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By Alameda County Environmental Health 11:29 am, Jun 17, 2016

June 17, 2016

Mr. Mark Detterman
Senior Hazardous Materials Specialist, PG, CEG
Alameda County Environmental Health
1131 Harbor Bay Parkway
Alameda, CA 94502

RE: FOCUSED SITE CONCEPTUAL MODEL AND DATA GAP WORK PLAN
FORMER ROCKRIDGE CLEANERS
5100 BROADWAY, OAKLAND, CALIFORNIA

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 knowledge.

Sincerely,
Terramar Retail Centers

David Ristau
V.P. Construction

Attachment – Focused Site Conceptual Model and Data Gap Work Plan

June 17, 2016
P:\PROJECTS\Terramar\Oakland\5100 Broadway\IRAP Follow-Up\Data Gap Work Plan.doc

Mr. Mark Detterman
Senior Hazardous Materials Specialist, PG, CEG
Alameda County Department of Environmental Health
1131 Harbor Bay Parkway
Alameda, CA 94502

RE: FOCUSED SITE CONCEPTUAL MODEL AND DATA GAP WORK PLAN
FORMER ROCKRIDGE CLEANERS
5100 BROADWAY, OAKLAND, CALIFORNIA
RO# 0003172
TETRA TECH PROJECT NO. 117-7429001

Dear Mr. Detterman:

This letter presents a focused site conceptual model and data gap work plan in connection with the former Rockridge Cleaners tetrachloroethene (PCE) release site located at 5100 (5114 tenant space) Broadway in Oakland, California. This work plan was prepared in response to an April 12, 2016 letter from the Alameda County Department of Environmental Health (ACDEH), commenting on the Tetra Tech *Interim Remedial Action Document Report*, dated December 11, 2015.

The former Rockridge Cleaners was located in "Building 5" of the six building Rockridge Shopping Center (Figure 1), which is slated for two phases of demolition and construction, resulting in the new "Shops at the Ridge" redevelopment (Figure 2). Phase I is currently underway, with Buildings 4, 5 and 6 having been demolished in Summer 2015. Buildings 5 and 6 have been replaced by contiguous Building K and Building A, respectively, along with stand-alone Building C and Building D, all of which are currently under construction. Two-story Building K sits approximately at the same grade as former Building 5, has been framed, and the exterior will be closed in shortly. The northwest (back wall) of new Building K sits seven feet to the southeast of the former Building 5 rear wall. The new concrete slab is 5-inches thick, with a 2-foot thick perimeter footing (continuous beam) measuring between 4- and 6-feet wide.

The purpose of this work plan is to present a focused site conceptual model to support the collection of additional site data for delineating the extent of volatile organic compounds (VOCs) in soil vapor - namely vinyl chloride – in an area just north of the source area soil removal work completed in Fall 2015. Previous sample data indicate groundwater is not impacted by PCE, vinyl chloride or other VOCs at the former dry cleaner, and that the source area removal was effective in mitigating elevated PCE concentrations found in

shallow soil at the northwest (back wall) of the former dry cleaner. The soil excavation limits also encompassed areas of elevated VOC concentrations in shallow soil vapor beneath the former dry cleaner and along a section of sanitary sewer line, thereby removing that soil vapor from the footprint of Building K. However, two locations outside of the completed excavation limits, DC-VMP-14 and DC-VMP-15, contained concentrations of vinyl chloride in soil vapor above the commercial environmental screening level (ESL) value of 160 µg/m^3 at 5 feet in depth. One location (DC-VMP-14) exhibited a slightly increased vinyl chloride concentration at depth (210 µg/m^3 at 5' and 500 µg/m^3 at 14'), while the second location (DC-VMP-15) exhibited a much lower vinyl chloride concentration at depth (850 µg/m^3 at 5' and 35 µg/m^3 at 13'). Both sample locations are 40 feet from the foundation of new Building K, directly between Building K and the steep rock face that represents the edge of the former quarry at the site. Soil and groundwater samples from this location were non-detect for vinyl chloride.

The presence of VOCs in soil vapor distant from the source area is believed to be a result of the coarse fill material (up to boulder size) and many old utility lines present in the upper 9 feet in the area of the former dry cleaner, creating preferential pathways for soil vapor migration. It is expected that significant reductions in surrounding soil vapor concentrations occurred as a result of the source area removal and subsequent removal of the asphalt road surface in this area. Additional sampling will be performed to document post-cleanup soil vapor conditions at and in the vicinity of DC-VMP-14 and DC-VMP-15.

One excavation sidewall confirmation soil sample (EXSW2) contained PCE at a concentration of 480 micrograms per kilogram (µg/Kg) at 3-feet in depth in November 2015. Due to a recent revision in the commercial soil ESL values in February 2016, this concentration now exceeds the revised ESL commercial soil PCE value of 420 µg/kg (based on leaching to groundwater within 10 feet of the data point). As numerous (12) groundwater samples have demonstrated a lack of VOCs in groundwater beneath the former PCE soil source area and surrounding areas, and depth to static groundwater is 15 feet below grade in this area, this residual PCE concentration is not considered significant. The area at EXSW2 will be paved over as part of a delivery truck route once redevelopment is complete, further isolating it from direct contact.

It should be noted that construction work on Building K is currently on-going, and the area around boring locations DC-VMP-14 and DC-VMP-15 is currently blocked by supplies and storage containers, with limited space in the area. Site access may be delayed if these materials cannot be relocated.

FOCUSED SITE CONCEPTUAL MODEL

The environmental setting at the site is summarized in the focused Site Conceptual Model (SCM) presented in Table 1. The table includes a discussion of both regional and site-specific geology and hydrogeology, nearby surface water bodies, a search of nearby water supply wells, site history, and the chemical distribution at the site.

DATA GAP WORK PLAN

A total of four dual-completion soil vapor probe borings will be advanced to approximately 15 feet below ground surface, or depth to groundwater or bedrock, if encountered above the target depth. The rationale for the four borings is presented in Table 2. Static depth to groundwater around the dry cleaner typically stabilized at 15-feet below grade in Fall 2015, after drilling to between 16 and 24 feet in depth to encounter saturation. The locations of the proposed borings are shown on the attached Figure 3, which is a composite site plan showing the footprint of former Building 5 and the dry cleaner tenant space, the footprint of new Building K, the former site characterization soil boring locations, excavation limits, and excavation confirmation soil sample locations. Other salient features such as the former transformer pad behind the cleaners, and old utility lines are also depicted on the figure. The old utility lines are in various states of abandonment as the redevelopment moves forward, with new utility lines being installed behind Building K.

The four borings are intended to provide shallow (5-foot) and deeper (just above the water table) soil vapor data in the same locations as DC-VMP-14 and DC-VMP-15, in addition to two step-out locations approximately 20- to 25-feet north of each location, for the purpose of confirming and defining the northerly extent of vinyl chloride in soil vapor.

Pre-Field Tasks and Permitting

Pre-field tasks will include visiting the site to mark boring locations, modifying the existing site-specific Health and Safety Plan, obtaining the boring permit, hiring subcontractors and acquiring field equipment. Underground Service Alert (Dig Alert) will also be notified at least 48 hours prior to drilling.

An Alameda County Water District (ACWD) permit is required for completing the borings; the permit will be obtained prior to the field work. The permitting process typically requires between 5 and 10 business days to complete, but ACWD can generally expedite the process if personnel are available to review the permit and perform the grout inspection.

Soil Borings

The four soil borings will be advanced to approximately 15 feet below grade using a hollow-stem auger drill rig equipped with small diameter augers (6-inches or less). Total boring depth will be shallower if groundwater or bedrock is encountered above 15 feet in depth. Use of an auger rig is preferred over a direct push rig, as drilling has been difficult in the past with direct push technology at this site, due to the presence of dense, coarse gravel, cobbles and boulders. If possible, soil will be continuously cored, using a core barrel lined with brass sample sleeves. Reusable sampling equipment will be decontaminated between samples using a Liquinox and water solution, and rinsed with clean water.

Soil will be screened from the 5-, 10-, and 15-foot depth intervals using a MiniRAE 3000 portable ionizing detector (PID), and the soil lithology described on field logs. Laboratory soil sample analysis is not planned; however, soil samples will be collected if field impacts to soil are noted (i.e. solvent odor, elevated PID readings).

Groundwater sampling is not planned, as saturated conditions (first water) are typically encountered between 16 and 24 feet below grade, and VOCs have not been detected in groundwater samples to date.

Temporary Vapor Monitoring Points

Following completion of each soil boring, the boring will be converted into a dual-completion temporary vapor monitoring point (VMP). VMP screens will be installed at 5- and near 15-feet below grade in each boring. The deeper VMP will completed at a shallower depth if bedrock or groundwater are encountered above the target depth. If groundwater is encountered, the boring will be backfilled with granular bentonite to approximately 2-feet above static water, where the deeper VMP will then be constructed.

The VMPs will be constructed and sampled in the same fashion as the previous VMP installations. The VMPs will consist of a ½" diameter by 3-inch long stainless steel mesh probe screen, fitted to ¼" diameter stainless steel tubing to the surface. A brass ball valve and tubing barb will be fitted to the top of each VMP at the time of sampling. All VMP components will be compression-fit together to form a leak-tight assembly from the probe screen to the surface. The probe screens will be set in 1-foot of #2/12 sand (15 to 14 feet, and 5 to 4 feet below grade), and the annular space between the probe zones sealed with hydrated bentonite. The surface seal will also consist of hydrated bentonite to just below ground surface. The top of the tubing will be capped until sampling. The surface completion at each VMP will consist of an 8-inch traffic rated vault box set in concrete, and each VMP location cordoned off with traffic delineators and red "Danger Tape" to keep

subcontractors from disturbing the locations.

The VMPs will be allowed to equilibrate for at least 48-hours prior to sampling, per State of California Department of Toxic Substances Control (DTSC) and Regional Water Quality Control Board (RWQCB) active soil vapor sampling guidance (July 2015). Upon returning to the site, the tubing cap will be removed from the top of each VMP and a new brass ¼-turn valve and hose barb assembly will be compression fit to the top of the tubing. Samples will be collected in 1-liter Summa canisters provided by the analytical laboratory (Eurofins Air Toxics of Folsom, CA).

Sample and QA protocols will be generally consistent with the latest DTSC/RWQCB regulatory guidance (July 2015), including pre-purging and leak detection (performing a shut-in test, and using a helium gas shroud during sampling). The helium concentration inside the shroud, placed over the VMP headworks, will be monitored with a portable helium detector during purging and sample collection. The active soil vapor sampling protocol is attached.

The soil vapor samples will be analyzed for VOCs, including vinyl chloride, using Method TO-15, and for helium, using ASTM D1946, as a QA check to assess whether “short-circuiting” may have occurred (leak of ambient air down into the screen area).

The soil vapor samples will be analyzed using an expedited 1-week laboratory turn-around time.

Borehole Abandonment

Following VMP sampling and receipt of the data, the VMP borings will be over-drilled to 16 feet, and the VMP strings pulled from the ground. Each borehole will be grouted to near surface with neat cement.

If necessary, one or more of the paired VMPs may be left in place to allow for follow-up sampling.

Soil cuttings generated as part of this investigation will be placed on, and covered with, 6-mil visqueen, in the vicinity of the work area. One soil sample will be collected for waste profiling purposes, and analyzed for VOCs, TPH, and LUFT 5 metals on a 1-week turn-around time. The soil will be transported off-site for disposal as non-hazardous waste if required by the data; however, based on prior soil sample results from this area it is expected that the profile data will allow for the soil to be spread on-site.

Reporting

The results of the additional soil vapor sampling will be included in a data gap report of findings. Results will be compared to relevant agency screening criteria for potential vapor intrusion – State of California Regional Water Quality Control Board Environmental Screening Levels (Commercial ESL values), and Office of Environmental Health Hazard Assessment (OEHHA), California Human Health Screening Levels (CHHSLs). The appropriate use of commercials ESLs will also be discussed in the report.

DATA QUALITY OBJECTIVES

In order to meet the project objectives, data quality objectives (DQOs) have been established to ensure that the type, quantity, and quality of data collected is appropriate for the intended application. The purpose of this data gap investigation is to re-assess the previous detections of vinyl chloride in soil vapor at locations DC-VMP-14 and DC-VMP-15, and define the lateral and vertical extent of vinyl chloride above screening levels to north of these locations. DQOs have been established for this project to:

- ensure that project objectives are met;
- define the most appropriate type of data to collect; and
- determine the most appropriate conditions under which data may be collected, and specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the decisions.

In implementing this data gap work plan, analytical data from soil vapor samples collected will be examined and used in making the following decisions:

- Assess the lateral and vertical extent of vinyl chloride in soil vapor to the north of the recent soil excavation limits.

The data will be compared against screening level health risk goals established by the State of California, namely:

- Commercial ESL values for soil vapor. The commercial ESL value for vinyl chloride in soil vapor is 160 micrograms per cubic meter (µg/m3); and
- Commercial CHHSL values for soil vapor. The commercial CHHSL value for vinyl chloride in soil vapor is 95 µg/m3.

The inputs to the decisions are identified as follows:

- Analytical soil vapor results for VOCs, namely vinyl chloride, collected from the vapor monitoring points.
- Assuming no sample dilution is required, the laboratory data reporting limit for vinyl chloride in soil vapor is 1.2 µg/m3. As sample dilution is typically required, the actual reporting limit is generally in the 10 µg/m3 range for vinyl chloride.
- Analytical soil vapor results for helium, used as a leak check compound during soil vapor sampling. Helium detections below 5% by volume are considered acceptable.

Although the evaluation of vinyl chloride in soil vapor is in an area that will not support a structure, the data will be compared to screening values developed for evaluation of potential vapor intrusion into buildings and subsequent impact to indoor air. Previous data collected at locations DC-VMP-14 and DC-VMP-15 were non-detect for VOCs in soil and groundwater (with the exception of low concentrations of Freon 12 in groundwater).

REDEVELOPMENT TOOLS

Information requests outlined in the “Redevelopment Tools” section of the April 12, 2016 comment letter will be provided concurrent with the submittal of the data gap report of findings. Where applicable, some information will be included in the body of the report (i.e. discussion of appropriate use of ESLs). Other items, such as construction plan sets, cross sections and comprehensive soil, groundwater and soil vapor data tables (revised to indicate excavated data points) will be submitted as stand-alone documents. The information submittals are briefly summarized below.

Plan Set

Figure 3 of this data gap work plan presents a composite drawing showing the former Building 5 and dry cleaner, new Building K, the recent soil excavation area and confirmation soil sample locations, and the site characterization borings completed around the dry cleaner to date. The surveyed plan drawings showing the original Building 5 footprint, and the latest plan drawings for Building K, will be provided concurrent with the data gap work plan report of findings.

Cross-Sections

Two cross sections will be prepared for the former dry cleaner site. One section will trend southwest to northeast, parallel to the rear wall of the former dry cleaner space. The second section will trend southeast to northwest, parallel to the long direction of the former dry cleaner space, intersecting the first section line at 90-degrees. The lithology, soil

borings locations, depth to groundwater information, soil excavation limits, prior and new building slab locations, and soil, groundwater, and soil vapor data will be plotted with depth on each section. Excavated data points will be differentiated from data points that remain. The cross sections will be provided concurrent with the data gap work plan report of findings.

Data Tables and Non-Detectable Data

Comprehensive data tables will be prepared, summarizing all soil, groundwater and soil vapor data collected by Tetra Tech in the area of the former dry cleaner since 2001. Detected concentrations will be bolded, and those concentrations which exceed current commercial ESL values will be shaded. Data that are non-detect will be represented by the less than symbol "<", with the method reporting limit shown. Data points removed by soil excavation will be struck-out, but remain legible. The tabulated data will be provided concurrent with the data gap work plan report of findings.

SCHEDULE

Field work will be scheduled once Tetra Tech receives Work Plan approval from the ACDEH. Work will require up to eight weeks to complete, as follows:

Weeks 1-2	Obtain approval to proceed. Update Health & Safety Plan. Schedule field work. Submit ACWD soil boring permit application. Hire contractors. Obtain sampling equipment and supplies.
Weeks 3-4	Field work – install and sample soil vapor probes. Submit samples to lab.
Weeks 4-5	Lab analysis. Begin report preparation.
Week 6	Complete draft report. Determine if probes will be abandoned.
Week 7	Abandon VMP boreholes.
Week 8	Finalize report. Submit report to ACDEH.

CLOSURE

If you have any questions regarding this work plan, please contact Tim Costello (tim.costello@tetratech.com) or Keith Hoofard (keith.hoofard@tetratech.com).

Sincerely,
TETRA TECH, INC.

Keith Hoofard
Senior Geologist

Stephen M. Carlton, PG, CHG
Principal Hydrogeologist

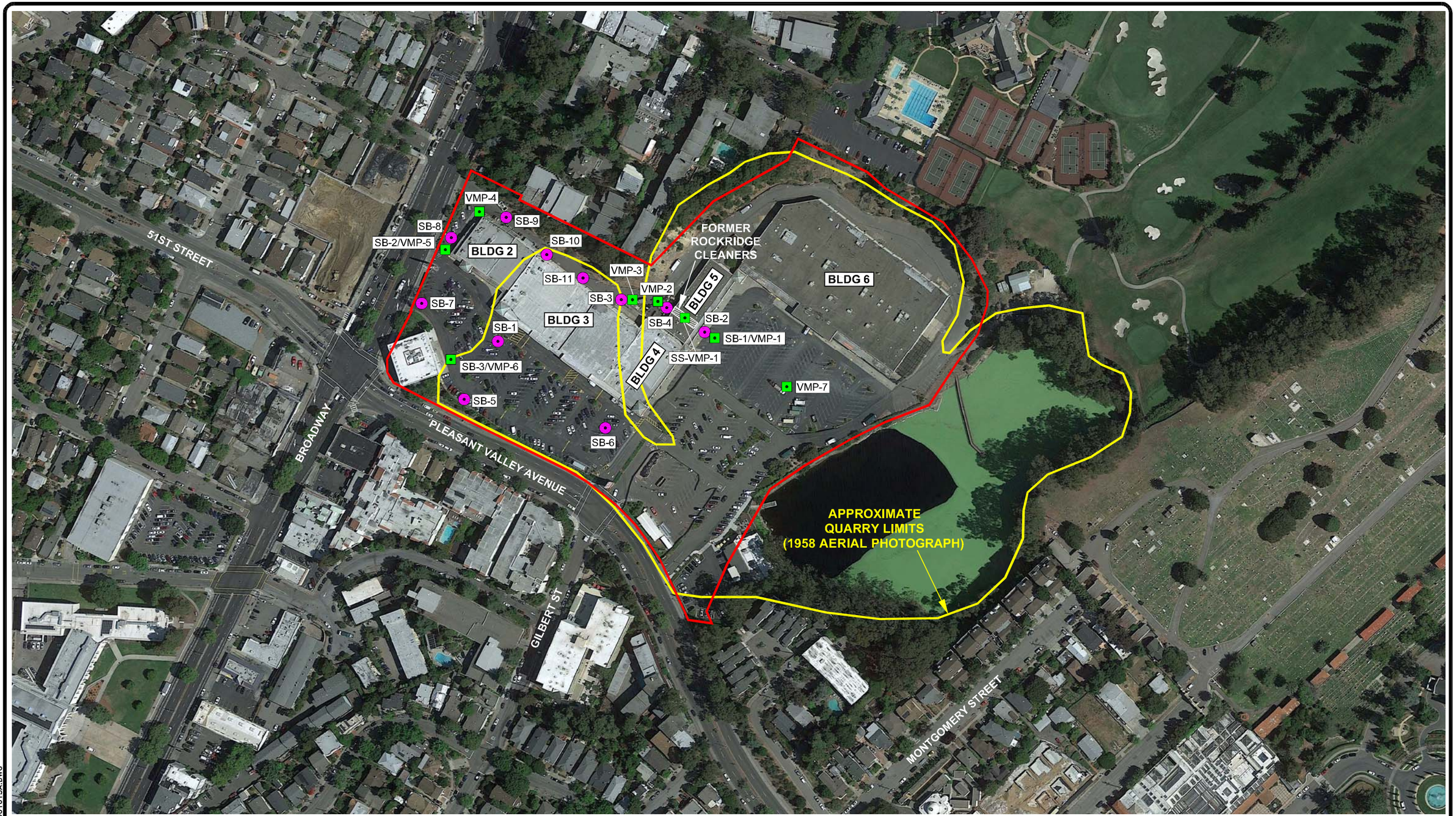
PROFESSIONAL GEOLOGIST
STEPHEN M. CARLTON
No. 4730
exp 1-31-18
STATE OF CALIFORNIA

Attachments: Figure 1 – Site Map
Figure 2 – Redevelopment Plan
Figure 3 – Proposed Data Gap Borings

Table 1 – Focused Site Conceptual Model
Table 2 – Data Gaps and Proposed Investigation

Active Soil Gas Sampling Protocol

cc: Juan Arriaga, Terramar Retail Centers (jarriaga@terramarcenters.com)
Tim Costello, Tetra Tech, Inc.



NOTE:

BUILDINGS 4 THRU 6 WERE DEMOLISHED IN SUMMER 2015 FOR PHASE I CONSTRUCTION.

SOURCE: GOOGLE EARTH PRO AERIAL DATED JUNE 2015.

LEGEND

- SOIL BORING - 2001 (GEOTRANS)
- SOIL BORING - 2014 (TETRA TECH - FORMERLY GEOTRANS)

N

0 200 400

SCALE IN FEET

TITLE: **SITE MAP**
EXISTING ROCKRIDGE SHOPPING CENTER

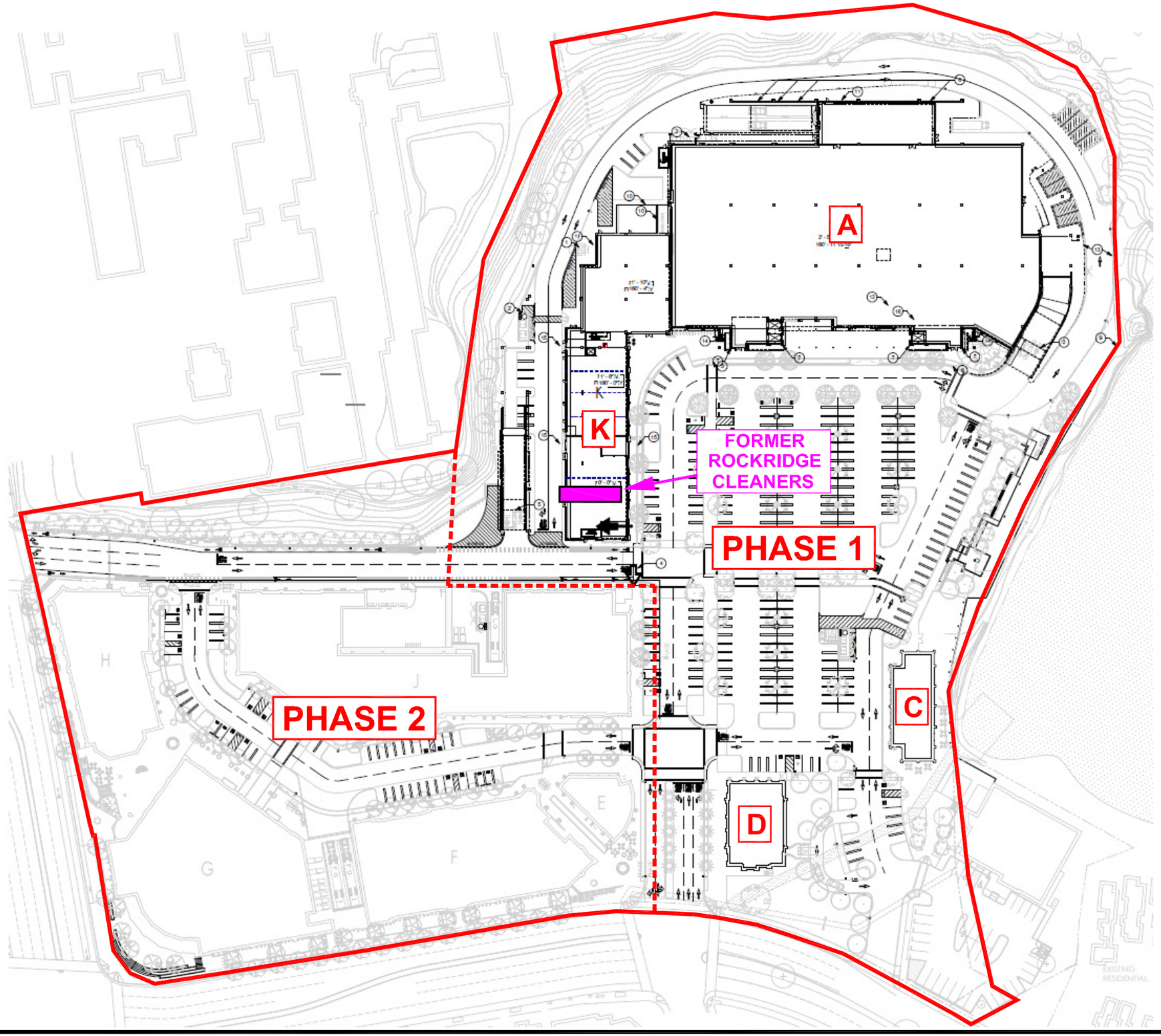
LOCATION: **5100 Broadway**
Oakland, California

TETRA TECH

APPROVED	TC
DRAFTED	CP
PROJECT#	117-7429001
DATE	6-15-16

FIGURE **1**

P:\ACAD\7429-001-OAKL\7429001013A.DWG



N

0 100 200

SCALE IN FEET

SOURCE: JRDV ARCHITECTS, DRAWING AS111 DATED MAY 30, 2014

TITLE: **REDEVELOPMENT PLAN**
PROPOSED SHOPS AT THE RIDGE

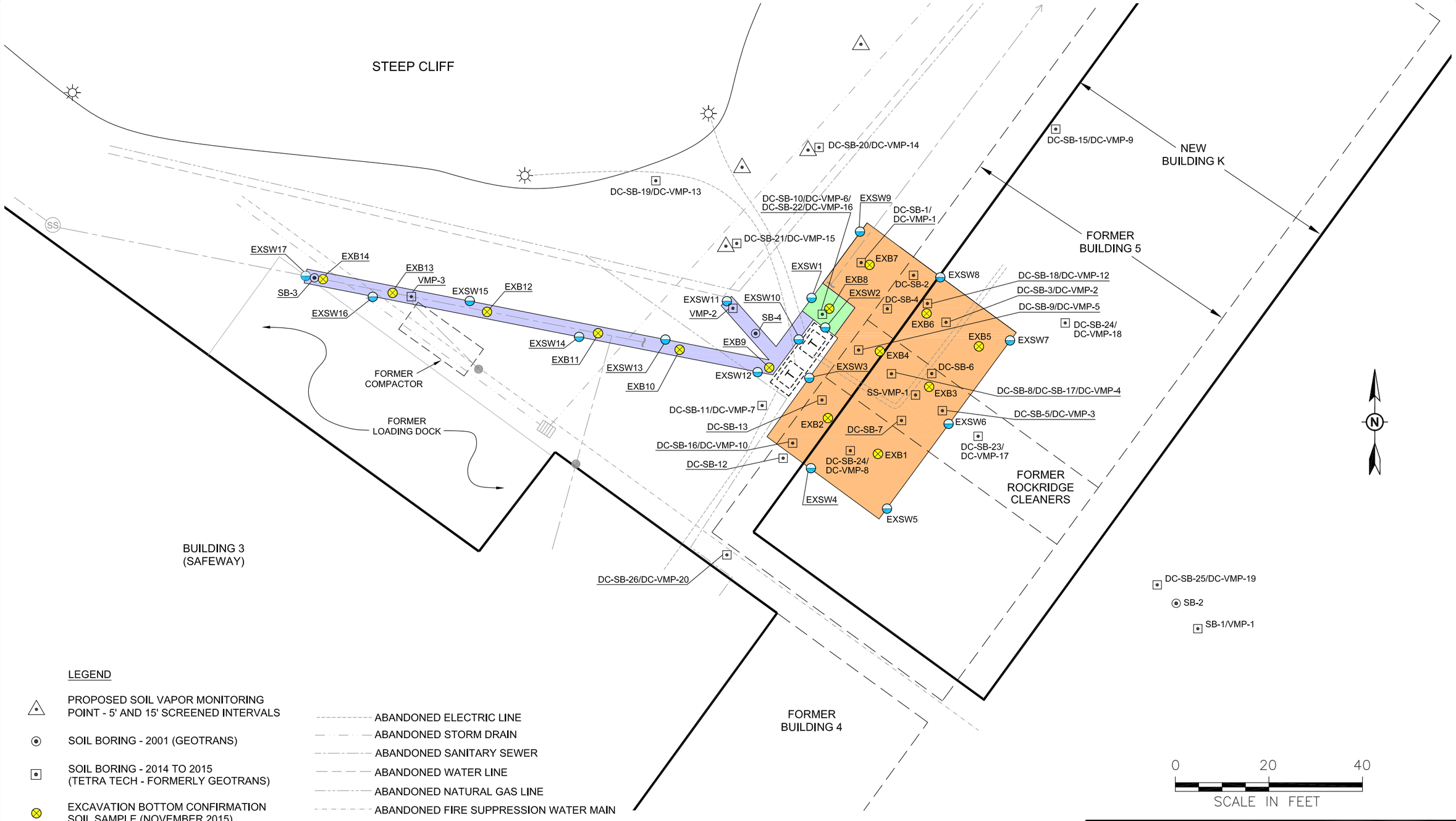
LOCATION: **5100 Broadway**
Oakland, California

TETRA TECH

APPROVED	TC
DRAFTED	CP
PROJECT#	117-7429001
DATE	6-15-16

FIGURE **2**

P:\ACAD\7429-001-OAKL\7429001014A.DWG



LEGEND

- PROPOSED SOIL VAPOR MONITORING POINT - 5' AND 15' SCREENED INTERVALS
- SOIL BORING - 2001 (GEOTRANS)
- SOIL BORING - 2014 TO 2015 (TETRA TECH - FORMERLY GEOTRANS)
- EXCAVATION BOTTOM CONFIRMATION SOIL SAMPLE (NOVEMBER 2015)
- EXCAVATION SIDEWALL CONFIRMATION SOIL SAMPLE (NOVEMBER 2015)
- ORIGINAL PG&E POWER POLE
- FORMER TRANSFORMER (BOTH REMOVED ALONG WITH PAD)
- ABANDONED ELECTRIC LINE
- ABANDONED STORM DRAIN
- ABANDONED SANITARY SEWER
- ABANDONED WATER LINE
- ABANDONED NATURAL GAS LINE
- ABANDONED FIRE SUPPRESSION WATER MAIN
- SANITARY SEWER MANWAY
- SANITARY SEWER CLEANOUT
- STORM DRAIN GRATE
- EXCAVATED TO 6' BGS (NOVEMBER 2015)
- EXCAVATED TO 8' BGS (NOVEMBER 2015)
- EXCAVATED TO 6.5'-8.5' BGS

TITLE: **PROPOSED DATA GAP BORINGS FORMER ROCKRIDGE CLEANERS**

LOCATION: **5100 Broadway (5114 Tenant Space) Oakland, California**

TETRA TECH

APPROVED	TC
DRAFTED	CP
PROJECT#	117-7429001
DATE	6-15-16

FIGURE 3

P:\ACAD\7429-001-OAK\7429001012A.DWG

TABLE 1

FOCUSED SITE CONCEPTUAL MODEL
ROCKRIDGE SHOPPING CENTER
5100 BROADWAY, OAKLAND, CALIFORNIA
Site Cleanup Program Case No. RO0003172
GeoTracker Global ID T10000007048

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Geology and Hydrogeology	**Regional**	**Geology (1):** *The site of the Rockridge shopping center project lies within the Coast Ranges geomorphic province, a series of discontinuous northwest-trending mountain ranges, ridges, and intervening valleys characterized by complex folding and faulting. The general geologic framework of the San Francisco Bay Area is illustrated in regional studies by Schlocker (1971), Helley et al. (1979), Wagner et al. (1991), Chin et al. (1993), Ellen and Wentworth (1995), Graymer et al. (1996), Graymer (2000), Graymer et al. (2006), and Witter et al. (2006).* *Geologic and geomorphic structures within the San Francisco Bay Area are dominated by the San Andreas fault (SAF), a right-lateral strike-slip fault that extends from the Gulf of California in Mexico to Cape Mendocino on the Coast of Humboldt County in northern California. It forms a portion of the boundary between two independent tectonic plates on the surface of the earth. To the west of the SAF is the Pacific Plate, which moves north relative to the North American Plate, located east of the fault. In the San Francisco Bay Area, movement across this plate boundary is concentrated on the SAF; however, it is also distributed, to a lesser extent across a number of other faults that include the Hayward, Calaveras and Concord among others. Together, these faults are referred to as the SAF System. Movement along the SAF system has been ongoing for about the last 25 million years. The northwest trend of the faults within this fault system is largely responsible for the strong northwest structural orientation of geologic and geomorphic features in the San Francisco Bay Area.* *Basement rocks west of the SAF are generally granitic, while to the east they consist of a chaotic mixture of highly deformed marine sedimentary, submarine volcanic and metamorphic rocks of the Franciscan Complex. Both are typically Jurassic to Cretaceous in age (200-65 million years old). Overlying the basement rocks are Cretaceous (about 145 to 65 million years old) marine, as well as Tertiary (about 65 to 1.8 million years old [USGS, 2006]) marine and non-marine sedimentary rocks with some continental volcanic rock. These Cretaceous and Tertiary rocks have been extensively folded and faulted as a result of late Tertiary and Quaternary regional compressional forces. The inland valleys, as well as the structural depression within which the San Francisco Bay is located, are filled with unconsolidated to semi-consolidated continental deposits of Quaternary age (about the last 1.8 million years). Continental surficial deposits (alluvium, colluvium, and landslide deposits) consist of unconsolidated to semi-consolidated sand, silt, clay, and gravel while the Bay deposits typically consist of very soft organic-rich silt and clay (Bay Mud) or sand.*	None	NA
		Hydrogeology (2): The site is not located within a mapped groundwater basin, sitting on the margin between the Franciscan bedrock and the East Bay Plain subbasin (Subbasin 2-9.04) of the Santa Clara Valley alluvial groundwater basin (Basin 2-9). As such, groundwater in the area is expected to be perched and discontinuous. The nearby East Bay Plain Subbasin is a northwest trending alluvial plain bounded on the north by San Pablo Bay, on the east by the contact with Franciscan Basement rock (where the site is located), and on the south by the Niles Cone (Subbasin 2-9.01). The East Bay Plain Basin extends beneath San Francisco Bay to the west. The near-surface water bearing formations in the East Bay Plain include the early Holocene Temescal Formation and areas of Artificial Fill. The Temescal Formation ranges from 1- to 50-feet thick with the water level located near ground surface (in the low-land areas).		

TABLE 1

FOCUSED SITE CONCEPTUAL MODEL
ROCKRIDGE SHOPPING CENTER
5100 BROADWAY, OAKLAND, CALIFORNIA
Site Cleanup Program Case No. RO0003172
GeoTracker Global ID T10000007048

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
	Site	**Geology:** The former dry cleaner site, and overall redevelopment site, is located within the confines of a former rock quarry (Blake & Bilger Quarry; previously Oakland Paving Co.) that operated from prior to 1939 up until the 1950s. The quarry operation also extended to the east of the redevelopment site, in the area of the existing pond. According to on-line sources discussing the former quarry, the bedrock that was quarried, and which is visible along the cliff walls on the north and east perimeter of the Property, is quartz diorite of the Franciscan Formation, in addition to the presence of metamorphosed sandstone in some areas. Kleinfelder's geotechnical work describe the exposed grey/blue bedrock as Tonalite; a type of quartz diorite with a higher quartz content. Following the end of quarry operations, the quarry pit beneath the Rockridge Shopping center was partially backfilled/leveled to facilitate construction of the shopping center in the early 1960s. While it is expected that some of the fill material used was derived from quarry spoils, much of the fill material appears to have been uncontrolled backfill (unknown source), based on Tetra Tech's many soil borings completed at the site to date. Debris consisting of metal, plastic, glass and brick, and decaying organic material consisting of lumber and trees, is typically encountered beneath a 6- to 11-foot thick layer of dense, silty sandy gravel, with cobbles and boulders (cap fill). The debris material is generally entrained in layers of finer sediments (silts, clays) beneath the cap fill, extending to 20 to 25 feet in depth (deepest explored) and exhibits a putrid odor, typical of anaerobic (reducing) conditions. Some fine to coarse carbonate gravel material is present at depth (based on reaction to HCl). Carbonate rock is also present in the cap fill materials. Based on seismic refraction surveys of the site conducted by Kleinfelder, depth to bedrock ranges from surface (near the quarry perimeter) to 60 feet below surface, with the top of the bedrock generally occurring between 20- and 40-feet below ground surface east of the former Building 4 location. Depth to bedrock west of former Building 4 is typically much shallower, occuring within 4- to 15-feet of ground surface. **Hydrogeology:** No groundwater monitoring wells have been installed at the Site. First water has been encountered on site in the area of the former dry cleaner at depths between 16 and 24 feet below grade. Depth to static water ranged from 11.6 feet to 15.7 feet below grade (open auger hole) in 2015. Groundwater on the western half of the overall site is generally absent, due to the presence of shallow bedrock. Based on Tetra Tech's prior review of historical aerial photography of the quarry, groundwater within the quarry limits is expected to be localized, bound by the topography of the former quarry pit, and generally not contiguous with true groundwater-bearing zones in the nearby East Plain subbasin, with the possible exception for some groundwater interconnectivity via fractured bedrock flow. Based on 2012 groundwater flow data from an adjacent former gasoline station (Exxon at 5175 Broadway), groundwater flow in the area has ranged from southwest to the southeast.	None	NA
Surface Water Bodies		There nearest surface water body is a pond located immediately east of the site. The pond is located in what appears to have been the initial quarry pit, based on review of historical aerial photographs. Today, the pond serves as a storm water receiving body for the area. The west branch of Glen Echo Creek is also depicted on Oakland WIKI, as being located between the pond and the redevelopment site. The creek channel is visible within the Claremont Country Club Golf Course located immediately northeast of the site, but there is no surface expression of the creek at the site or in the downstream vicinity. The creek may have been intercepted by the creation of the quarry pond, and channelized into an underground culvert downstream. The creek is shown ultimately discharging to Lake Merrit, 1.7 miles southwest of the site.	None	NA
Nearby Wells		The State Water Resources Control Board's GeoTracker GAMA database and the California Statewide Groundwater Elevation Monitoring (CASGEM) System databases were reviewed for information concerning nearby water wells known by the State of California. Based on the GAMA database, there are no water supply wells located within 1-mile of the site. Based on the CASGEM database, there is one observation well located approximately 0.86-miles west-northwest of the site. The well is reportedly operated by the East Bay Municipal Utility District (EBMUD), and is 125 feet in depth.	None	NA

TABLE 1

FOCUSED SITE CONCEPTUAL MODEL
ROCKRIDGE SHOPPING CENTER
5100 BROADWAY, OAKLAND, CALIFORNIA
Site Cleanup Program Case No. RO0003172
GeoTracker Global ID T10000007048

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Plume	**Soil Gas**	Elevated concentrations of VOCs in soil vapor were detected in the upper 5-feet of soil surrounding the rear of the former Rockridge Dry Cleaner tenant space, extending radially outward approximately 30-feet from the soil source area, and along the sanitary sewer line approximately 120-feet down sewer from the rear of the former dry dry cleaner. The presence of VOCs in soil vapor distant from the source area is believed to be a result of the coarse fill material (up to boulder size) and many old utility lines present in the upper 9 feet in the area of the former dry cleaner, creating preferential pathways for soil vapor migration (see Figure 3). Soil excavation completed in November 2015 removed the elevated concentrations of VOCs in soil at the rear of the tenant space (see Figure 3). The soil excavation limits also encompassed the areas of elevated VOC concentrations in shallow soil vapor beneath the former dry cleaner and along the sanitary sewer line, thereby removing that soil vapor from the footprint of Building K. However, two locations outside of the completed excavation limits, DC-VMP-14 and DC-VMP-15, contained concentrations of vinyl chloride in soil vapor above the commercial environmental screening level (ESL) value of 160 µg/m3 at 5 feet in depth (see Figure 3). One location (DC-VMP-14) exhibited a slightly increased vinyl chloride concentration at depth (210 µg/m3 at 5' and 500 µg/m3 at 14'), while the second location (DC-VMP-15) exhibited a much lower vinyl chloride concentration at depth (850 µg/m3 at 5' and 35 µg/m3 at 13'). Both sample locations are 40 feet from the foundation of new Building K, directly between Building K and the steep rock face that represents the edge of the former quarry at the site. Soil and groundwater samples from this location were non-detect for vinyl chloride.	Lateral and vertical extent of vinyl chloride in soil vapor not delineated to the north of the recent soil excavation area.	Complete additional soil vapor monitoring points to the north (see Table 2).
	Groundwater	Chlorinated VOCs have not been detected in the 12 groundwater samples collected at and around the former dry cleaner location.	None	NA
Summary Tables	**Soil Soil Vapor Groundwater**	Comprehensive data tables from samples collected in 2001, 2014 and 2015 will be submitted concurrent with the Data Gap report of findings. The data will correspond to all sample locations shown on the attached Figure 1 and Figure 3.		
Facility Structures	**Historic**	The former dry cleaner site, and overall redevelopment site, is located within the confines of a former rock quarry (Blake & Bilger Quarry; previously Oakland Paving Co.) that operated from prior to 1939 up until the 1950s. The site was partially filled and leveled to make way for the Rockridge Shopping Center, constructed around 1966-67. The shopping center consisted of five interconnected buildings (Buildings 2 through 5) and stand-alone building (Building 1; current Chase Bank). A dry-cleaner (most recently known as Rockridge Cleaners) operated from the 5114 Broadway tenant space from around 1967 until mid-2014, near the southern end of Building 5. On-site dry cleaning using PCE reportedly occurred from around 1967 through the late 1970s or early 1980s, but no later than 1982. Buildings 4 through 6 were demolished in Summer 2015 to allow for Phase I redevelopment of the new Shops at the Ridge. Figures 1 depicts the layout of the Rockridge Shopping Center. Phase II redevelopment will include demolition of Buildings 1 through 3, but has yet to commence.	NA	NA
	Current	New Building K is under construction. Two-story Building K sits approximately at the same grade as former Building 5, is concrete slab-on-grade, has been framed, and the exterior will be closed in shortly. The northwest (back wall) of new Building K sits seven feet to the southeast of the former Building 5 rear wall. The new slab measures 5-inches thick and is supported by a continuous 2-foot thick perimeter grade-beam that varies from 4- to 6-feet in width. Figure 2 shows Building K, along with the balance of the new Shops at Ridge structures. Figure 3 is a composite drawing, depicting both former Building 5 and new Building K in relation to the former dry cleaner tenant space, along with the original subsurface utility lines. The original utilities are in various states of abandonment, while new subsurface utilities are installed behind Building K.	NA	NA
Site Operations	**Historic**	Former Building 5 was a multi-tenant commercial/retail building. Just prior to demolition, tenants included Payless Shoe Source, Game Stop, 1st United Credit Union, Rockridge Cleaners, North Oakland Village, Great Clips, Starbucks, and three vacant tenant spaces (5108, 5112 and 5128 Broadway). On-site dry cleaning using PCE reportedly occurred at the Rockridge Cleaners tenant space from around 1967 through the late 1970s or early 1980s, but no later than 1982.	NA	NA

TABLE 1

FOCUSED SITE CONCEPTUAL MODEL
ROCKRIDGE SHOPPING CENTER
5100 BROADWAY, OAKLAND, CALIFORNIA
Site Cleanup Program Case No. RO0003172
GeoTracker Global ID T10000007048

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
	Current	New Building K is under construction (since Fall 2015). The building will support multi-tenant retail/food-related operations when completed.	NA	NA
Nearby Release Sites	**5175 Broadway**	A former Exxon gasoline station was located immediately west of the overall redevelopment site, across Broadway, 630 feet west-northwest of the former Rockridge Cleaners tenant space. The former gas station site had been vacant since 1979, until residential redevelopment commenced at that site and surrounding area in Summer 2015. According to documents reviewed on the GeoTracker website, subsequent to the gasoline station closing down, three 8,000-gallon gasoline tanks and a 500-gallon waste oil tank were removed in January 1990. Holes were observed in all four tanks. Approximately 700 tons of impacted soil was removed during the tank work, remediated on-site, and reused as backfill. A total of 19 on-site monitoring wells, 3 offsite monitoring wells, 4 on-site soil gas probes and 3 off-site soil gas probes were installed and routinely monitored during the course of site investigation and remediation work between 1990 and 2012. Dual-phase extraction with air sparging commenced in December 2010 and was subsequently shut down in December 2012 after rebound testing was conducted. Groundwater flow ranged from southwest to southeast, with a depth to water typically between 5 and 15 feet. Total petroleum hydrocarbons as gasoline (TPH-g) was detected concentrations up to 1,600 ppb (well DPE-6) during the last groundwater monitoring event in December 2012, with benzene detected up to 27 ppb (well MW-3A). The closest wells to the shopping center were offsite wells MW-9A/9C and MW10C, installed in 2007. No significant concentrations of TPH-g, TPH-diesel or benzene were detected in these three wells, along with no detections of MTBE. MTBE was first tested for in 1996, and was sporadically detected in on-site monitoring wells between 1999 and 2002 at concentrations up to 170 ppb. There was a hiatus in groundwater monitoring from 2002 to 2006. The site was granted a Low-Threat Closure by the Regional Board in June 2013, and the wells abandoned in September 2013. During 2001 subsurface investigation work conducted by Tetra Tech (then GeoTrans) at the Rockridge Shopping Center, MTBE was detected in a groundwater sample (SB-9) collected in the delivery driveway behind Building 2, 215 feet east-southeast of the former Exxon site. The MTBE concentration of 48 ppb exceeded the California Maximum Contaminant Level (MCL) and Drinking Water Standard of 13 ppb MTBE. Groundwater flow data (2012) from the former gasoline station indicated there was a southeasterly component to groundwater flow at the former station site, placing it up-gradient from the Rockridge Shopping Center. As a result, the source of the MTBE in groundwater at the Rockridge Shopping Center is expected to be from the former Exxon station.	None - currently part of a residential redevelopment project	NA

TABLE 1

FOCUSED SITE CONCEPTUAL MODEL
ROCKRIDGE SHOPPING CENTER
5100 BROADWAY, OAKLAND, CALIFORNIA
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CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Land Use and Exposure Scenarios	**On-Site**	The Rockridge Shopping Center is currently undergoing redevelopment as the Shops at the Ridge, where land use will remain the same as it has since 1967 (mixed use commercial/retail/food-related). The redevelopment site is located within the confines of a former rock quarry, and outside areas of beneficial groundwater use (just outside Subbasin 2-9.04, on the margin of Franciscan bedrock). Additionally, groundwater sample data indicate groundwater has not been impacted by VOCs, and thus does not represent a threat to human health or the environment. Soil excavation in November 2015 removed the shallow source area of PCE behind the former dry cleaner, along with elevated concentrations of VOCs in soil vapor beneath the new Building K location and along a section of sanitary sewer line, thus mitigating soil exposure and the potential for vapor intrusion into the overlying building. One excavation sidewall confirmation soil sample (EXSW2) contained PCE at a concentration of 480 micrograms per kilogram (µg/Kg) at 3-feet in depth in November 2015. This location is 13-feet northwest of the rear wall of Building K. Due to a recent revision in the commercial soil ESL values in February 2016, this concentration now exceeds the revised ESL commercial PCE value of 420 µg/kg (based on leaching to groundwater within 10 feet). As numerous groundwater samples have demonstrated a lack of VOCs in groundwater in the area, and depth to static groundwater was 15 feet below grade in this area, this residual PCE concentration is not considered significant. The area at EXSW2 will be paved over as part of a delivery truck route once redevelopment is complete. Two previous soil vapor sample locations, DC-VMP-14 and DC-VMP-15, distant from the recent soil excavation limits and new Building K, did contain elevated concentrations of vinyl chloride above the commercial ESL value. While not expected to represent a potential threat to groundwater (based on previous non-detect soil and groundwater data) or indoor air (located 40 feet from Building K), the lateral and vertical extent of vinyl chloride in soil vapor has not been fully delineated.	Lateral and vertical extent of vinyl chloride in soil vapor not delineated to the north of the recent soil excavation area.	Complete additional soil vapor monitoring points to the north (see Table 2).
	Adjacent Sites	The adjacent sites surrounding the overall redevelopment site include an Arts College and the Claremont Country Club to the north; a pond (part of original quarry to the east), beyond which is residential; residential and commerical to the south, across Pleasant Valley Avenue; and a new multi-story residential building under construction to the west, across Broadway. The PCE source area at the former dry cleaner has been removed, leaving minimal residual vinyl chloride in soil vapor at two locations above the commercial ESL value, along with one detection of PCE in soil above the commercial ESL value at 3-feet in depth, all located in close proximity to the former dry cleaner lease space. The Arts College is located above the former dry cleaner site, atop a steep rock cliff face, discontinous with the shopping center land, isolating it from any potential soil, soil vapor or groundwater exposure from the former dry cleaner. The Country Club is also located distant from the former dry cleaner, atop the same steep rock cliff face. The remaining adjacent sites are located at least 500 feet from the former dry cleaner site, where groundwater is not impacted by VOCs.	None	NA

(1) Excerpted from *GeoTechnical Investigation Report, Shops at the Ridge, Safeway Store #3132, Broadway & Pleasant Valley, 5130 Broadway, Oakland, California* , dated November 10, 2014 and prepared by Kleinfelder.

(2) https://gis.water.ca.gov/app/gicima/ (for Subbasin boundary), and *Bulletin 118, Santa Clara Valley Groundwater Basin, East Bay Plain Subbasin, San Francisco Bay Hydrologic Region* , Updated 2/27/04, California Department of Water Resources.

TABLE 2

DATA GAPS AND PROPOSED INVESTIGATION
ROCKRIDGE SHOPPING CENTER
5100 BROADWAY, OAKLAND, CALIFORNIA
Site Cleanup Program Case No. RO0003172
GeoTracker Global ID T10000007048

Item	Data Gap	Proposed Investigation	Rationale	Analysis
1	Evaluate the lateral and vertical extent of vinyl chloride in soil vapor to the north of the recent soil excavation area.	Complete four temporary dual-completion soil vapor monitoring points (VMPs) (Figure 3). Each VMP will be screened at 5-feet below grade and at 15-feet below grade, or 2-feet above static depth to water, which was previously encountered at 15- to 16-feet below grade in the area in 2015. The VMPs will be installed using small diameter hollow-stem augers, and overdrilled for abandonment after sample data have been received.	Two of the VMPs will be for confirmation purposes, completed at previous locations DC-VMP-14 and DC-VMP-15, where vinyl chloride concentrations above the commercial ESL value were detected in soil vapor prior to the November 2015 interim remedial action. Two of the VMPs will be step-out locations, each completed between 20- and 25-feet north of the confirmation VMP locations. Step-out VMP placement will be adjusted based on the proximity to the nearby bedrock cliff face, which extends below the ground surface at a moderate to steep angle, often resulting in drilling refusal in the area.	**Soil Vapor:** VOCs by EPA Method TO-15 Helium by ASTM-D1946 (leak detection)

Active Soil Gas Sampling Protocol

Active soil gas samples are collected from the vapor monitoring points (VMPs) by connecting ¼-inch diameter Teflon tubing (DTSC/RWQCB, 2015), from the hose barb at the top of the VMP to a dedicated sampling manifold. A laboratory-supplied manifold prevents soil particles or water from entering the sample canisters and restricts the air flow to less than 200 milliliters per minute (mL/min). Manifolds are used once and then returned to the laboratory for cleaning.

Three purge volumes are extracted from each VMP using a 6-liter Summa canister that is only used for purging (DTSC/RWQCB, 2015). The soil gas samples are collected in a 1-liter Summa canister. As part of the quality control procedures, Summa canister vacuum levels are measured prior to and after collecting each soil gas sample. These measurements are recorded on the sample label and on the sample chain of custody form.

Ambient air leaks during soil gas sampling may dilute the samples and produce results that underestimate the actual site concentrations or contaminate the sample with external contaminants. Prior to collecting a soil gas sample in the 1-liter Summa canister, a shut-in test is conducted followed by a leak detection test using helium.

The shut-in test is used to test if the above-ground fittings are air tight. The soil gas sampling apparatus is assembled (e.g. valves, tubing, manifold, fittings) downstream from the top of the probe. The apparatus is evacuated using a vacuum of about 20 inches of mercury. The applied vacuum is allowed to equilibrate in the apparatus, all valves are then closed, and the vacuum held for at least one minute. If there is an observable loss of vacuum, then the fittings are adjusted as needed until the apparatus holds a vacuum (DTSC/RWQCB, 2015).

Helium is a naturally occurring compound and is present in air at about 5 parts per million by volume (ppmv). The potential for ambient air leaks is evaluated using a shroud. Assuming a reasonably good seal can be obtained with the shroud, the ambient air leak can be quantified with helium. The apparatus for leak detection is set up after the shut-in test has been conducted. Leak detection is implemented at the well head using industrial-grade helium gas within the sampling shroud. The shroud consists of a plastic container placed over the entire top of the VMP well head. The shroud has two ports fitted with ¼-inch stainless steel or brass through-wall bulkhead fittings equipped with hose barbs. One barb is for injection of the helium into the shroud and the second barb is for the helium detector to connect to the shroud. The Summa canister sample tubing is fed through a third hole in the shroud, fitted with a rubber grommet, and connected to the VMP via compression fittings. The helium cylinder is connected to the shroud via ¼-inch tubing.

The shroud is secured to cover the entire well top and aluminum foil or hydrated bentonite is used to seal around the bottom the shroud where the shroud does not fit evenly to the ground. The helium gas is injected into the shroud to a concentration equal to 50 percent by volume, as measured using a helium gas detector. A purge volume is calculated using the volume of the screened probe tip, the volume of the rigid tubing from the probe tip to brass ball valve at the

surface, the filter pack void space volume, and the length of tubing from the brass ball valve to the vacuum 6-liter Summa canister. Three purge volumes are purged from the well tubing using the vacuum 6-liter Summa canister. The 6-liter Summa canister is closed and the 1-liter Summa sample canister valve is opened to collect the soil gas sample. The helium concentration inside the shroud is measured continuously using a helium gas detector during the soil gas sampling. The concentrations of helium are noted at the start and end of sampling.

The 1-liter Summa canisters is submitted under COC documentation to Air Toxics, LTD in Folsom, California and analyzed for VOCs using Method TO-15 Direct Inject and helium to assess potential leak detection.

Helium is analyzed based on a percentage basis. An ambient air leak of five percent of the concentration within the shroud is acceptable for quantitative testing performed by shrouding. If the concentration of helium in the laboratory sample is less than five percent of the helium concentration in the shroud (using the helium gas detector), then the sample is considered valid.