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December 19, 2013

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Dear Mr. Detterman:

"I declare under penalty of perjury that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowlege."

Sincerely,

PELCO SALES AND SERVICE

Pennie Barger
Secy-Treas.

Draft
Data Gaps Investigation Work Plan
Apex Refrigeration, Inc.
1550 Park Avenue
Emeryville, California

December 2013

ERRG Project No. 2013-094

Prepared for:

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Emeryville, California 94608

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Apex Refrigeration, Inc.
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Submitted by:
Engineering/Remediation Resources Group, Inc.

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Abbreviations and Acronyms

ACEH	Alameda County Environmental Health Department
Apex	Apex Refrigeration, Inc.
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
1,2-DCA	1,2-dichloroethane
DQOs	data quality objectives
EDB	ethylene dibromide
EPA	U.S. Environmental Protection Agency
ERRG	Engineering/Remediation Resources Group, Inc.
ESLs	environmental screening levels
IDW	investigation-derived waste
LNAPL	light nonaqueous-phase liquids
LUFT	leaking underground fuel tank
mg/kg	milligrams per kilogram
MTBE	methyl tertiary-butyl ether
PAHs	polycyclic aromatic hydrocarbons
PVC	polyvinyl chloride
SCM	site conceptual model
STLC	soluble threshold limit concentration
SFRWQCB	San Francisco Regional Water Quality Control Board
TPH	total petroleum hydrocarbons
TPH-d	total petroleum hydrocarbons as diesel
TPH-g	total petroleum hydrocarbons as gasoline
TPH-mo	total petroleum hydrocarbons as motor oil
USA North	Underground Service Alert North
UST	underground storage tank

Section 1. Introduction

Engineering/Remediation Resources Group, Inc. (ERRG) has prepared this work plan in response to the Alameda County Environmental Health Department's (ACEH) request to collect additional data to further assess the nature and extent of petroleum compounds in soil, groundwater, and soil gas in the vicinity of the former underground storage tank (UST) associated with the Apex Refrigeration Corporation (Apex) building, at 1550 Park Avenue in Emeryville, California (ACEH, 2013b). This work plan describes the specific field activities pertaining to the data gaps investigation. The additional data will be used to support the continued development of the site conceptual model (SCM) and determine whether site closure can be requested in accordance with the criteria established in the State Water Resources Control Board (SWRCB) Low-Threat UST Case Closure Policy (SWRCB, 2012).

Because previous data suggest light nonaqueous-phase liquids (LNAPL) may be present at the site, this data investigation will focus predominantly on the vadose zone and water table interface. The primary elements of the data gaps investigation are summarized below.

- Conduct a geophysical survey to locate utilities and determine depths of previously identified underground utilities to evaluate whether the utility corridors have the potential to contribute to the lateral migration of contaminants in the subsurface.
- Collect soil and groundwater samples from six locations surrounding previous sampling locations to further delineate the areal extent of total petroleum hydrocarbons (TPH) in shallow soil and shallow groundwater.
- Collect two soil gas samples immediately adjacent to the building at 1550 Park Avenue to determine whether vapors are present.
- Install one groundwater well in the area where the highest concentrations of TPH have been detected in soils to assess whether LNAPL is present in the immediate vicinity of the former UST.

In addition to this introduction, which describes the site (Section 1.1) and includes a summary of the site background (Section 1.2), this work plan describes the SCM (Section 2), the data quality objectives (DQOs) (Section 3), and the field activities to be performed by ERRG (Section 4). Section 5 lists the guidance and documents that were used to prepare this work plan, and figures and tables are provided after Section 5.

1.1. SITE LOCATION AND DESCRIPTION

The former UST site is located in Alameda County, California, about 10 miles east-northeast of San Francisco (Figure 1). The site is within the incorporated boundaries of the city of Emeryville. The nearest receiving water body is the San Francisco Bay, located approximately 1,500 feet to the west of the site (Figure 1). The ground surface in the site vicinity is approximately 10 to 15 feet above mean sea level and slopes gently toward the bay (Engineering-Science, 1988).

The former UST site at the western end of Park Avenue is bordered to the west by a Southern Pacific Railroad right-of-way between Halleck Street, to the north and south by commercial buildings, and to the east by Halleck Street. The site underwent recent street improvements and is paved in concrete with surrounding planter boxes. The surrounding land use is primarily commercial and light industrial.

Because the site is located close to the bay, shallow-depth sediments in the vicinity of the site consist primarily of fine-grained silt and clay sediments deposited in tidal marsh and estuarine environments. The depth to groundwater varies seasonally and has been measured historically in the site vicinity between 3 to 5 feet below ground surface (bgs).

1.2. SITE BACKGROUND

In November 2009, a UST was discovered during street improvements adjacent to the building located at 1550 Park Avenue in Emeryville, California (P&D Environmental, Inc., 2010). The street, curb, and gutter adjacent to the south side of the UST were excavated to a depth of approximately 4 feet bgs. The top of the UST was encountered at a depth of approximately 1 foot bgs and was measured to be approximately 10 feet long and 5 feet in diameter. No holes were reported in the tank; however, an opening at the top of the tank allowed access to the interior of the UST. The UST contained water and a floating layer of black, viscous fluid with a strong petroleum odor (P&D Environmental, Inc., 2010).

On December 9, 2009, approximately 700 gallons of oily water was pumped from the UST and transported off site for disposal at the Clearwater Environmental disposal facility in Silver Springs, Nevada (P&D Environmental, Inc., 2010). One water sample collected from the UST was submitted to McCampbell Analytical, Inc. in Pittsburg, California, for a petroleum hydrocarbon fingerprint analysis using U.S. Environmental Protection Agency (EPA) Methods 3550C and 8015B. The laboratory analysis identified fuel oil and possibly bunker oil in the sample. During January and February 2010, approximately 1,500 gallons of additional water was pumped from the UST and the adjacent excavated area and transported for disposal at the Alviso Independent Oil facility in Alviso, California (P&D Environmental, Inc., 2010).

After consulting with Apex, the City of Emeryville removed the UST on February 8, 2010 (P&D Environmental, Inc., 2010). The UST was visually inspected following removal from the excavation pit. The UST appeared to be in good condition and had a calculated capacity of approximately 1,500 gallons. No evidence of cracks or pitting from significant corrosion was observed; however, a hole was observed at the west end of the UST where a rivet was missing. It is unclear whether the rivet was dislodged during UST removal activities. The soil excavated around the UST displayed a blue-gray discoloration and exhibited a strong oily odor (P&D Environmental, Inc., 2010).

Following removal of the UST, a layer of black oil was observed floating on the water in the UST excavation pit at approximately 6 feet bgs. However, water samples could not be collected for chemical analysis because an inadequate amount of water was present in the pit. Two soil samples (T1 and T2) were collected from the bottom of the excavation pit using a backhoe bucket. The samples were collected from the western and eastern ends of the former UST and submitted for laboratory analysis. A four-point composite sample (SP1) was also collected from the excavated soil for waste characterization purposes. The samples were analyzed for TPH as diesel (TPH-d) using EPA Method 3550C, in conjunction with modified EPA Method 8015C, and for benzene, toluene, ethylbenzene, and xylenes (BTEX) and the lead scavengers ethylene dibromide (EDB) and 1,2-dichloroethane (1,2-DCA) by EPA Method 5030B, in conjunction with EPA Method 8260B. In addition, sample SP1 was analyzed for Leaking Underground Fuel Tank (LUFT) 5 metals (cadmium, total chromium, lead, nickel, and zinc) by EPA Method 3050B, in conjunction with EPA Method 6010B, and for total chromium by soluble threshold limit concentration (STLC) test and waste extraction test methods and EPA Method 6010B. Approximately 20.29 tons of soil was transported for offsite disposal at the Republic Services Vasco Road Landfill in Livermore, California.

TPH-d was detected in samples T1, T2, and SP1 at concentrations of 15 milligrams per kilogram (mg/kg), 5.8 mg/kg, and 830 mg/kg, respectively. BTEX, EDB, and 1,2-DCA were not detected at concentrations exceeding laboratory reporting limits in samples T1 and T2. Cadmium was not detected at concentrations exceeding laboratory reporting limits in sample SP1. Total chromium, lead, nickel, and zinc were reported at concentrations of 54 mg/kg, 26 mg/kg, 57 mg/kg, and 110 mg/kg, respectively. The STLC for total chromium in sample SP1 was 0.23 milligrams per liter.

Based on the investigation results, the City of Emeryville prepared an UST Unauthorized Release (Leak)/Contamination Site Report form naming Apex as the responsible party and submitted the form to ACEH for review. ACEH subsequently submitted a letter to Apex, dated June 11, 2011, requiring that a soil and groundwater investigation be performed to delineate the lateral and vertical extent of potential petroleum impacts related to the former UST (ACEH, 2011).

On March 1, 2013, ERRG collected soil samples and groundwater samples from four locations (S1 through S4) surrounding the former UST to evaluate the lateral and vertical extent of petroleum hydrocarbons in soil and groundwater. The soil and groundwater samples were analyzed for TPH-purgeables and extractables by EPA Method 8015B, BTEX and methyl tertiary-butyl ether (MTBE) by EPA Method 8260B, and polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8270C-SIM.

Analytical results for soil and groundwater samples were compared with the San Francisco Regional Water Quality Control Board's (SFRWQCB) environmental screening levels (ESLs) under commercial/industrial land use scenarios where groundwater is not a current or potential source of drinking water (SFRWQCB, 2013). The following analytes were detected at concentrations exceeding the SFRWQCB ESLs in soil and groundwater samples:

- Soil: TPH as gasoline (TPH-g) and TPH-d at locations S2 and S4
- Groundwater: TPH-g and TPH-d at locations S1 through S4; TPH-mo at locations S1, S2, and S4; and benzo(b)fluoranthene at boring S2

BTEX, MTBE, and the remaining PAHs were either not detected at concentrations exceeding their respective laboratory limits or were detected at concentrations less than the SFRWQCB ESLs in soil and groundwater. Figure 2 shows the locations where samples were collected and the TPH results for soil and groundwater.

At the request of ACEH (2013a), a preferential pathway survey was also performed during the investigation to locate possible utility corridors within the immediate area surrounding the former UST. Figure 3 shows the utility lines within and surrounding the project site.

Section 2. Site Conceptual Model

To develop a conceptual understanding of the site, information on potential chemical source, chemical release and transport mechanisms, locations of potentially exposed human and ecological receptors, and potential exposure routes were assessed. The SCM associates the source of chemicals with potentially exposed receptors and complete exposure pathways. In this way, the SCM assists in quantifying potential impacts to human and ecological health.

All of the following four components are necessary for a chemical exposure pathway to be considered complete and for chemical exposure to occur (EPA, 1989):

- A chemical source and a mechanism of chemical release to the environment
- An environmental transport medium (e.g., soil) for the released chemical
- A point of contact between the contaminated medium and the receptor (i.e., the exposure point)
- An exposure route (e.g., dermal contact with chemically impacted soil) at the exposure point

Because site data are limited, the SCM is generally limited to the area of concern surrounding the immediate vicinity of the former UST. Table 1 describes the following SCM elements to identify data gaps and proposed actions to address each data gap:

- Regional and site-specific geology and hydrogeology
- Surface water bodies
- Nearby wells
- Unauthorized releases
- Free product
- Secondary sources
- Vapor intrusion to indoor air
- Preferential pathways

As indicated in Table 1, the source of contamination is the unauthorized release from the former UST and potential contact with detected chemicals at the site could occur via exposure to soil, groundwater, and soil gas.

Section 3. Data Quality Objectives

The following table documents the seven steps of the EPA's DQO process (EPA, 2006) for the collection of soil, groundwater, and soil gas samples and the assessment of LNAPL during this data gaps investigation. Table 2 summarizes the evaluation of data gaps and the rationale for further investigation.

DQO Step	Description
Step 1 State the Problem	TPH-d, TPH-g, TPH-mo and select PAHs (anthracene, benzo[b]fluoranthene, chrysene, and phenanthrene) have been detected in soil and groundwater at concentrations exceeding the SFRWQCB's ESLs for the protection of human health. Further investigation is needed to sufficiently delineate the extent of TPH and PAH contamination in soil, groundwater, and soil gas has not been fully delineated, assess whether LNAPL is present, and to guide site management decisions.
Step 2 Identify the Goal of the Study	The primary questions to be answered by the sampling event are: ▪ What is the areal extent of TPH in soil and shallow groundwater at concentrations exceeding SFRWQCB ESLs? ▪ Does soil gas contain petroleum vapors at concentrations exceeding SFRWQCB ESLs? ▪ Is LNAPL present at the site? ▪ Do subsurface utility corridors have the potential to contribute to the lateral migration of chemicals in subsurface soil or groundwater?
Step 3 Identify Information Inputs	The inputs to the project decision include: ▪ Validated, defensible analytical data for TPH, BTEX and MTBE, and PAHs from previous soil and groundwater samples. ▪ Validated, defensible analytical data for TPH in soil and groundwater samples and for TPH and VOCs in soil gas samples collected as part of this investigation. ▪ SFRWQCB ESLs under commercial/industrial land use scenarios where groundwater is not a current or potential source of drinking water (SFRWQCB, 2013, or most current version). ▪ Map that depicts the locations of previous sampling locations and their analytical data (Figure 2) ▪ Historical reports and site documentation.
Step 4 Define the Boundaries of the Study	The lateral boundary of the project is the railroad right-of-way to the west and adjacent property to the south. The vertical boundary is defined as the depth at which LNAPL is no longer present and TPH concentrations in soil are less than the SFRWQCB ESLs (anticipated to be below 5.5 feet bgs based on previous data). The temporal boundary of the data gaps investigations is the time it will take to perform field activities (i.e., approximately 1 to 2 days). There are no other time constraints for the project.

DQO Step	Description
Step 5 Develop the Analytic Approach	The decision rules for the project are: ▪ **IF** validated analytical results for soil and/or groundwater samples indicate petroleum-related chemical concentrations are less than the SFRWQCB ESLs, **THEN** it will be concluded that the areal extent of petroleum-related chemicals in soil and groundwater is adequately bounded and no further evaluation is necessary. ▪ **IF** validated analytical results for soil and/or groundwater samples indicate petroleum-related chemical concentrations exceed the SFRWQCB ESLs, **THEN** the investigation summary report will evaluate the uncertainty regarding a potentially larger area of contaminated soil and groundwater and will consider the degree to which further characterization would aid in the assessment of potential risks to humans at the site. ▪ **IF** validated analytical results for soil, groundwater, and soil gas samples indicate petroleum-related chemical concentrations are less than the SFRWQCB ESLs, **THEN** it will be concluded that the areas sampled are not potential sources of contamination to groundwater and indoor air and no further evaluation is necessary. ▪ **IF** validated analytical results for soil, groundwater, and soil gas indicate petroleum-related chemical concentrations exceed the SFRWQCB ESLs, **THEN** the investigation summary report will further evaluate potential contaminant sources based on several lines of evidence, including the extent and magnitude of petroleum-related concentrations in soil, groundwater, and soil gas. ▪ **IF** validated analytical results for soil gas samples indicate chemical concentrations are less than the SFRWQCB ESLs, **THEN** it will be concluded that the areas sampled are not potential sources of contamination via vapor intrusion and no further evaluation is necessary. ▪ **IF** validated analytical results for soil gas samples indicate chemical concentrations exceed the SFRWQCB ESLs, **THEN** it will be concluded that the areas sampled are potential vapor intrusion sources. The investigation summary report will evaluate potential vapor intrusion sources based on several lines of evidence, including the extent and magnitude of contamination. ▪ **IF** LNAPL is not measurable in the new monitoring well using an oil/water interface probe, **THEN** it will be concluded that free product is not present and has been removed to the extent practicable during excavation of the former UST and no further evaluation is necessary. ▪ **IF** LNAPL is found at any measurable thickness in the monitoring well using an oil/water interface probe, **THEN** removal of free product to the extent practicable will be evaluated further based on physical site conditions and proven remedial technologies. ▪ **IF** the depth of utility corridors are less than 3 feet bgs, **THEN** it will be concluded that no preferential pathway exists for contamination to migrate laterally in subsurface soil or groundwater and no further evaluation is necessary. ▪ **IF** the depth of utility corridors exceeds 3 feet bgs (depth to water anticipated to be 4 feet bgs), **THEN** the investigation summary report will further evaluate the potential preferential pathways for contaminant migration based on several lines of evidence, including the extent and magnitude of petroleum-related concentrations in soil, groundwater, and soil gas.

DQO Step	Description
Step 6 Specify Performance or Acceptance Criteria	The H_0 and H_A hypotheses evaluated for this investigation are: H_0. Concentrations of chemicals in soil and groundwater exceed the SFRWQCB ESLs H_A. Concentrations of chemicals in soil do not exceed the SFRWQCB ESLs Sampling locations will be selected based on the presence of the highest concentrations of petroleum-related chemicals in soil and groundwater samples and known utility corridors. The number and placement of sampling locations for evaluating chemicals in soil will be based on best professional judgment. Because there is no probability-based theory for estimating sampling errors for judgmental designs, it is not possible to specify quantitative limits for Type I and Type II decision errors. A professional land surveyor capable of measuring horizontal and vertical accuracy to ±0.01 foot will survey all sample locations and relevant site features. Hand measurements with an approximate accuracy of ±0.5 foot will identify the vertical depth (relative to the ground surface) of all sampling locations in the field. Sampling depths should be selected based on previously observed water table depths (approximately 4 feet bgs) because previously collected data identified the locations where LNAPL contamination is present. The consequence of committing a Type I error (false rejection) for the investigation of areas or locations suspected of containing petroleum-related chemicals exceeding SFRWQCB ESLs is that the extent of contaminated soil and groundwater will be underestimated. The consequence of committing a Type II error (false acceptance) is that the extent of contaminated soil and groundwater will be overestimated.
Step 7 Describe the Plan for Obtaining Data	Six borings (S5 through S10) will be advanced using hand auger drilling methods because numerous utilities have been previously identified in the area of investigation. A continuous soil core will be obtained from each boring, and headspace measurements will be obtained to determine the precise soil sampling interval above the water table for laboratory analysis. For each planned sampling interval, headspace measurements will be taken at a minimum of two depths: (1) at 1.0 foot above the planned sampling depth and (2) at the planned sampling depth. Additional headspace measurements will be collected and documented where staining or noticeable odors are visible. One soil and one groundwater sample will be collected from each of the six boring locations (S5 through S10). The groundwater samples will be collected from each boring after the boring has been advanced 1 foot below the observed water table or until a depth has been reached that allows sufficient water for sample collection. Soil and groundwater samples will be submitted to an offsite laboratory for analysis of TPH-d, TPH-g, and TPH-mo by EPA Method 8015B. One temporary soil vapor probe will be collocated with boring location S10, and one additional boring (S11) will be advanced to install a temporary soil vapor probe at 6 inches above the anticipated water table (3.5 to 4 feet bgs). Both soil gas locations are north of the former UST and immediately adjacent to the building located at 1550 Park Avenue. One soil gas sample will be collected from location S10 using a retractable soil vapor probe tip that is driven into undisturbed soil, and on soil gas sample will be collected at location S11 from the temporary probe. Soil gas samples will be analyzed for VOCs by EPA Method TO-15 and for gasoline-range organics by EPA Method TO-3. One groundwater monitoring well will be advanced and installed to a depth of 4 feet below the water table. The upper portion of the screen interval will be placed about 1 foot above the water table to enable the well to capture any LNAPL that may be floating on groundwater. Any LNAPL will be measured with an oil/water interface probe. Figure 3 shows the location of the proposed sample locations and known utility corridors.

Section 4. Field Investigation Methods

The section describes the specific activities and procedures associated with the data gaps investigation at the site, including the following:

- Permitting
- Utility location and geophysical survey
- Drilling borings
- Collecting soil and groundwater samples
- Collecting soil gas samples
- Measuring LNAPL
- Managing investigation-derived waste (IDW)
- Reporting procedures

All work will be conducted in accordance with ERRG's site-specific Health and Safety Plan (HASP) (ERRG, 2012). The HASP was prepared in accordance with Title 29 Code of Federal Regulations Section 1910.120, "Hazardous Waste Operations and Emergency Response." All ERRG personnel and subcontractors entering the work area will be required to read and understand the HASP.

4.1. PERMITTING

Prior to mobilization, ERRG will obtain soil boring, groundwater well installation, and soil vapor monitoring point permits from Alameda County Public Works Agency. An encroachment permit will be obtained from the City of Emeryville for the drilling of soil borings on Park Avenue or along the sidewalk.

4.2. UTILITY LOCATING AND GEOPHYSICAL SURVEY

ERRG will mark the proposed boring locations in white paint and notify Underground Service Alert North (USA North) a minimum of 5 working days prior to the drilling. USA North will notify public and private utility companies to mark the locations of underground utilities owned and maintained by each company. ERRG will also contract with a private utility locator to mark and clear any locations within the work area where borings are proposed.

Numerous utility lines were previously located in the vicinity of the former UST (Figure 3). The private utility locator will perform a geophysical survey to determine the depths of the utilities to evaluate whether the utility corridors are potential preferential pathways for lateral migration of contamination to subsurface soil and groundwater. The utility lines will be electrically energized or a transmitter will be inserted to locate the utility and identify its depth.

4.3. DRILL BORINGS

ERRG will subcontract a California-licensed driller to advance eight 3.25-inch-diameter borings using hand auger drilling techniques. An ERRG field geologist, under the supervision of a California-registered geologist, will oversee all drilling activities and log the lithology of each boring using the Unified Soil Classification System. ERRG's field geologist will also screen each boring for hydrocarbon vapors using a portable photoionization detector. Figure 3 shows the locations of the proposed borings.

Borings S5, S6, and S7 will be advanced 1 foot below the observed water table (anticipated to be 3.5 to 4 feet bgs) to an approximate total depth of 5 feet bgs to allow collection of soil and groundwater samples. Borings S8 and S9 will be located adjacent to the storm drain line and southeast of the former UST. As a result, these borings will be advanced to at least 1 foot below the observed water table and at least 1 foot below the top of the storm drain line (depths to be determined following completion of the utility survey). Soil, groundwater, and soil gas samples will be collected from one collocated boring (S10). As a result, boring S10 will initially be advanced to 1 foot bgs to install a hand-driven soil vapor probe tip; following collection of the soil gas sample, this boring will be advanced to approximately 5 feet bgs to collect soil and groundwater samples. Boring S11 will be advanced to approximately 3.5 feet bgs and a temporary soil vapor monitoring probe will be installed. Boring S12 will be advanced to approximately 8 feet bgs and groundwater monitoring well will be installed. All borings will be tremie grouted from the bottom up with neat cement upon completion.

The locations of the proposed borings may be adjusted in the field based on the presence of utilities or other unforeseen physical obstacles.

4.4. COLLECT SOIL AND GROUNDWATER SAMPLES

One soil sample will be collected from borings S5 through S10. The soil samples will be collected from a depth that is 6 inches above the observed groundwater table, which is anticipated to be at approximately 4 feet bgs. Soil samples will be transferred directly from the hand auger bucket into laboratory-supplied glass jars with Teflon lids, given a unique sample identification number (i.e., APEX-S5-3.5-MMDDYY), placed in zip-top baggies, and immediately stored in an ice-filled cooler.

After each boring is advanced to its prescribed depth below the water table, 1-inch diameter polyvinyl chloride (PVC) 0.010-inch slotted screen pipe will be inserted to the bottom of each boring. Groundwater will be drawn from each of the borings using a peristaltic pump equipped with 0.25-inch Teflon tubing and a 0.45-micron groundwater filter. At each boring, grab groundwater samples will be collected directly from the filter outlet into laboratory-supplied 40-milliliter volatile organic analysis vials and 1-liter amber bottles, given a unique sample identification number (i.e., APEX-S5-GW-MMDDYY), placed in zip-top plastic bags, and immediately stored in an ice-filled cooler.

Soil and groundwater samples will be submitted to a California-certified laboratory for analysis of the following analytes:

- TPH-purgeables by EPA Method 8015B with silica gel cleanup
- TPH-extractables by EPA Method 8015B

In addition, one four-point soil composite sample and one wastewater sample will be analyzed for LUFT 5 metals (cadmium, chromium, nickel, lead, and zinc) by EPA Method 6010B for waste disposal characterization purposes.

4.5. COLLECT SOIL GAS SAMPLES

ERRG will collect soil gas samples from borings S10 and S11, which re located in the vicinity of the former UST and adjacent to the southern and western walls of the building at 1550 Park Avenue (Figure 3).

At boring S10, a retractable soil vapor probe tip attached to hollow extension rods will be driven into undisturbed soil with a slide hammer to a depth of 2 feet bgs. The probe tip, which is attached to 0.25-inch Teflon tubing through the hollow extension rods, will then be retracted to allow purging of the sample line and collection of a soil gas sample. Prior to sample collection, 1-inch of hydrated bentonite will be placed at the base of the boring to form a seal around the extension rods. The soil gas sample will be collected in a 1.4-liter SUMMA canister a minimum of 2 hours after the probe is installed and after one tubing volume has been purged from the sample line. During collection of the soil gas sample, 1,1-difluoroethane will be dispersed in the air to serve as a leak detection compound. After the soil gas sample has been collected, the probe tip and extensions will be removed so the boring can be further advanced for collection of soil and groundwater samples.

At boring S11, a probe tip attached to 0.25-inch Teflon tubing will be placed midway in 6 inches of sand pack at the bottom of the boring (i.e., approximately 3.5 feet bgs). Six inches of dry granular bentonite will be placed on top of the sand pack followed by hydrated bentonite completed to the surface. After the temporary soil vapor probe is installed, the probe will be allowed to equilibrate for a minimum of 48 hours before a sample is collected. The soil gas samples will be collected using a laboratory-constructed soil gas sampling system consisting of a shroud with helium meter, purge train with helium meter, sample trains with vacuum gauges, helium gas canisters, 6-liter SUMMA purge canister, and 1.4-liter SUMMA sample canisters supplied by the analytical laboratory. A single-depth duplicate-sample system will be used to collect a sample and duplicate sample at S11. Three dead space volumes, consisting of the volume of tubing and the annular space around the probe tip, will be purged prior to sample collection.

Helium gas, used in conjunction with the shroud and a helium meter, will test the integrity of the soil vapor probe while it is purged. A shut-in test, where the sample train is subjected to a vacuum, will be conducted to leak test the sample train. Flow regulators in the sample lines will ensure that all soil gas samples are collected at a rate less than 200 milliliters per minute and flow controllers in the purge lines will ensure that the soil vapor probe is purged at a rate of 170 milliliters per minute.

Following collection of the soil gas sample at boring S11, a California-licensed driller will abandon the temporary probe by tremie grouting it from the bottom up with neat cement after the tubing, sand pack, and bentonite has been removed by hand augering.

Soil gas samples will be submitted to a California-certified laboratory for analysis of the following analytes:

- BTEX and naphthalene by EPA Method TO-15
- 1,1-Difluoroethane by EPA Method TO-15 (soil gas sample from boring S10 only)
- Gasoline Range Organics by EPA Method TO-3
- Helium by ASTM International Method D1946 (soil gas sample from boring S11 only)

Analytical results of the soil gas samples will be used to assess soil vapor conditions in the subsurface.

4.6. MEASURE LNAPL

ERRG will subcontract a California-licensed driller to advance and install one groundwater monitoring well (S12) to assess whether LNAPL is present in the vicinity of the former UST. An ERRG field geologist, under the supervision of a California-registered geologist, will oversee all drilling activities and log the lithology of each boring using the Unified Soil Classification System. ERRG's field geologist will also screen each boring for hydrocarbon vapors using a portable photoionization detector. Figure 3 shows the locations of the proposed monitoring well.

The monitoring well will be installed west of the former UST near previous sample location S4, where the highest concentrations of TPH-d were reported (83,000 micrograms per liter) in the grab groundwater sample collected in March 2013 (Figure 2). After the soil boring has been advanced an approximate total depth of 8 feet bgs, a 5-foot long, 1.5-inch inner diameter by 2.5-inch outer diameter, prepacked screen will be inserted using flush threaded PVC riser pipe. The prepacked screen will consist of a standard slotted PVC well screen pipe surrounded by a stainless steel mesh. Sand will be packed between the slotted PVC and the stainless steel mesh to ensure that sand is located directly around the slotted PVC during installation. The upper portion of the screen interval will be placed about 1 foot above the water table so the well will capture any LNAPL that may be floating on groundwater. Once the well assembly is in place, #2/12 sand will be gravity installed to fill any voids between the prepacked screen and well bore, and to create a 6-inch sand filter directly above the well screen. With the sand filter in place, 6 inches of dry granular bentonite will be gravity installed on top of the sand barrier and hydrated to form a well seal. After the bentonite has been hydrated (typically 30 minutes), the remaining well annulus will be grouted with neat cement. The well will be capped with an expanding well plug and surface completed with a traffic-rated flush-mounted well box.

ERRG will develop the well a minimum of 48 hours after the well is installed. Well development will consist of a combination of mechanical surging and bailing. Well development will be considered complete when the entire length of the well screen has been surged for 5 minutes and five well volumes have been evacuated. ERRG will return a minimum of 7 days after development to identify whether any LNAPL is present in the well using an oil/water interface probe.

4.7. MANAGEMENT OF INVESTIGATION-DERIVED WASTE

IDW is anticipated to consist of soil cuttings, decontamination water, and groundwater. IDW will be stored in U.S. Department of Transportation-approved 55-gallon drums, pending analysis and waste characterization. One four-point soil composite sample and one wastewater sample will be analyzed for LUFT 5 metals (cadmium, chromium, nickel, lead, and zinc) by EPA Method 6010B for waste disposal characterization purposes. ERRG will obtain permission to temporarily store the drums in a secure location at the site. Any personal protective equipment will be disposed of as nonhazardous waste in the municipal trash. Waste soil and water generated during investigation activities will be placed in drums, sealed, and transported for disposal at a California-certified facility.

4.8. REPORTING

ERRG will prepare a summary report for submittal to ACEH following ACEH's approval of this work plan and ERRG's completion of field investigation outlined in this work plan. The report will include a refined SCM based on the investigation results, a description of field procedures and methods, figures indicating boring and sample locations and site features, tabulated analytical results, soil boring logs, conclusions, and recommendations for additional investigation or remedial action, if necessary. Sampling analytical results will be compared with appropriate SFRWQCB ESLs (SFRWQCB, 2013).

Section 5. References

Alameda County Environmental Health Department (ACEH), 2011. Letter regarding Request for Site Investigation Work Plan; Fuel Leak Case No. RO0003069 and GeoTracker Global ID T1000002519, Pellegrini Refrigeration & Restaurant Equipment Company, 1650 Park Avenue, Emeryville, CA 94608. From Mark Detterman, Senior Hazardous Materials Specialist, ACEH. To Pennie Barger, Apex Refrigeration Corp. and Pellegrini Refrigeration & Restaurant Equipment Co. June 29.

ACEH, 2013a. Letter Regarding Conditional Approval of Site Investigation Work Plan; Fuel Leak Case No. RO0003069 and GeoTracker Global ID T1000002519, Pellegrini Refrigeration & Restaurant Equipment Company, 1550 Park Avenue, Emeryville, CA 94608. January 24.

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Engineering/Remediation Resources Group, Inc., 2012. "Work Plan for Soil and Groundwater Investigation, Apex Refrigeration, Inc., 1550 Park Avenue, Emeryville, California." October.

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P&D Environmental, Inc. (P&D), 2010. "Underground Storage Tank Removal Report, 1550 Park Avenue, Emeryville, CA." March 12.

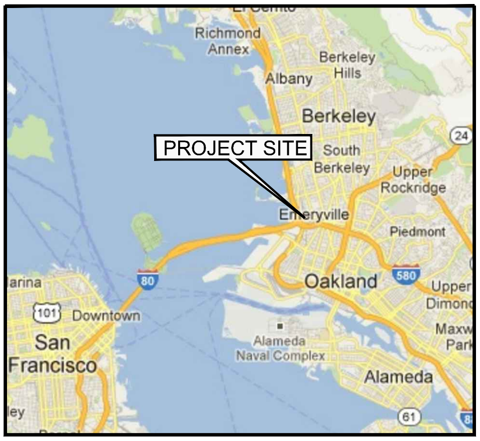
San Francisco Regional Water Quality Control Board, 2013. "ESL – Environmental Screening Levels (Interim Final – May 2013)." Available Online at: <http://www.swrcb.ca.gov/rwqcb2/water_issues/programs/esl.shtml>.

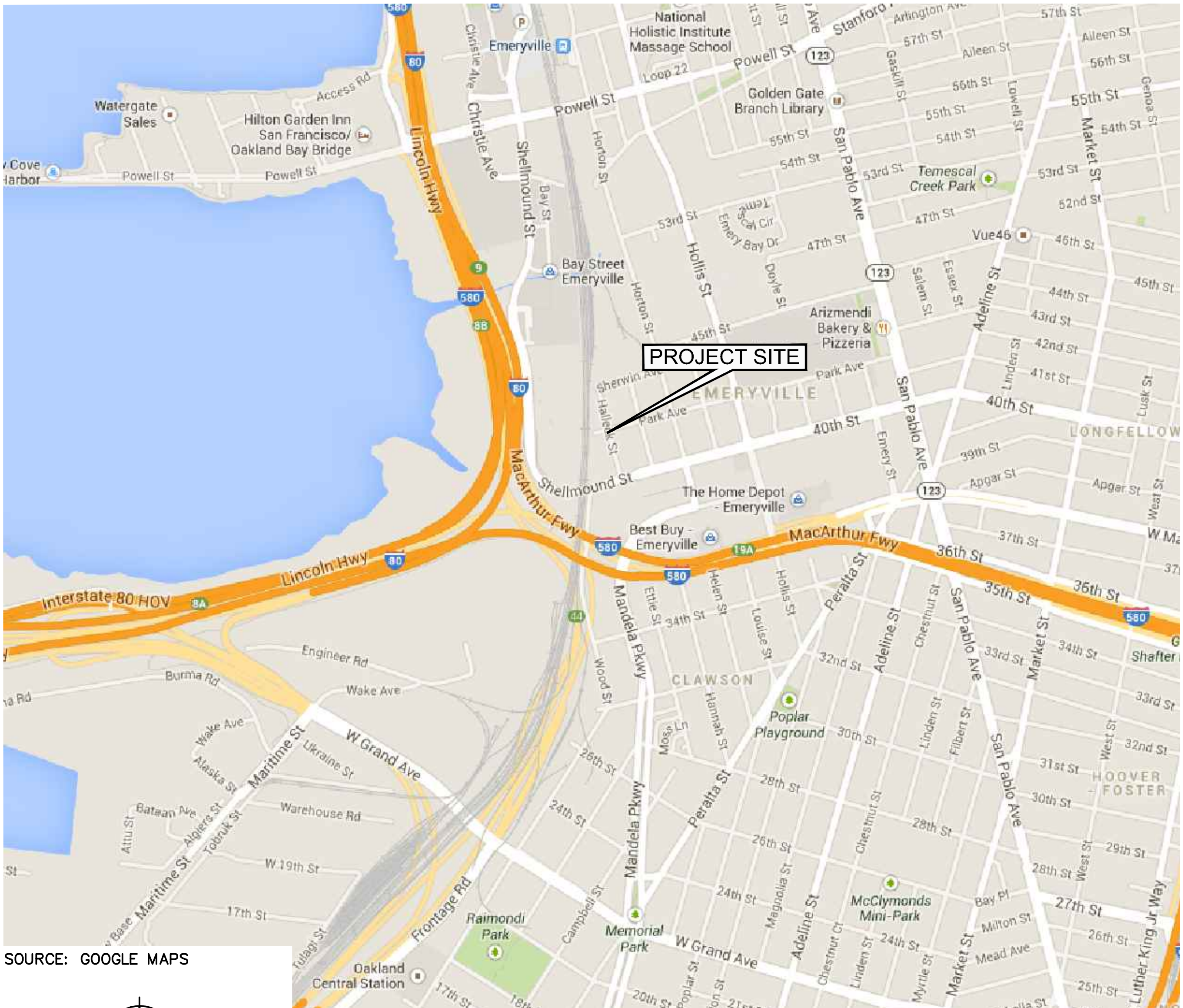
State Water Resources Control Board (SWRCB), 2012. "Low-Threat Underground Storage Tank Case Closure Policy." August 17. Available Online at: <http://www.waterboards.ca.gov/ust/lt_cls_plcy.shtml#policy081712>.

U.S. Environmental Protection Agency (EPA), 1989. "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part), Interim Final." Office of Emergency and Remedial Response. EPA/540/1-89/002. December.

EPA, 2006. "Guidance on Systematic Planning Using the Data Quality Objectives Process." EPA/240/B-06/001. February. Available Online at: <http://www.epa.gov/QUALITY/qs-docs/g4-final.pdf>.

Figures





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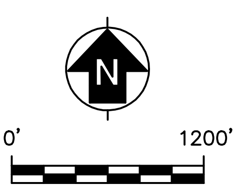
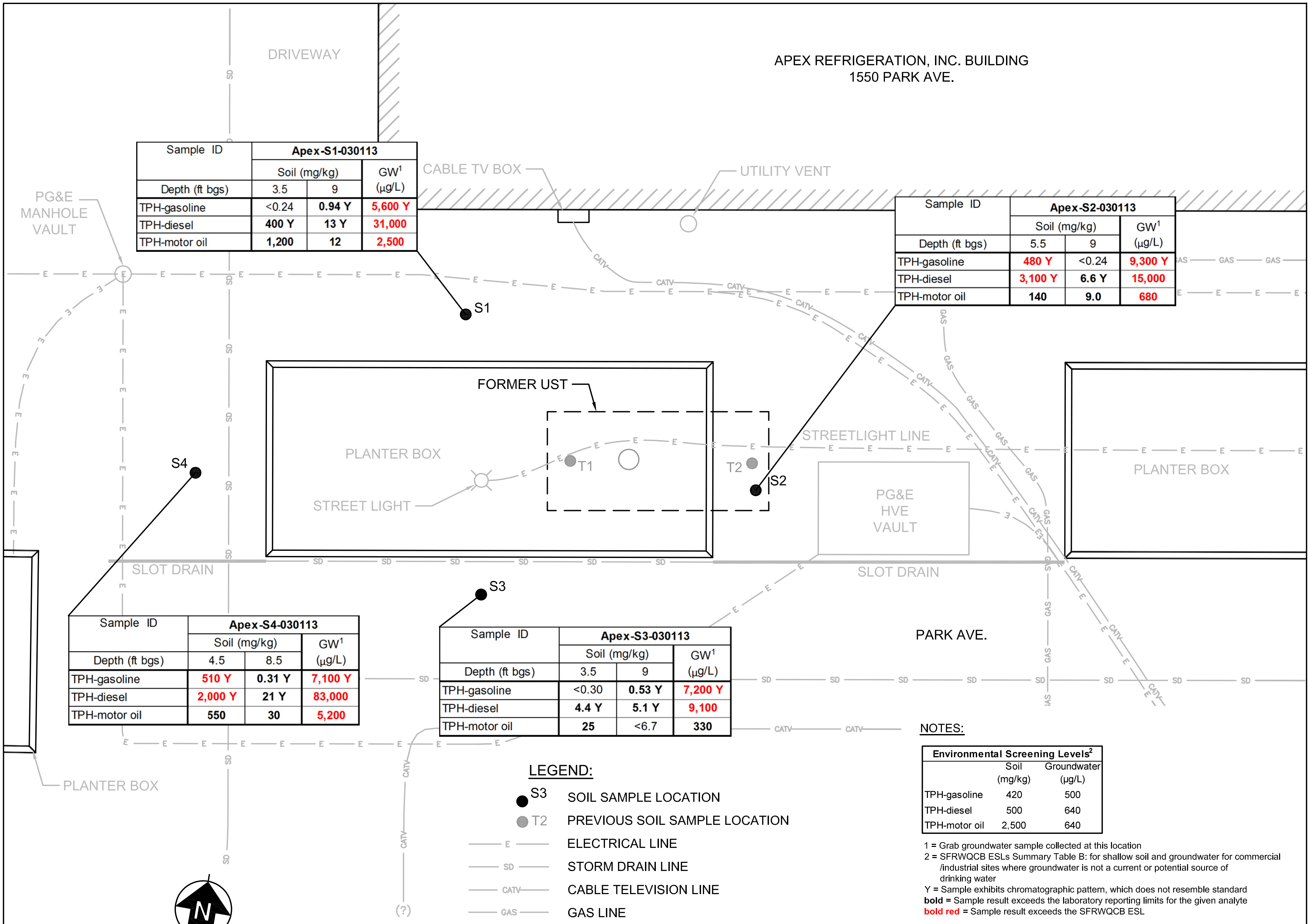


APPROXIMATE SCALE: 1"=1200'

Engineering/Remediation Resources Group, Inc. 4585 Pacheco Blvd., Suite 200 Martinez, California 94553 (925) 969-0750 ERRG	CLIENT: APEX REFRIGERATION, INC. EMERYVILLE, CALIFORNIA	SITE LOCATION MAP			
	LOCATION: 1550 PARK AVENUE EMERYVILLE, CALIFORNIA	DRAWN BY: RDB 10/28/13	CHECKED BY: EKO 10/28/13	PROJECT NO. 2013-094	FIG NO. 1

FILE NAME: N:\Graphics\2013\2013-094 APEX Emeryville\Site Location Map 2.dwg LAYOUT NAME: 1 PLOTTED: Monday, October 28, 2013 - 3:01pm



Sample ID	Apex-S1-030113		
	Soil (mg/kg)		GW[1] (µg/L)
Depth (ft bgs)	3.5	9	
TPH-gasoline	<0.24	**0.94 Y**	**5,600 Y**
TPH-diesel	**400 Y**	**13 Y**	**31,000**
TPH-motor oil	**1,200**	**12**	**2,500**

Sample ID	Apex-S2-030113		
	Soil (mg/kg)		GW[1] (µg/L)
Depth (ft bgs)	5.5	9	
TPH-gasoline	**480 Y**	<0.24	**9,300 Y**
TPH-diesel	**3,100 Y**	**6.6 Y**	**15,000**
TPH-motor oil	**140**	**9.0**	**680**

Sample ID	Apex-S3-030113		
	Soil (mg/kg)		GW[1] (µg/L)
Depth (ft bgs)	3.5	9	
TPH-gasoline	<0.30	**0.53 Y**	**7,200 Y**
TPH-diesel	**4.4 Y**	**5.1 Y**	**9,100**
TPH-motor oil	**25**	<6.7	**330**

Sample ID	Apex-S4-030113		
	Soil (mg/kg)		GW[1] (µg/L)
Depth (ft bgs)	4.5	8.5	
TPH-gasoline	**510 Y**	**0.31 Y**	**7,100 Y**
TPH-diesel	**2,000 Y**	**21 Y**	**83,000**
TPH-motor oil	**550**	**30**	**5,200**

LEGEND:

- S3 SOIL SAMPLE LOCATION
- T2 PREVIOUS SOIL SAMPLE LOCATION
- E ELECTRICAL LINE
- SD STORM DRAIN LINE
- CATV CABLE TELEVISION LINE
- GAS GAS LINE

NOTES:

Environmental Screening Levels[2]	Soil (mg/kg)	Groundwater (µg/L)
TPH-gasoline	420	500
TPH-diesel	500	640
TPH-motor oil	2,500	640

1 = Grab groundwater sample collected at this location
2 = SFRWQCB ESLs Summary Table B: for shallow soil and groundwater for commercial /industrial sites where groundwater is not a current or potential source of drinking water
Y = Sample exhibits chromatographic pattern, which does not resemble standard
bold = Sample result exceeds the laboratory reporting limits for the given analyte
bold red = Sample result exceeds the SFRWQCB ESL

ERRG
Engineering/Remediation Resources Group, Inc.
4585 Pacheco Blvd, Suite 200
Martinez, California 94553
(925) 969-0750

CLIENT: APEX REFRIGERATION, INC. EMERYVILLE, CALIFORNIA

LOCATION: 1550 PARK AVENUE EMERYVILLE, CALIFORNIA

TPH CONCENTRATIONS IN SOIL AND GROUNDWATER, MARCH 2013

DRAWN BY:	CHECKED BY:	PROJECT NO.	FIG NO.
JJC 12/16/13	VD 12/16/13	2013-094	2

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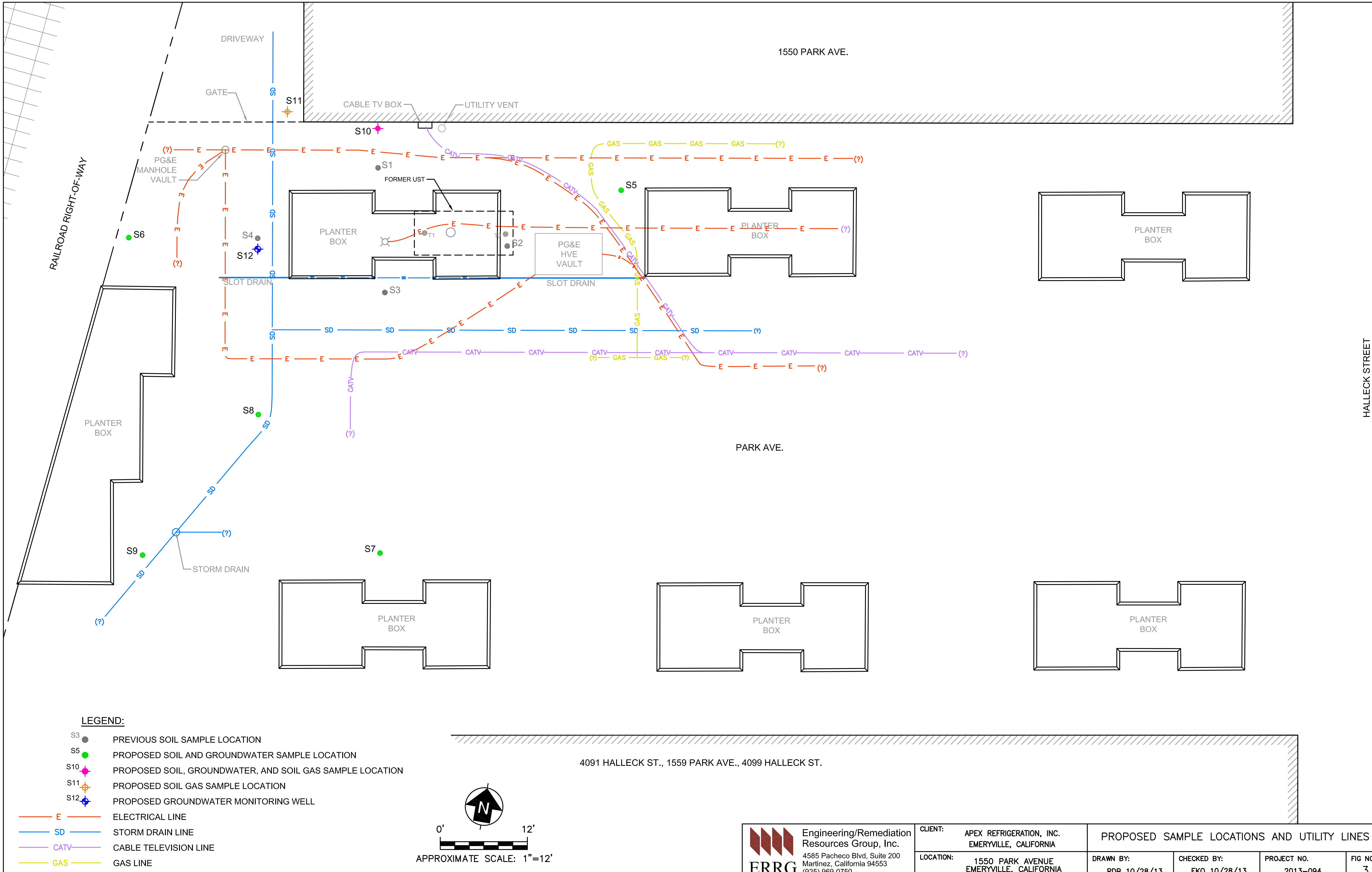

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Tables

Table 1. Site Conceptual Model

SCM Element	SCM Sub-Element	Description	Data Gap	How to Address
Geology and Hydrogeology	Regional	*Geology:* The hills along Emeryville and along the San Francisco Peninsula, as well as the downwarped Bay Plain in between, are part of the central California Coast Range Province. The rock exposed in the hills and underlying the sedimentary deposits of the Bay Plain consists of Tertiary-aged sediments and volcanic rock. The uplift of the hills resulted in erosion and deposition of a thick alluvial fan deposits on the Bay Plain, known as Alameda formation. Approximately 540 feet of tertiary to early quaternary sediments overlies bedrock beneath Emeryville. The unconsolidated sedimentary deposits include artificial fill; estuarine deposits known as Bay Mud; Merritt sand; Yerba Buena Mud; and the Alameda Formation (Engineering-Science, 1988). The closest major fault (i.e., Hayward) is located about 3 miles east of the property. Although the site is located in a seismically active area, it is not within an Alquist-Priolo Earthquake Fault Zone (known as "Special Studies Zones" prior to January 1, 1994). Earthquake Fault Zones are regulatory zones that encompass surface traces of active faults that have the potential for future surface fault rupture. *Hydrogeology:* The freshwater aquifer beneath Emeryville includes most of the porous sands and gravels of the Alameda and Temescal alluvial deposits and the Merritt Sand. The aquifer is recharged by rainfall on exposed areas of the porous formations, primarily between the railroad right-of-way and the Oakland Hills to the east. The water flows downgradient toward San Francisco Bay. The fresh water contacts higher density saltwater in the vicinity of the bay margin. The regional groundwater flows to the west toward the bay, although local variations may occur due to variations in topography and subsurface lithology. The depth to groundwater varies seasonally and has been measured between 3 to 8 feet bgs (Engineering-Science, 1988).	None	Not Applicable
Geology and Hydrogeology	Site	*Geology:* Lithologic logs for borings advanced at the site indicated that subsurface materials in the area consist predominantly of gravel and silty clays with occasional sandy and/or gravelly interbeds (alluvial deposits). *Hydrogeology:* Shallow groundwater has been encountered at depths of approximately 3 to 5 feet bgs. The hydraulic gradient and groundwater flow direction have not been specifically evaluated at the site.	Previous borings at the site have been advanced to approximately 10 feet bgs in the immediate vicinity of the former UST. The areal extent of contamination has not been completely defined, and previous soil and groundwater data suggest LNAPL are present. Lithologic data will be obtained from additional shallow borings that will be advanced on site to further understand the understanding of the subsurface.The horizontal groundwater gradient has not been confirmed.	Additional borings will be advanced at the site using hand augers to collect soil, groundwater, and soil gas samples, and the soil lithology will be logged. See items 1, 2, and 3 in Table 2. Analytical results for the groundwater samples will be used to evaluate the general groundwater flow gradient. In addition, data on surrounding sites, provided in the Geotracker website, will be used to evaluate groundwater flow gradients in the area. See items 1, 2, and 3 in Table 2.
Surface Water Bodies	Site	The closest surface water body, San Francisco Bay, is located approximately 1,500 feet to the west of the site.	None	Not Applicable
Nearby Wells	Site	SWRCB Geotracker website includes information on the approximate locations of water supply wells in California. The closest water wells are approximately 7,000 feet south of the site.	None	Not Applicable
Unauthorized Release	Site	During a street improvement project in 2009, a UST with an unauthorized petroleum release was discovered adjacent to the building located at 1550 Park Avenue in Emeryville, California. The tank was measured to be approximately 10 feet long and 5 feet in diameter, with a calculated volume capacity of 1,500 gallons. The release was stopped when the UST was removed, approximately 20 tons of surrounding soil was excavated, and 2,200 hundred gallons of oily water was pumped from the tank and excavation. Results of subsequent soil and groundwater samples indicated the following chemicals of potential concern were associated with the release: TPH-diesel, TPH-gasoline, TPH-motor oil, and benzo(b)fluoranthene.	None	Not Applicable

Table 1. Site Conceptual Model *(continued)*

SCM Element	SCM Sub-Element	Description	Data Gap	How to Address
Free Product	Site	Previous data appear to suggest the presence of LNAPL.	LNAPL has not been confirmed to exist at the site	One shallow monitoring well will be installed using hand auger drilling methods. The well will be located where the highest total TPH concentrations were detected in groundwater. The well will be screened across the water table to allow any LNAPL that is present to infiltrate the well. LNAPL will be measured with an oil-water interface probe. See Item 3 in Table 2.
Secondary Source	Site	Soil and groundwater characterization in the vicinity of the former UST has begun but is incomplete.	Areal extent of soil and groundwater contamination is not fully defined.	Seven shallow soil boring will be advanced surrounding previous sample locations using hand auger drilling methods. One soil and one groundwater sample will be collected from each boring. See Item 1 in Table 2.
Vapor Intrusion to Indoor Air	Site	Insufficient data have been collected to evaluate whether petroleum vapors are present in soil at concentrations that would warrant concern of vapor intrusion to indoor air.	Soil gas has not been evaluated at the site.	Two shallow soil boring will be advanced adjacent to the building at 1550 Park Avenue. One soil gas sample will be collected from each boring. See Item 2 in Table 2.
Preferential Pathways	Site	Numerous utility lines were located within and surrounding the site.	It is unclear whether the utility trenches may contribute to lateral migration of contaminants.	Two shallow soil borings will be located along the storm sewer corridor. One soil and one groundwater sample will be collected from each soil boring. A utility survey will be performed to document depth to utility lines and vaults. See Item 1 in Table 2.

Notes:
bgs = below ground surface
LNAPL = light nonaqueous-phase liquids
SCM = site conceptual model
SWRCB = State Water Resources Control Board
TPH = total petroleum hydrocarbons
UST = underground storage tank

Table 2. Data Gaps and Proposed Investigation

Item	Data Gap	Proposed Investigation	Rationale	Analyses
1	▪ Evaluate the areal extent of soil and groundwater contamination at the site. ▪ Evaluate the general horizontal groundwater gradient. ▪ Evaluate the utility conduits as preferential pathways for lateral migration of contaminants.	Advance seven soil borings surrounding previous sample locations. Two of the borings will be located along the north-south storm drain lateral on the western portion of the site. Collect one soil sample and one groundwater sample from each boring. All soil samples will be collected immediately above the water table. Four of the soil borings will be advanced to 1 foot below the water table, while the two borings along the storm drain will be advanced to at least 1 foot below the water table and 1 foot below the top of the storm drain to allow collection a groundwater samples. A visual and geophysical utility survey will also be conducted to determine depths of numerous utility conduits previously identified at the site.	Because previous data are limited and appears to suggest LNAPL is present, this investigation will focus predominantly on the vadose zone and water table interface in the area immediately surrounding previous sampling locations to further define the extent of soil and groundwater contamination at the site. Chemical concentrations in groundwater may reveal the general horizontal groundwater gradient and also indicate if the storm drain (assumed to be deepest utility conduit) aids in the lateral migration of contaminants. Depths of the utilities will likely indicate the bottom of utility corridors, and any corridors not below the water table are unlikely to serve as a preferential pathway.	Soil and groundwater: ▪ TPH-purgeables by EPA Method 8015B with silica gel cleanup. ▪ TPH-extractables by EPA Method 8015B Groundwater gradient: isoconcentration contours. Conduits: visual and geophysical utility survey.
2	▪ Evaluate the presence of petroleum vapors in soil.	Install two (one collocated) temporary soil vapor probes immediately adjacent to the building at 1550 Park Avenue in the vicinity of previous soil and groundwater sample location S1, where TPH-d and TPH-g were reported at 31,000 and 5,600 µg/L, respectively. One sample will be collected from 2 feet bgs, and a second sample will be collected from 3.5 feet bgs.	Two probes are proposed north and northwest of location S1 near the closest building where vapor intrusion to indoor air would be the greatest concern.	Soil vapor: ▪ BTEX by EPA Method TO-15 ▪ Gasoline-Range Organics by EPA Method TO-3
3	▪ Evaluate the potential presence of LNAPL at the site.	Install one groundwater monitoring well to approximately 8 feet bgs. The upper portion of the screen interval will be placed about 1 foot above the water table so the well can capture any LNAPL that may be floating on groundwater. The monitoring well will be located west of the former UST near previous sample location S4, where the highest concentrations of TPH-d were reported (83,000 µg/L) in a March 2013 grab groundwater sample. LNAPL will be measured using an oil/water interface probe.	One well is proposed west of the former UST in the vicinity of previous sample location S4 where LNAPL would most likely be found.	LNAPL: oil/water interface probe

Notes:
bgs = below ground surface
BTEX = benzene, toluene, ethylbenzene, and xylenes
EPA = U.S. Environmental Protection Agency
LNAPL = light nonaqueous-phase liquids
TPH = total petroleum hydrocarbons
TPH-d = total petroleum hydrocarbons as diesel-range organics
TPH-g = total petroleum hydrocarbons as gasoline-range organics
UST= underground storage tank
µg/L = micrograms per liter