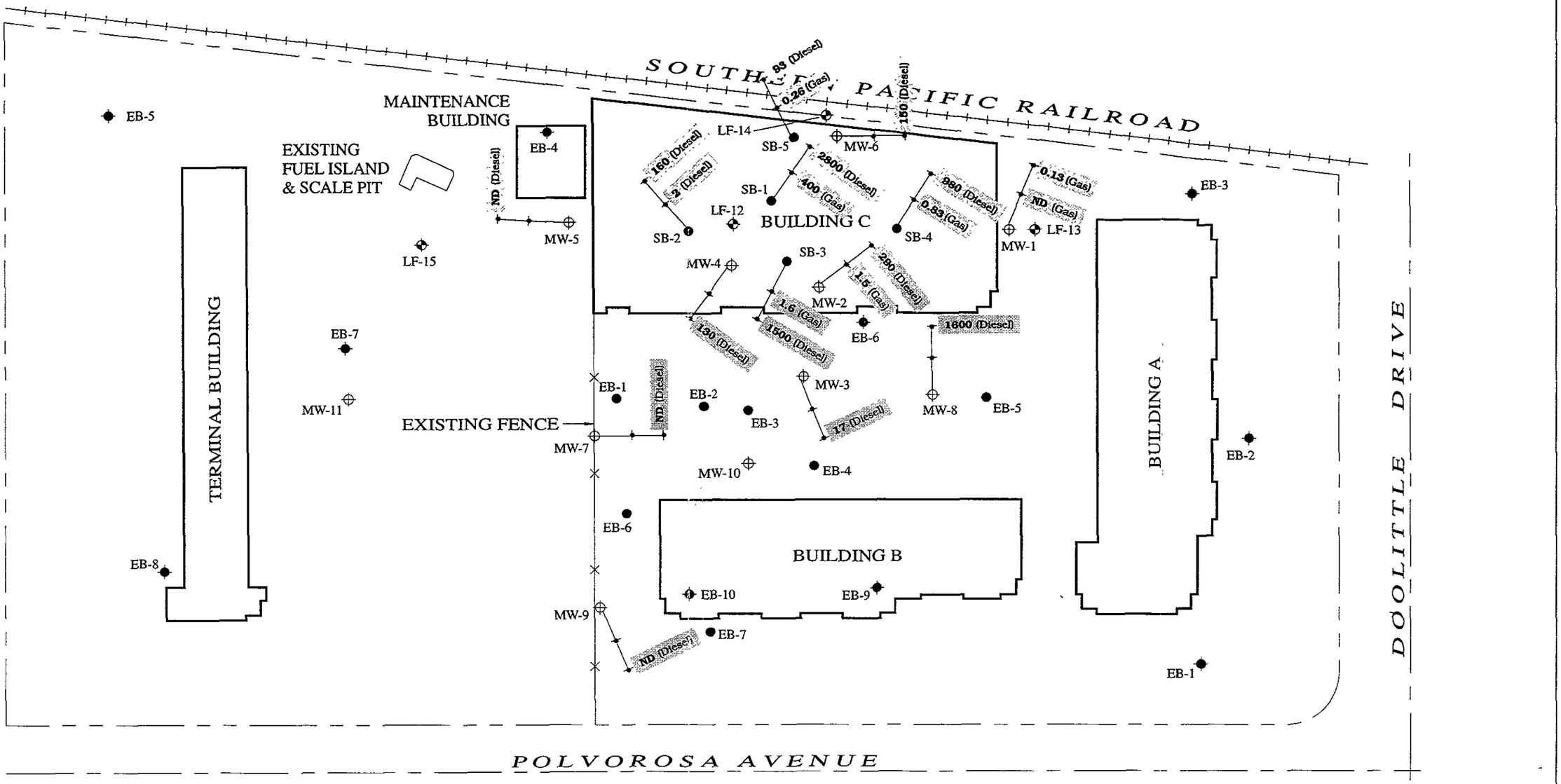
Site Location Map,
Polvorosa Business Park,
1555 Doolittle Drive, San Leandro, California

Levine-Fricke-Recon

Figure 1

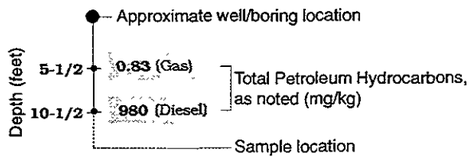
Project No. 1204

1204C003.CDR 041498

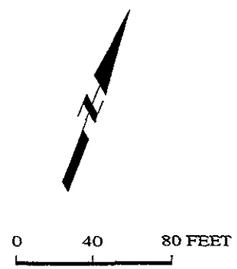


EXPLANATION

- Approximate well location installed for this study
- Approximate well location installed and tested by others
- Approximate soil boring location drilled by Donald E. Banta and Associates
- Approximate soil boring location drilled by others



Note: Ground-water level during soil sample collection was at 10 feet bgs. Soil samples collected were all at 5.5 and 10.5 feet bgs.
Samples taken on 14 October 1986



POLVOROSA BUSINESS PARK

Total Petroleum Hydrocarbons in Soil from Hydrogeologic Assessment

Levine-Fricke-Recon Figure 2

Project No. 1204

1204B001.CDR 031396

Appendix A

Risk-Based Corrective Action Evaluation for Polvorosa Business Park

May 6, 1997 1204.00-004

Risk-Based Corrective Action (RBCA) Evaluation for
Polvorosa Business Park
1555 Doolittle Drive
San Leandro, California

Based on a request from Alameda County Department of Environmental Health (ACDEH), Levine-Fricke-Recon Inc. (LFR) has prepared this Risk-Based Corrective Action (RBCA) evaluation for the Polvorosa Business Park site (hereafter referred to as "the Site"). This evaluation is derived from the Standard RBCA method applied to petroleum release sites (American Society for Testing of Materials, ASTM standard method E-1739-95). In the absence of specific state policy and guidance concerning RBCA, we have used the example policies presented in the Appendices of ASTM E-1739, modified as noted.

Step 1: Initial Site Assessment

The site investigation was conducted in several phases subsequent to UST removal in 1986. The groundwater characterization was completed by LFR in 1988. The most current soil quality data is from samples collected by Groundwater Technology in October, 1986.

The fuel types of concern are gasoline- and diesel-range fuel hydrocarbons. The thickness of free-phase hydrocarbons on groundwater was measured when encountered. Groundwater quality samples were analyzed for total petroleum hydrocarbons as gasoline (TPHg), TPH as diesel (TPHd), benzene, toluene, ethylbenzene, and xylenes. Groundwater samples were not analyzed for the above analytes when free-phase hydrocarbons were detected. Soil samples (collected in 1986) were analyzed for motor fuels, benzene, toluene, and total xylenes.

Step 2: Site Classification and Initial Response Action

Using Table 1 of ASTM Standard E 1739-95, the site falls under Classification 3 - Long-term threat to human health, safety, or sensitive environmental receptors. (This conclusion was drawn from both pre- and post-remediation conditions)

Interim Remedial Action

During UST removal activities in 1986, some unsaturated-zone hydrocarbon-affected soils in the immediate vicinity of the USTs were removed. However, the quantity of soils that were removed was not recorded. Based on available records, the volume of soils excavated may have been several hundred cubic yards.

From August, 1989 to August, 1993, a total fluids groundwater capture system was operated in the area where free-phase hydrocarbons were encountered. Approximately 766,000 gallons of total fluids were removed, including about 283 gallons of free-phase hydrocarbons.

Step 3: Tier 1 Evaluation

The following is a brief summary of the rationale used in screening of reasonable sources, pathways, and exposures for evaluation.

Primary Sources:

The tanks and piping were removed in 1986.

Secondary Sources:

Based on existing data, the following secondary sources are present at the site:

- impacted subsurface soils
- dissolved groundwater plume
- free-phase liquid plume (limited extent based on observation of hydrocarbon sheen)

Transport Mechanisms:

The site is presently covered with asphalt and building structures. A one-story warehouse building overlies much of the more affected area. A landscaped area, without pavement, exists near the hydrocarbon-affected area, and is estimated at about 10% of the building footprint. Downgradient wells on the Site indicate that the plume has had little or no additional migration after the cessation of ground water capture.

The following transport mechanisms were judged to be significant:

- volatilization and atmospheric dispersion (through landscaped areas around the parking area)
- volatilization, migration of vapors through the building foundation, and enclosed-space accumulation

The following transport mechanisms were not considered significant as noted:

- wind erosion and atmospheric dispersion (because only a small portion of the site is unpaved)
- leaching and groundwater transport (because ground water is not extracted for human uses in the general vicinity of the Site)
- mobile free-liquid migration (because the source and mobile free-phase hydrocarbons were removed)
- stormwater/surface water transport (because the affected area does not include any affected surface soils or any large underground lines)

The receptors at the Site were characterized as:

- commercial/industrial
- construction workers

Applicable Risk-Based Screening Levels (RBSLs) from Tier 1 Look-up Table

Using the modified example ASTM RBCA table provided to us by ACDEH, the following is a comparison of applicable values for commercial/industrial sites:

SOIL-BASED EXPOSURE PATHWAYS, RBSLS, AND AVAILABLE SITE DATA

Exposure Pathway	Target Risk Level	Benzene (mg/kg)	Toluene (mg/kg)	Xylenes (total) (mg/kg)
Volatilization to outdoor air	Cancer $1x10^{-6}$	0.133		
	Cancer $1x10^{-4}$	13.3		
	Chronic Hazard		RES	RES
Vapor intrusion into buildings	Cancer $1x10^{-6}$	0.00155		
	Cancer $1x10^{-4}$	0.155		
	Chronic Hazard		54.5	RES
Max Conc. detected (1998)		0.77	0.27	1.2
Mean over-excavation (@10'x10'x8' (1998)		0.23	0.11	0.28

GROUNDWATER-BASED EXPOSURE PATHWAYS, RBSLs, AND AVAILABLE SITE DATA

Exposure Pathway	Target Risk Level	Benzene (mg/l)	Toluene* (mg/l)	Ethylbenzene (mg/l)	Xylenes (total)
Volatilization to outdoor air	Cancer $1x10^{-6}$	5.34			
	Cancer $1x10^{-4}$	>S			
	Chronic Hazard		>S	>S	>S
Vapor intrusion into buildings	Cancer $1x10^{-6}$	0.0069			
	Cancer $1x10^{-4}$	0.69			
	Chronic Hazard		54.5	>S	RES
[illegible]	[illegible]	[illegible]	[illegible] MDL	[illegible] MDL	[illegible] MDL
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

EXPLANATION:

RES = the selected risk level is not exceeded for pure compound selected in any concentration

>S = the selected risk level is not exceeded for all possible dissolved levels

<MDL = the analyte was not detected above the lab minimum detection level

bgs = below ground surface (depth)

*the mean calculated was an arithmetic mean of soil sample data at the approximate depth of shallow ground water over the area and immediate vicinity of Building C

** the 0.0009 mg/l benzene concentration detected was in a well downgradient from the most affected area; well LF-12 was not sampled in May 1995 due to the measurement of 0.02 feet of free-phase hydrocarbons

The estimated maximum concentrations for benzene, toluene, ethylbenzene, and xylenes were based on mole fractions of 0.026, 0.015, 0.0038, and 0.021, and pure-compound solubilities of 1780, 515, 152, and 215 mg/l, respectively. The lightly shaded cells of RBSL values are those exceeded at the Tier 1 screening level.

Step 4: Decision Tree/Comparison with RBSLs

Based on our conversations with ACDEH, we considered a $1x10^{-4}$ (1 in ten thousand) excess cancer risk as the appropriate target risk level for the commercial/industrial receptors at the Site.

Chemical(s) of concern concentrations exceed RBSLs? - Yes, benzene (both soil and ground water into indoor air) and toluene (soil and ground water into indoor air). Both of the groundwater RBSLs were exceeded based on the assumption of free-phase hydrocarbons rather than the actual values detected.

Remediation to Tier 1 RBSLs practicable? - No

Interim remedial action appropriate? - Yes, but to further evaluate whether remaining concentrations pose an acceptable risk, we completed a Tier 2 evaluation to derive Site Specific Target Levels (SSTLs).

Step 5: Tier 2 Calculation of SSTLs

Based on the attached calculations, the groundwater-to-outdoor air pathway is well below the applicable commercial/industrial SSTL values using a combination of default and site-specific assumptions.

Table 1 shows the Site-specific assumptions used to calculate the SSTLs. Other input parameters were taken from the default parameters presented in ASTM E1739.

Tables 2, 3 and 4 are the calculations used to derive the SSTLs for the indoor air exposure pathway. The SSTLs calculated are summarized below:

Media	Benzene		Toluene
Risk Level	risk=10^{-4}	risk=10^{-5}	HI=1
Soil (mg/kg)	17.0	1.7	1,683
Groundwater (mg/l)	34.0	3.4	1,168

Step 6: Comparison with SSTLs

The calculated benzene and toluene SSTLs are well above the detected concentrations of benzene and toluene in soil and groundwater at the Site. The groundwater SSTLs for benzene (34 mg/l at the $1x10^{-4}$ risk level) and toluene (1,168 mg/l) also are well above the estimated maximum groundwater concentrations (4.6 mg/l for benzene and 7.7 mg/l for toluene) that would be expected adjacent to a fresh liquid diesel sheen, based on equilibrium partitioning. The groundwater SSTL for benzene at the $1x10^{-4}$ risk level is several orders of magnitude greater than the maximum detected concentration of benzene in groundwater at the Site, which was only 0.0009 mg/l in a sample collected from well LF-14, downgradient from the former USTs.

Conclusion

We recommend no further corrective action at the Site. It is our opinion that the possible exposure pathways have been considered and evaluated to pose an insignificant risk using Site data. This conclusion is consistent with proposed State of California guidelines, since benzene has not been detected at concentrations greater than 1 mg/l at the Site and the Site is greater than 750 feet from the nearest drinking water well.

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PROJECT: Polvorosa Site RBCA Evaluation
SUBJECT: Site-Specific Input Parameters

SHEET Table 1, p.1 OF 1, Calcs 1/8
JOB NO.: 1204.00.03
DATE: 18 March 1997, Rev 8/4/97
COMPUTED BY: J. Sturman
CHECKED BY: E. Nichols

Symbol	Definition of Parameter	Tier 1 Default Value	Tier 2 Site-Specific Value	Reason for Modification
θ_{as}	volumetric air content vadose zone soils	0.26 $\frac{cm^3 air}{cm^3 soil}$	0.18 $\frac{cm^3 air}{cm^3 soil}$	fine-grained soils under buildings are typically at least 50% saturated
θ_{ws}	volumetric water content vadose zone soils	0.12 "	0.20 "	" "
$\theta_{a\,crack}$	volumetric air content foundation cracks	0.26 "	0.18 "	foundation cracks are typically partially filled with soil and/or water
$\theta_{w\,crack}$	Volumetric Water Content foundation cracks	0.12 "	0.20 "	" "
h_v	thickness of vadose zone	295 cm	305 cm	the approximate depth to ground water is about 9 feet at the site
L_{GW}	depth to ground water	300 cm	310 cm	$L_{GW} = h_v + h_{cap}$
L_S	depth to subsurface soil sources	100 cm	170 cm	in 1986, some hydrocarbons were detected at 5.5 feet bgs
ER	enclosed-space air exchange rate	0.00023/sec	0.00023/sec	~~an exchange rate of 10 volumes per hour was used based on the use of the building as a warehouse with large doors open much of the time~~
		※revised to use commercial/industrial default value 8/4/97		
η	areal fraction of cracks in foundation	0.01	0.001	the building is relatively new (about 10 years) and was constructed with a polyethylene moisture barrier below the foundation slab

Diffusion Coefficient Soil - Vapor, D_s^{eff}

$$D_s^{eff} \cong D_v^{air} \frac{\theta_{as}^{3.33}}{\theta_T^{2.0}} + D^{wat} \frac{1}{H} \frac{\theta_{ws}^{3.33}}{\theta_T^{2.0}}$$

For benzene,

$$D_s^{eff} \cong 0.093 \frac{(0.18)^{3.33}}{(0.38)^{2.0}} + (1.1\times10^{-5}) \frac{1}{0.22} \frac{(0.18)^{3.33}}{(0.38)^{2.0}}$$

$$\cong 0.093 \frac{0.0033}{0.1444} + (1.1\times10^{-5})(4.54) \frac{0.0033}{0.1444}$$

$$\cong 0.0021 + 1\times10^{-6}$$

$$\cong 0.0021 \text{ cm}^2/\text{sec}$$

For toluene,

$$D_s^{eff} \cong 0.093 \frac{(0.18)^{3.33}}{(0.38)^{2.0}} + (9.4\times10^{-6}) \frac{1}{0.26} \frac{(0.18)^{3.33}}{(0.38)^{2.0}}$$

$$\cong 0.0021 + 1\times10^{-6}$$

$$\cong 0.0021 \text{ cm}^2/\text{sec}$$

Diffusion Coefficient through foundation cracks, D_{crack}^{eff}

$$D_{crack}^{eff} \cong D^{air} \frac{\theta_{acrack}^{3.33}}{\theta_T^{2}} + D^{wat} \frac{1}{H} \frac{\theta_{ws}^{3.33}}{\theta_T^{2}}$$

For benzene,

$D_{crack}^{eff} \cong$ same as D_s^{eff} for benzene $= 0.0021 \text{ cm}^2/\text{sec}$

For toluene,

$D_{crack}^{eff} \cong$ same as D_s^{eff} for toluene $= 0.0021 \text{ cm}^2/\text{sec}$

Diffusion Coefficient through capillary fringe, D_{cap}^{eff}

$$D_{cap}^{eff} = D^{air} \frac{\theta_{acap}^{3.33}}{\theta_T^2} + D^{wat} \frac{1}{H} \frac{\theta_{wcap}^{3.33}}{\theta_T^{2.0}}$$

For benzene,

$$D_{cap}^{eff} = 0.093 \frac{(0.038)^{3.33}}{(0.38)^{2.0}} + 1.1\times10^{-5} \frac{1}{0.22} \frac{(0.342)^{3.33}}{(0.38)^{2.0}}$$

$$= 0.093 \frac{0.000019}{0.1444} + 1.1\times10^{-5} \frac{1}{0.22} \frac{0.028}{0.1444}$$

$$= 1.2\times10^{-5} + 9.7\times10^{-6}$$

$$= 2.2\times10^{-5} \text{ cm}^2/\text{sec}$$

For toluene,

$$D_{cap}^{eff} = 0.093 \frac{(0.038)^{3.33}}{(0.38)^{2.0}} + 9.4\times10^{-6} \frac{1}{0.26} \frac{(0.342)^{3.33}}{(0.38)^{2.0}}$$

$$= 0.093 \frac{0.000019}{0.1444} + 9.4\times10^{-6} \frac{1}{0.26} \frac{0.028}{0.1444}$$

$$= 1.2\times10^{-5} + 7.0\times10^{-6}$$

$$= 1.9\times10^{-5} \text{ cm}^2/\text{sec}$$

Diffusion Coefficient between ground water and soil surface D_{ws}^{eff}

$$D_{ws}^{eff} = (h_{cap} + h_v)\left(\frac{h_{cap}}{D_{cap}^{eff}} + \frac{h_v}{D_s^{eff}}\right)^{-1}$$

For benzene

$$D_{ws}^{eff} = \frac{(5+305)}{\left(\frac{5}{2.2\times10^{-5}} + \frac{305}{0.0021}\right)} = \frac{310}{2.27\times10^5 + 1.45\times10^3} = 8.3\times10^{-4}$$

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SHEET Table 2, p.3 OF 3, Calcs 4/8
JOB NO.: 1204.00.03
DATE: 18 March 1997, Rev 8/4/97
COMPUTED BY: J. Sturman
CHECKED BY: E. Nichols

PROJECT: Polvorosa Site RBCA Evaluation
SUBJECT: Calculation of diffusion coefficients

For toluene

$$D_{ws}^{eff} = \frac{(5+305)}{\frac{5}{1.9\times10^{-5}} + \frac{305}{0.0021}} = \frac{310}{2.63\times10^{5} + 1.45\times10^{3}} = 7.6\times10^{-4} \text{ cm}^2/\text{sec}$$

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~~SHEET~~ Table 3, p.1 OF 2, Calcs 5/8
JOB NO.: 1204.60.03
DATE: 18 March 1997, Rev 8/4/97
COMPUTED BY: J. Sturman
CHECKED BY: E. Nichols

PROJECT: Polvorosa Site RBCA Evaluation
SUBJECT: Calculation of Volatilization Factors

Volatilization Factor, Soil to indoor air VF_{SESP}

$$VF_{SESP} = \frac{\dfrac{H\rho_s}{[\theta_{ws} + K_s\rho_s + H\theta_{as}]}\left[\dfrac{D_s^{eff}/L_s}{ER \cdot L_B}\right]}{1 + \left[\dfrac{D_s^{eff}/L_s}{ER\ L_B}\right] + \left[\dfrac{D_s^{eff}/L_s}{(D_{crack}^{eff}/L_{crack})\eta}\right]} \times 10^3$$

For benzene,

numerator terms $= \dfrac{0.22\,(1.7)}{0.20 + 0.38\,(1.7) + 0.22\,(0.18)} \dfrac{0.0021/170}{0.00023 \cdot 300}$

$= 0.42 \cdot 0.00018 = 7.5 \times 10^{-5}$

denominator terms $= 1 + \left[\dfrac{0.0021/170}{0.00023 \cdot 300}\right] + \dfrac{0.0021/170}{0.0021/15\ (0.001)}$

$1 + 0.000179 + 88.2 = 89.2$

$$VF_{SESP} = \frac{7.5 \times 10^{-5}}{89.2} \times 10^3 = 8.4 \times 10^{-4} \frac{mg/m^3\ air}{mg/kg\ soil}$$

For toluene,

numerator terms $= \dfrac{0.26\,(1.7)}{0.20 + 1.35\,(1.7) + 0.26\,(0.18)} \dfrac{0.0021/170}{0.00023 \cdot 300}$

$= 0.173 \cdot 0.00018 = 3.1 \times 10^{-5}$

denominator terms = Same as benzene, above

Toluene $VF_{SESP} = \frac{3.1\times10^{-5}}{89.2}\times10^{-3} = 3.47\times10^{-4}$ $\frac{mg/m^3\ air}{mg/kg\ soil}$

Volatilization Factor, groundwater to indoor air, VF_{WESP}

$$VF_{WESP} = \frac{H\left[\frac{D_{ws}^{eff}/L_{GW}}{ER\ L_B}\right]}{1+\left(\frac{D_{ws}^{eff}/L_{GW}}{ER\ L_B}\right)+\left[\frac{D_{ws}^{eff}/L_{GW}}{(D_{crack}^{eff}/L_{crack})n}\right]}\times10^3$$

For benzene, numerator terms $= 0.22\ \frac{8.3\times10^{-4}/310}{0.00023\cdot300} = 8.5\times10^{-6}$

denominator terms $= 1 + \frac{8.3\times10^{-4}/310}{0.00023\cdot300} + \frac{8.3\times10^{-4}/310}{0.0021/15\cdot0.001}$

$= 1 + 3.9\times10^{-5} + 19.1 = 20.1$

Benzene $VF_{WESP} = \frac{8.5\times10^{-6}}{20.1}\times10^3 = 4.2\times10^{-4}$ $\frac{mg/m^3\ air}{mg/L\cdot H_2O}$

For toluene numerator terms $= 0.26\ \frac{7.6\times10^{-4}/310}{0.00023\cdot300} = 9.24\ 10^{-6}$

denominator terms $= 1+\left(\frac{7.6\times10^{-4}/310}{0.00023\cdot300}\right)+\frac{7.6\times10^{-4}/310}{0.0021/15\cdot0.001} = 18.5$

Toluene $VF_{WESP} = \frac{9.24\times10^{-6}}{18.5}\times10^3 = 5.0\times10^{-4}$ $\frac{mg/m^3\ air}{mg/L\cdot H_2O}$

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~~SHEET~~ Table 4, p.1 OF 2, Calcs 7/8
JOB NO.: 1204.00.03
DATE: 18 March 1997, Rev. 8/4/97
COMPUTED BY: J. Sturman
CHECKED BY: E. Nichols

PROJECT: Palvarosa Site RBCA Evaluation
SUBJECT: Calculation of SSTLs

Calculation of Site-Specific Target Levels

Benzene – 1×10^{-4} risk level

Using $C_{air} = 1.43 \times 10^{1}$ mg/m³ as the maximum acceptable level based on the Tier 1 look-up table,

For soil

$$C_{T\ soil}^{Ben} = \frac{C_{air}}{VF_{SESP}} = \frac{1.43 \times 10^{1}\ ug/m^3}{8.4 \times 10^{-4}\ \frac{mg/m^3\ air}{mg/kg\ soil}} \times 10^{-3}\ \frac{mg}{ug}$$

$$= 17.0\ mg/kg\ soil$$

For groundwater

$$C_{T\ gw}^{Ben} = \frac{C_{air}}{VF_{WESP}} = \frac{1.43 \times 10^{1}\ ug/m^3}{4.2 \times 10^{-4}\ \frac{mg/m^3\ air}{mg/L\ H_2O}} \times 10^{-3}\ \frac{mg}{ug}$$

$$= 34.0\ mg/L\ groundwater$$

Toluene

For soil $C_{air} = 5.84 \times 10^{2}$ mg/m³ as above (HQ = 1)

$$C_{T\ Soil}^{Tol} = \frac{C_{air}}{VF_{SESP}} = \frac{5.84 \times 10^{2}\ mg/m^3}{3.47 \times 10^{-4}\ \frac{mg/m^3\ air}{mg/kg\ soil}} \times 10^{-3}\ \frac{mg}{ug}$$

$$= 1{,}683\ mg/kg\ soil$$

Toluene in ground water

$$C_{T\ GW}^{Tol} = \frac{C_{air}}{VF_{WESP}} = \frac{5.84 \times 10^{2}\ mg/m^3}{5.0 \times 10^{-4}\ \frac{mg/m^3\ air}{mg/L \cdot H_2O}} \times 10^{-3}\ mg/mg$$

$$= 1{,}168\ mg/L \cdot H_2O\ \text{ground water}$$

Benzene – 1×10^{-5} risk level

$C_{air} = 1.43\ ug/m^3$ from Tier 1 Look-up Table

C_T values are one order of magnitude less than the 1×10^{-4} risk level values

Thus $C_{T\ soil}^{benzene} = 1.70\ mg/kg$

$C_{T\ gw}^{benzene} = 3.40\ mg/kg$