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Environmental Health

August 16, 2012

Ms. Dilan Roe
Hazardous Materials Specialist
Alameda County Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94501-6577

Subject: **Soil, Groundwater, and Soil Vapor Investigation Work Plan**
Crown Chevrolet Cadillac Isuzu
7544 Dublin Boulevard and 6707 Golden Gate Drive
Dublin, California
Fuel Leak Case No. RO0003014

Dear Ms. Roe:

Enclosed please find the *Soil, Groundwater, and Soil Vapor Investigation Work Plan* (work plan) for the Crown Chevrolet Cadillac Isuzu site at 7544 Dublin Boulevard and 6707 Golden Gate Drive, in Dublin, California (Fuel Leak Case No. RO0003014, GeoTracker Global ID T10000001616). This work plan was prepared by AMEC Environment & Infrastructure, Inc. (AMEC), on behalf of Crown Chevrolet Cadillac Isuzu.

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.

Please contact me at (925) 984-1426 or Susan Gallardo of AMEC at 510-663-4137 if you have any questions regarding this Work Plan.

Sincerely yours,

Terri Costello

Terri Costello
Betty J. Woolverton Trust

Attachment: Soil, Groundwater, and Soil Vapor Investigation Work Plan

cc: Tondria Hendrix, Zurich North American Insurance
Thomas L. Vormbrock, Rimkus Consulting Group, Inc.
Susan Gallardo, AMEC Environment & Infrastructure, Inc.

Soil, Groundwater, and Soil Vapor Investigation

Work Plan

Crown Chevrolet Cadillac Isuzu
7544 Dublin Boulevard and 6707 Golden Gate Drive
Dublin, California

Prepared for:

Crown Chevrolet, Dublin, California

Prepared by:

AMEC, Oakland, California

August 2012

Project OD10160070

amec

SOIL, GROUNDWATER, AND SOIL VAPOR INVESTIGATION WORK PLAN
Crown Chevrolet Cadillac Isuzu
7544 Dublin Boulevard and 6707 Golden Gate Drive
Dublin, California
Fuel Leak Case No. RO0003014

August 16, 2012
Project OD10160070

This report was prepared by the staff of AMEC Environment & Infrastructure, Inc., under the professional supervision of Avery Patton. The findings, recommendations, specifications, and/or professional opinions presented in this report were prepared in accordance with generally accepted professional geologic practice, and within the scope of the project. There is no other warranty, either express or implied.

PROFESSIONAL GEOLOGIST
AVERY PATTON
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TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

TABLES

FIGURES

SOIL, GROUNDWATER, AND SOIL VAPOR INVESTIGATION WORK PLAN

Crown Chevrolet
7544 Dublin Boulevard and 6707 Golden Gate Drive
Dublin, California

AMEC Environment & Infrastructure, Inc. (AMEC) has prepared this *Soil, Groundwater, and Soil Vapor Investigation Work Plan* (work plan) on behalf of Crown Chevrolet for the properties located at 7544 Dublin Boulevard and 6707 Golden Gate Drive in Dublin, California (the site; Figure 1). The work plan was prepared pursuant to a letter dated August 3, 2012, from the Alameda County Environmental Health Services Department (ACEH) to Terri Costello of the Betty K. Woolverton Trust and Patrick Costello of Crown Chevrolet, requesting submission of a work plan for a soil, groundwater, and soil vapor investigation.

In addition to a description of the proposed work, this work plan presents an initial site conceptual model (SCM). The SCM will be refined pending the results of the investigation proposed herein.

In order to collect sufficient data to generate an updated SCM, and to meet the schedule of proposed site re-development, AMEC proposes to proceed with the general schedule presented below; a detailed project schedule is being submitted to the ACEH under separate cover. Throughout the implementation of the work plan, we will maintain communication with the ACEH to convey field decisions that may be necessary regarding the locations of some sampling locations (as discussed below), potential field impediments that require modifications to this work plan, preliminary analytical results, and schedule changes, if any.

- Month of August 2012
    - Compile data from previous investigations performed by AMEC and others into tables and onto figures.
    - Develop known aspects of SCM, to be supplemented by forthcoming data.
    - Draft fact sheet submitted to ACEH for public distribution.
- Week of August 13, 2012
    - Submit work plan to ACEH.
    - Initiate permitting activities for proposed field investigation.
- Week of August 20, 2012
    - Meet with ACEH to discuss and obtain feedback regarding the elements of the work plan and SCM.

- ACEH approval of work plan.
- Week of August 27, 2012
  - Initiate field activities, beginning with the shallow soil and grab groundwater borings at the western property boundary, and continuing with deeper borings and nested monitoring wells and soil vapor probes.
  - Begin receiving preliminary data from the investigation (on expedited turnaround). Make decisions about locations of some groundwater and vapor monitoring wells, as possible.
- Week of September 3, 2012
  - Continue field investigation, including installation, development, and sampling of shallow monitoring wells and conversion of two temporary vapor probes to permanent probes.
  - Continue receiving preliminary data from investigation.
- Week of September 10, 2012
  - Complete field investigation/sampling. Incorporate data into tables and onto figures with historical data.
- Week of September 17, 2012
  - Update the SCM with new site data.
- Week of September 24, 2012
  - Meet with ACEH to discuss SCM and findings of field investigation.
  - Continue to update SCM and prepare report documenting investigation.
- October 19, 2012
  - Submit SCM and investigation reports (including all previously collected data) to ACEH.

1.0 OBJECTIVE

The objective of the work proposed herein is to collect additional data to address identified gaps in the current knowledge of site conditions with regard to chemical impacts to soil, groundwater, and soil vapor concentrations and distribution.

2.0 BACKGROUND

The site was developed in 1968 as Crown Chevrolet, a car dealership with auto body shops, on previously undeveloped land. At that time, the three main site buildings (Buildings A, B, and C) were constructed. Building A was later expanded. Building D was reportedly constructed in 1994. Operations as a car dealership and auto body shop continued from 1968 through the present, although operations have been significantly reduced in the past several years. The site originally consisted of one approximately 6.33-acre parcel, but was divided into north (4.97-acre) and south (1.36-acre) parcels in approximately 2000, when St. Patrick Way was built. The facility operations discussed above were conducted on the north parcel; the south parcel was used for vehicle parking.

It is tentatively planned that the north and south parcels will be redeveloped. Specifically, the north parcel is tentatively planned for development of 310 homes (multi-unit structures) and 17,000 square feet of retail space. The south parcel is tentatively planned for development as 76 units of affordable veterans' housing.

Multiple investigations have been conducted at the site; these investigations have been performed to address regulatory concerns as well as in support of transactional and potential redevelopment activities. Previous investigations conducted at the site are documented in the following reports:

- March 16, 2009—Basics, *Limited Phase II Environmental Site Sampling Report* (Basics, 2009).
- April 4, 2011—AMEC, *Revised Soil and Groundwater Investigation Report* (AMEC, 2011a).
- January 7, 2011—Ninyo & Moore, *Limited Phase II Environmental Site Assessment* (Ninyo & Moore, 2011a).
- September 16, 2011—Ninyo & Moore, *Additional Phase II Environmental Site Assessment* (Ninyo & Moore, 2011b).
- September 27, 2011—AMEC*, Soil, Groundwater, and Soil Vapor Investigation Report* (AMEC, 2011b).

Sampling locations for the multiple investigations conducted to date are shown on Figure 2. Select samples collected during these investigations have been analyzed for VOCs, total petroleum hydrocarbons, metals, polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and glycols. Based on the results, two primary environmental impacts related to the presence of volatile organic compounds (VOCs) have been identified. First, VOCs, primarily tetrachloroethene (PCE) and trichloroethene (TCE) have been detected in shallow groundwater and soil vapor throughout the northern portion of the north parcel (Figure 2). Second, chlorobenzenes and related compounds have been detected in soil, groundwater, and soil vapor at a former sump and a former pit within Building B. In addition to these primary impacts, a low concentration (relative to screening levels) of PCE has been detected in soil vapor in the northeastern corner of the south parcel. No PCE is present in groundwater in this area and no facility operations, other than vehicle parking, were conducted in the southern parcel; however, the origin and extent of PCE in soil vapor are not known.

Based on the currently available information, there does not appear to be separate-phase product (i.e., dense non-aqueous phase liquid [DNAPL]) in soil or groundwater at the site. The rationale for this conclusion, which is based on the U.S. Environmental Protection Agency

(EPA) Fact Sheet entitled Estimating Potential for Occurrence of DNAPL at Superfund Sites (Fact Sheet, U.S. EPA 1992), is presented in the initial SCM (Table 1). Some elements listed in the Fact Sheet that would further our understanding of whether DNAPL is present at the site include additional knowledge of site stratigraphy and vertical distribution of the target chemical; these additional elements are presented in the initial SCM and addressed as part of the additional site characterization activities proposed herein.

Remediation was performed in October 2011 at the former sump and former pit within Building B. The remediation effort included removing a total of 432 tons of VOC–affected soil, concrete, and pea gravel from the former sump and pit excavations and approximately 5,600 gallons of VOC-affected water from the sump excavation. The work is documented in AMEC's *Remediation Report* (AMEC, 2011c).

3.0 SITE CONCEPTUAL MODEL

The August 3, 2012 letter from ACEH to Crown Chevrolet requires that a detailed site conceptual model (SCM) be prepared for the site. However, as there are identified data gaps at this time, AMEC has developed an initial SCM to document known environmental conditions at the site based on the data available at this time (from the site and nearby properties), and indicate where data gaps exist.

The SCM is presented in tabular format in Table 1. Cross sections associated with the SCM are included on Figures 3, 4, and 5 (cross-section locations are shown on Figure 2).

As mentioned above, from previous investigations at the site, it is known that there are VOC impacts to soil and groundwater in the northern portion of the north parcel of the site (Figure 2). However, the following data gaps have been identified and are detailed in Table 2 relative to specific field activities to address these data gaps:

Further definition of deeper lithology on-site

- Hydrogeology
  - Confirmation of groundwater flow direction
  - Vertical groundwater gradients
- Lateral distribution of VOCs in shallow groundwater
  - Refinement of groundwater contours south (beneath Building A) and north of the higher concentration area, which is north of Building A;
  - Distribution of VOCs at the western (presumed upgradient direction) property boundary
  - Presence of VOCs toward the east (presumed downgradient direction) and off site
- Potential presence of VOCs in deeper groundwater

- Potential presence of DNAPL
- Concentration trends in shallow and deeper groundwater
- Soil Vapor
    - Possible off-site migration of impacted soil vapor to the east, including concentration trends of VOCs in soil vapor in this area
    - Presence of VOC concentrations in soil vapor in the south parcel of the site.
- Potential for biodegradation of VOCs in groundwater
- Preferential pathways and sources

4.0 FIELD INVESTIGATION

To address the data gaps described in the SCM (Table 1), a total of 26 borings are proposed for collection of soil, groundwater, and/or soil vapor samples (including 3 shallow groundwater monitoring wells, 2 borings for evaluation of deeper soil lithology, 4 nested groundwater monitoring wells, 9 temporary borings for shallow soil and/or grab groundwater sample collection, and 8 temporary or permanent soil vapor probes). As possible, AMEC will collect grab groundwater samples that are planned in the vicinity of some of the proposed monitoring wells and request data from the analytical laboratory on an expedited turnaround, prior to installation of monitoring wells, so that the monitoring well locations may be adjusted, if needed, to be placed in higher-concentration areas.

A discussion of the data gaps, the proposed investigation to address the data gaps, the rationale for the proposed boring locations and depths, and proposed laboratory analysis for each sample location are presented in Table 2. Field methods for the proposed investigation are discussed in the following sections.

4.1 FIELD METHODS

Prior to conducting the field work, AMEC will obtain a soil boring permit from Zone 7 Water Agency. Additionally, AMEC will mark the proposed boring locations with white paint, contact Underground Service Alert, and contract with a private utility locator to evaluate the proposed boring locations for underground utilities.

The utility locator will assess the area north of Building A using available equipment, including ground-penetrating radar (GPR); in addition to clearing proposed boring locations, this methodology will facilitate the identification of currently-unknown subsurface utilities or features that may have acted as a source or preferential pathway for migration of VOCs.
A current understanding of on-site and off-site utilities is mapped on Figures 2 and 6 and, as possible, the locations are shown on the cross sections on Figures 3 through 5.

4.1.1 Soil Borings

All 26 borings will be advanced by a licensed drilling contractor under the supervision of AMEC field personnel. A decontaminated hand auger may be used to advance the first 5 feet of each boring.

Twelve soil borings will be advanced for soil and grab groundwater sample collection, including nine temporary borings and three for monitoring well installation. These borings will be advanced using dual-tube direct-push technology with an outside diameter of at least 3.25 inches to approximately 2 feet below first encountered saturated soil, which is assumed to occur at approximately 9 to 16 feet bgs. However, if saturated soil is not encountered due to the clay content of the soil, the borings may be advanced to a total depth of up to 20 feet bgs (the total depths of soil borings previously advanced for grab groundwater sample collection at the site have been 15 to 20 feet bgs).

Eight borings will be advanced for installation of temporary or permanent soil vapor probes. These borings may be installed using dual-tube direct-push technology (McCall, W., et al., 2006; pp. 373-375), or may be installed entirely using a hand auger to approximately 5.5 or 8.5 feet bgs depending on the location.

Two borings will be advanced to approximately 75 feet bgs, if possible, using dual-tube direct-push technology so that deeper soil lithology can be logged (including noting the presence or absence of water) to allow for evaluation of appropriate depths of installation of nested monitoring wells. The following measures will be employed in order to avoid potential cross-contamination of deeper groundwater by shallow groundwater, which is known to be impacted:

- The deeper borings will be advanced in areas of lower VOC concentrations in shallow groundwater.
- So that the casing joints are water-tight (to prevent infiltration of groundwater from shallower water-bearing units while drilling to deeper depths), Teflon tape will be wrapped around the casing threads.

Four borings will be advanced for installation of nested, multi-port monitoring wells. Each boring will be advanced using sonic drilling technology to create a borehole with a diameter of at least 6 inches to approximately 65 feet bgs (Ruda, T. and Farrar, J., 2006, pp. 312-313). It is not necessary to wrap the sonic casing threads with Teflon tape, as they are not prone to leaking; additionally, these borings will also be advanced in areas of lower VOC concentrations in shallow groundwater.

A continuous core of soil will be collected at each direct push and sonic soil boring location for lithologic logging and collection of soil samples. Lithology will be described by an AMEC field geologist under the supervision of an AMEC California-licensed Professional Geologist, using the visual-manual procedures of the ASTM International Standard D 2488 for guidance, which is based on the Unified Soil Classification System (USCS). Recovered soil will be screened for the presence of volatile organic compounds using a photoionization detector (PID). The PID readings will be recorded on the lithologic logs prepared for each boring. Field observations of the presence of any staining or odor will also be recorded.

4.1.2 Soil Sampling

The soil sample depths will be based on field observations, including staining, odor, or elevated PID readings. If there is field evidence of chemical impacts, a soil sample will also be collected from the apparently impacted soil as well as a depth interval below the apparently impacted soil to attempt to evaluate the vertical extent of the chemical impact. In the absence of field evidence of chemical impacts, soil samples will be collected from the approximate depths described on Table 2.

Soil samples for analysis of VOCs (including total petroleum hydrocarbons quantified as gasoline [TPHg]) will be collected using a field preservation method in accordance with U.S. Environmental Protection Agency (U.S. EPA) Method 5035. Samples will be immediately labeled with unique identifiers and the sample collection time, and then stored in an ice-chilled cooler pending transport to a California Department of Public Health−accredited analytical laboratory under AMEC chain-of-custody procedures.

4.1.3 Soil Vapor Sampling

Eight soil vapor borings will be advanced to a total depth of approximately 5.5 feet bgs (in the south parcel) or 8.5 feet bgs (along the eastern property boundary), using a decontaminated hand auger and/or dual-tube direct-push technology. Single-port soil vapor probes will be installed at approximately 5 feet bgs in the south parcel, and nested soil vapor probes will be constructed at depths of approximately 4 and 8 feet bgs along the eastern property boundary. Pending results of initial vapor sampling, two of the temporary probes at the eastern property boundary will be converted to permanent vapor monitoring wells.

The soil vapor probes will be installed, sampled, and abandoned, in general accordance with the *Advisory—Active Soil Vapor Investigations*, jointly prepared by various groups within the California Environmental Protection Agency (Cal/EPA, 2012). Specific field methods are described in the following sections. Figure 7 shows a schematic drawing of a nested soil vapor probe.

4.1.3.1 Probe Installation

Once the total desired depth has been reached, new, disposable, small-diameter (i.e., 1/8-inch or 1/4-inch outside diameter) Teflon® tubing, fitted with a filter at the bottom to prevent particulate infiltration, will be placed in the boring at approximately 0.5 feet above the bottom of the boring. Approximately 12 inches of filter pack sand will be placed in the bottom of the boring, with the bottom of the Teflon® tubing placed midway through the filter pack sand.

Following installation of the sand pack, approximately 6 to 12 inches of dry granular bentonite will be emplaced above the sand pack (for the probes to be installed at 4 feet bgs, the interval of dry, granular bentonite may be reduced in order to allow a deeper seal of hydrated bentonite). The borehole will then be grouted to the surface with bentonite that is hydrated continuously as the probe is installed. A valve will be fitted to the aboveground end of the tubing and will remain closed prior to purging and sampling. The probe will be protected at the ground surface within a zip-closure plastic bag and beneath a traffic cone.

4.1.3.2 Equilibration

For borings advanced using a hand auger, or within 5 vertical feet of a portion of the boring advanced using a hand auger, the soil vapor probe will be allowed to equilibrate for a minimum of 48 hours prior to purging and sampling. For borings advanced using direct-push technology, the soil vapor probe will be allowed to equilibrate for at least 2 hours prior to purging and sampling.

4.1.3.3 Purging and Sampling

Following equilibration, AMEC will assemble a soil vapor sampling manifold that will allow each soil gas sample to be collected into a 1-liter Summa™ canister. The manifold will include a Summa™ canister, flow controller, and three-way valve to allow for purging of vapor prior to sampling. Canisters and flow controllers will be provided by a California Department of Public Health−accredited laboratory.

Immediately prior to sampling, the tubing and manifold will be purged to clear the tubing and sample train of stagnant or ambient air. Because samples will be collected into Summa™ canisters for analysis at a fixed laboratory and analytical results will not immediately be available, a default of three purge volumes will be removed before sampling at each location. One purge volume will be calculated in the field based on the volume of the void space in the tubing (including the manifold) plus an estimate of the void space in the sand pack and dry bentonite. The estimated purge volume calculation is presented below.

> Estimated purge volume: one purge volume ≈ (internal volume of tubing, including manifold) + (annular pore space around probe tip, including sand and dry, granular bentonite)

The vapor flow rate during purging will be limited to less than 200 milliliters per minute (mL/min) using a universal pump calibrated with a volumetric air flow meter. A vacuum gauge will also be installed in-line during purging. The gauge will be monitoring to confirm that the vacuum does not exceed 100 inches of water (approximately 7.4 inches of mercury).

Immediately following purging at each location, a soil gas sample will be collected into a 1-liter Summa™ canister, which will be equipped with a flow controller that limits the flow rate into the canister to less than 200 mL/min. The Summa™ canister will be allowed to fill almost completely. Following sampling, the valve on the Summa™ canister will be closed and the canister will be capped with a fitting to prevent ambient air intrusion during shipping. The canister will be immediately labeled with unique identifiers and the sample collection time, and stored in a cardboard box prior to being shipped to an appropriately qualified analytical laboratory under AMEC chain-of-custody procedures.

4.1.3.4 Quality Control

Before leak testing is performed at each soil gas probe, a "shut-in" test will be applied to all aboveground sampling equipment. A vacuum between 10 and 15 inches of mercury will be applied to the aboveground sampling train. The vacuum will be monitored for approximately five minutes. If the vacuum dissipates during the shut-in test, all aboveground fittings will be tightened and the test will be repeated until the sampling equipment holds a vacuum.

A leak test will be conducted during sampling at each soil gas probe location. A shroud filled with approximately 10 to 30 percent helium will be placed over the boring and all aboveground sampling equipment during purging. The concentration of helium in the shroud will be measured using a hand-held field helium detector and recorded on field sampling forms. The final 200 milliliters of purged soil gas will be collected in a Tedlar bag, and the concentration of helium in the Tedlar bag will be measured with a hand-held field helium detector. If the concentration of helium is greater than 0.5 percent, the surface of the sample probe will be resealed and all aboveground fittings will be tightened. Soil gas will be purged again and another leak test will be conducted. If the helium concentration is less than 0.5 percent helium, soil gas sample collection will proceed. As an additional quality control measure, a minimum of 10 percent of the shallow soil gas samples collected via Summa™ canisters will be analyzed for helium by the analytical laboratory.

Approximately ten percent of the soil gas samples will be collected as blind field duplicate pairs. Duplicate samples will be collected simultaneously with the primary samples by using a "T" connector between two Summa™ canisters. The duplicate samples will be stored in the same manner as the primary samples and submitted to the laboratory for analysis of VOCs.

One ambient air sample will be collected per day of soil vapor sampling, and will be analyzed for the same suite of constituents as the primary samples. Ambient air samples will be collected into 6-liter Summa™ canisters equipped with flow controllers that will allow the canisters to fill over the course of the field work each day (e.g., 6-hour or 8-hour flow controllers). The canister will be placed in an approximately upwind direction of the sampling area each day.

4.1.3.5 Probe Destruction or Conversion to Vapor Monitoring Wells

Following completion of sampling activities, all but two of the temporary vapor probes will be abandoned by pulling the probe tubing from the ground, overdrilling the probe to remove the annular materials, and backfilling the boring from total depth to ground surface with neat cement grout (note that it is planned to leave vapor probes in place along the eastern boundary of the northern parcel for temporal data). The ground surface will be restored to match surrounding conditions. Two sets of nested probes will be converted to vapor monitoring wells to provide VOC concentration trends over time. For these probes, traffic-rated flush-mounted well boxes will be installed and secured with steel bolts.

4.1.4 Grab Groundwater Sampling

Nine borings will be advanced to a total depth of approximately 15 to 20 feet bgs for collection of soil and/or shallow grab groundwater samples. Once each soil boring has been advanced to total depth, temporary polyvinyl chloride (PVC) casing with 5 feet of 0.01-inch slotted screen will be installed in the boring within the outer drill casing, and the outer drill casing then will be retracted approximately 5 feet to expose the PVC screen to the water-bearing unit.

Prior to collection of all groundwater samples, the casing will be purged using a peristaltic pump, or a new, disposable, polyethylene bailer to allow for collection of more representative samples. The wells will be purged until the water is relatively free from sediment (if possible) and field parameters (e.g., dissolved oxygen, oxidation/reduction potential, temperature, pH, and specific conductance) are relatively stable. These measurements will be recorded in a field sampling log and will be included in the report documenting the investigation. Following purging, a grab groundwater sample will be collected from each boring using a peristaltic pump or a new, disposable, polyethylene bailer.

The groundwater sample will be placed into laboratory-provided volatile organic analysis (VOA) containers preserved with hydrochloric acid (HCl). If the groundwater sample reacts with the HCl preservative (e.g. bubbles are observed in the VOA vial), then an unpreserved groundwater sample will be collected for VOC analysis (hold time will be reduced from 14 to 7 days for an unpreserved sample); this will be noted on the sample chain-of-custody record. Samples will be immediately labeled with unique identifiers and the sample collection time, and then stored in an ice-chilled cooler pending transport to a California Department of Public Health−accredited analytical laboratory under AMEC chain-of-custody procedures.

Approximately ten percent of the grab groundwater samples will be collected as blind field duplicate pairs. Duplicate samples will be collected and stored in the same manner as the primary samples and submitted to the laboratory for analysis of VOCs. An equipment blank sample may also be collected.

Following completion of sampling, the borings will be backfilled with Type I/II neat cement grout using a tremie hose or pipe, so that the boring is sealed from total depth to ground surface.

4.1.5 Groundwater Monitoring Wells

Seven groundwater monitoring wells are proposed to be installed using two different methodologies. Three shallow monitoring wells (i.e., approximately 15 to 20 feet bgs) will be installed using pre-pack monitoring wells in direct push borings. Four deeper, nested monitoring wells (i.e., to approximately 65 feet bgs) will be installed in borings advanced using sonic drilling technology.

4.1.5.1 Installation and Development of Pre-Pack Wells within Direct Push Borings

Three pre-pack monitoring wells will be installed in direct push borings, following collection of a grab groundwater sample from those borings using the methodology described above (McCall, W., et al., 2006, pp. 448-458).

The well assembly will consist of 0.75-inch diameter Schedule 40 PVC pipe with a factory-installed 0.5-inch filter pack. Well screens come in 5-foot length sections with 0.010-inch slot sizes; one 5-foot-long screen will be emplaced in each well. The factory-installed filter pack consists of sand wrapped in a stainless steel mesh. The outside diameter of the well assembly, which includes the well casing and factory installed filter pack, is approximately 1.4 inches.

Direct push monitoring wells will be installed by advancing 3.25-inch dual-tube direct-push casing to the desired depth of approximately 15 to 20 feet bgs. Once the total depth has been reached and a grab groundwater sample has been collected, the pre-pack well assembly will be fitted with the appropriate amount of blank PVC Schedule 40 PVC riser pipe and lowered into the boring within the outer drill casing. Once the well assembly has been lowered into the casing, the casing will be retracted to just above the well screen. This allows the native formation to contact the pre-pack filter section. A 1-foot thick sand barrier will then be installed immediately above the screened well casing, and will be tagged with a weighed measuring tape to ensure the sand is installed to the correct depth. As the native formation is known to be very fine-grained, it may not collapse around the pre-pack well screen. Therefore, as sand is added to the boring, it will also fill any voids remaining around the pre-pack filter section. A minimum of two feet of bentonite granular seal then will be placed above the sand pack, and tagged to ensure proper placement using the weighted measuring tape. The bentonite is expected to hydrate naturally, and will be allowed to do so for a minimum of 30 minutes. Once the bentonite has hydrated, the remaining annular space of the well will be sealed with Type I/II neat cement grout to ground surface. As the neat cement grout is installed, groundwater is likely to be displaced from the well, and will be removed at the surface using a shop vacuum and placed into 55-gallon drums pending disposal at an appropriately licensed facility. The wells will be completed inside traffic-rated flush-mounted well boxes with locking caps and secured with steel bolts. A typical direct push pre-pack well construction diagram is included as Figure 8.

At least 48 hours after well installation, the wells will be developed using a combination of bailing, surging, and purging until the water is relatively visibly clear and field parameters (e.g., dissolved oxygen, oxidation/reduction potential, temperature, pH, and specific conductance) are relatively stable (Kraemer, C., et al., 2006, pp. 850-855). These parameters will be monitored during well development and recorded on a well development record, which will be included with the report documenting the field work.

4.1.5.2 Installation and Development of Monitoring Wells within Sonic Borings

Four monitoring wells will be installed within borings advanced using sonic drilling technology. The wells will be constructed using the Solinst 3-channel continuous multichannel tubing (CMT) system with three monitoring ports at depths of approximately 15, 40, and 65 feet bgs (depths will be adjusted in the field based on the lithology logged in the deeper direct push borings) (Einarson, M., 2006, pp. 830-837). The wells will be installed using sonic drilling technology by a California-licensed drilling contractor trained to install CMT wells by Solinst, the manufacturer of the CMT system, and under the direct supervision of a California-licensed Professional Geologist.

Upon reaching the target depth for the well installation, the pre-fabricated CMT well will be placed inside the drill casing to total depth, and annular materials will be placed while incrementally retracting the drill casing. Annular materials will consist of filter pack sand and bentonite pellets to serve as filter packs and transition seals, respectively. Annular materials will be placed as follows: first, filter pack sand will be placed from the total depth of the boring to approximately 1 foot above the top of the deepest screened interval. Bentonite pellets will then be placed above the filter pack sand to approximately 1 foot below the bottom of the next deepest screened interval, followed by filter pack sand to approximately 1 foot above the top of the screened interval. This process is repeated until the uppermost bentonite seal is in place and allowed to hydrate for a minimum of 30 minutes. Once the bentonite has hydrated, the remaining annular space of the well will be sealed with Type I/II neat cement grout to ground surface. As the neat cement grout is installed, groundwater is likely to be displaced from the well, and will be removed at the surface using a shop vacuum and placed into 55-gallon drums pending disposal at an appropriately licensed facility. The wells will be completed inside traffic-rated flush-mounted locking well boxes.

At least 48 hours after well installation, each sample port will be developed by pumping with a peristaltic pump or bladder pump until the water is relatively free from sediment and field parameters (e.g., dissolved oxygen, oxidation/reduction potential, temperature, pH, and specific conductance) are relatively stable. These parameters will be monitored during development and recorded on a well development record, which will be included with the report documenting the field work.

4.1.5.3 Groundwater Elevations and Monitoring Well Sampling

At least 48 hours after development, groundwater elevations will be measured and groundwater samples collected from the monitoring wells. In order to measure depths to water, well caps will first be removed at all wells, and the water levels will be allowed to equilibrate. Equilibration will be considered complete when two depth-to-groundwater measurements collected within several minutes agree (Dalton, M, 2006, pp. 891-893). Depth to groundwater measurements will be measured to an accuracy of 0.01 foot.

Prior to sample collection, each well will be purged using a low-flow technique. During purging, the following field measurements will be recorded and documented on field records: dissolved oxygen, oxidation/reduction potential, temperature, pH, and specific conductance. Purging will be considered complete when these parameters have stabilized (i.e., when three consecutive readings of the water quality parameters are within approximately 10 percent of each other, if possible) (Nielsen, et al., 2006, p. 1057). Following purging, groundwater samples will be collected from each well into laboratory-provided VOA containers preserved with HCl, using a peristaltic pump or bladder pump. Samples will be immediately labeled with unique identifiers and the sample collection time, and then stored in an ice-chilled cooler pending transport to a California Department of Public Health−accredited analytical laboratory under AMEC chain-of-custody procedures.

Approximately ten percent of the grab groundwater samples will be collected as blind field duplicate pairs. Duplicate samples will be collected and stored in the same manner as the primary samples and submitted to the laboratory for analysis of VOCs. An equipment blank sample may also be collected.

4.1.6 Decontamination

All reusable sampling equipment will be decontaminated prior to sampling and between use at each boring using a steam cleaner and/or Liquinox rinse, followed by a final rinse of distilled or deionized water. Additionally, as possible, borings will be advanced in the anticipated lower concentration areas before the anticipated higher concentration areas, to reduce the risk of possible cross-contamination between boring locations.

4.1.7 Surveying

The vapor and groundwater monitoring points will be surveyed following installation by a California Licensed Land Surveyor. The top of casing (horizontal and vertical coordinates) and ground surface (vertical coordinates) will be surveyed to a vertical accuracy of 0.01 foot and a horizontal accuracy of 0.1 foot.

4.1.8 Investigation-Derived Waste

Investigation-derived waste, including drill cuttings, purge water, and equipment wash water, will be stored at the site in 55-gallon drums pending off-site disposal at an appropriately licensed facility.

4.2 LABORATORY ANALYTICAL METHODS

The soil and groundwater samples will be analyzed for VOCs (including TPHg) using U.S. EPA Method 8260B. The soil vapor samples will be analyzed for VOCs using U.S. EPA Method TO-15.

A blind field duplicate grab groundwater sample will be collected from approximately 10 percent of the borings during the sampling event and analyzed for the same suite of constituents as the primary samples. At least one blind field duplicate groundwater sample will also be collected during each subsequent groundwater monitoring event.

Additionally, to assist with waste disposal profiling, one composite sample of soil cuttings generated during the investigation will be analyzed for Title 22 metals, using U.S. EPA Method 6020, with the exception of mercury, which will be analyzed using U.S. EPA Method 7471A; and total extractible petroleum hydrocarbons, using U.S. EPA Method 8015M, as necessary.

5.0 PREFERENTIAL PATHWAYS STUDY

A study will be conducted to further identify on-site and nearby off-site utilities that could act as potential sources or preferential pathways and gather contemporary information regarding water-producing, monitoring, and cathodic wells that could act as vertical conduits or, in the case of water-producing wells, serve as a potential receptor to impacted groundwater from the site.

Current information regarding on-site and off-site utilities has come from field observation and utilities mapped by Carlson, Barbee & Gibson, of San Ramon, California, using field observations and Underground Services Alert markings. Additional information will be obtained on site using GPR and other utility locating methodologies in areas of borings and where subsurface utilities may be expected based on knowledge of site operations or aboveground features that may relate to subsurface utilities. Additionally, as possible, the depths of sewers will be obtained by lifting cleanout and manhole covers, from site plans, and from City of Dublin maps.

Additionally, ACEH has requested that Crown perform a well survey to encompass a 1-mile radius from the site. This information will be obtained from Zone 7 Water Agency and the California Department of Water Resources. To the extent that such information is available, the well survey will include the type and status of each permitted well (e.g., active, destroyed), and general location relative to the site. The well survey will include a background study of historical information, including aerial photos and Sanborn maps, if available.

6.0 REPORTING

AMEC will prepare two reports following completion of the investigation for submittal to ACEH.

One report will document the results of this investigation. The report will include copies of the field forms, analytical laboratory reports, and sample chain of custody records. Lithologic logs prepared for each boring will be presented graphically. The report will include all data generated during this investigation as well as from the previous five site investigations in tabular format. Relevant data will also be presented on figures. This report will also address the following items, as discussed during July 12 and 18, 2012, meetings with ACEH:

- Validated data from prior investigations, including a data quality review signed by an AMEC's technical expert in this field. Additionally, more detail will be included in the text regarding data validation performed.
- Clarification regarding some prior sampling methods and analytical testing suites for specific samples and sampling events (e.g., rationale for analyzing some samples only for specific constituents)
- Recommendations made in prior reports prepared by other consultants
- Discussion of laboratory reporting limits greater than applicable screening levels, especially with respect to whether elevated reporting limits are materially significant relative to our understanding of site conditions.
- Locations of all individual borings (e.g., a former cone penetrometer boring and companion borings) and discrepancies between the number of borings shown on the report versus the permit application.
- Correction to an environmental screening level shown in a table, and updating text describing the environmental screening levels referenced.
- Updating boring logs to include the depth to first groundwater and stabilized water.

The second report will be an updated site conceptual model, which will include detail on the following:

- Regional and local geology and hydrogeology;
- Analysis of the hydraulic flow system in the vicinity of the site, including horizontal and vertical hydraulic gradients;
- Release history;
- Distribution of VOCs in groundwater (to facilitate visualization of the lithology and chemical distribution, cross-sections and three-dimensional illustrations will be developed);
- Summary tables for all media, including screening levels;
- Current and historical facility structures and physical and surface water features;
- Current and historical site operations;
- Other contaminant release sites in the vicinity, including Montgomery Ward and Quest Laboratory;
- Land uses and potential exposure pathways at the site and neighboring properties; and
- Identification of data gaps and proposed methods of addressing them.

7.0 ANTICIPATED SCHEDULE

The generalized schedule to implement the field work described herein is presented in Section 1.0. The specific dates to conduct the field work are dependent on driller availability; as indicated, we anticipate the field investigation can be performed in two to three weeks. Following this proposed investigation and reporting, additional investigation will be proposed and performed, as needed, based on the results of this proposed work.

An overall project schedule will be provided to ACEH under separate cover by August 17, 2011; this overall schedule includes submittal of a corrective action plan, its implementation, and public notification requirements, based on our current understanding of such requirements.

8.0 REFERENCES

AEI Consultants, 2008, Phase I Environmental Site Assessment, 7544 Dublin Boulevard & 6707 Golden Gate Drive, Dublin, California, October 29.

AMEC, 2010, Soil and Groundwater Investigation Work Plan, Crown Chevrolet Cadillac Isuzu, 7544 Dublin Boulevard and 6707 Golden Gate Drive, Dublin, California, June 15.

AMEC, 2011a, Revised Soil and Groundwater Investigation Report, Crown Chevrolet Cadillac Isuzu, 7544 Dublin Boulevard and 6707 Golden Gate Drive, Dublin, California, April 4.

AMEC, 2011b, Soil, Groundwater, and Soil Vapor Investigation Report, Crown Chevrolet Cadillac Isuzu, 7544 Dublin Boulevard and 6707 Golden Gate Drive, Dublin, California, September 27.

Basics Environmental, Inc., 2008, Phase I Environmental Site Assessment, 7544 Dublin Boulevard and 6707 Golden Gate Drive, Dublin, California, October 14.

Basics Environmental, Inc., 2009, Limited Phase II Environmental Site Sampling Report, 7544 Dublin Boulevard & 6707 Golden Gate Drive, Dublin, California, March 16.

Bureau Veritas, 2009, Additional Soil and Groundwater Investigation (Fuel Leak Case No. RO0002860), Former Quest Laboratory, 6511 Golden Gate Drive, Dublin, California, March 13.

California Environmental Protection Agency (Cal/EPA), 2012, Advisory—Active Soil Vapor Investigations. April.

Dalton, M., et al., 2006, Acquisition and interpretation of water-level data: in Nielsen, D. (ed.), Practical Handbook of Environmental Site Characterization and Ground-Water Monitoring, 2nd Ed., Taylor & Francis Group, LLC, Boca Raton, Fla., Ch. 13, pp. 883-911.

Einarson, M., 2006, Multilevel ground-water monitoring: in Nielsen, D. (ed.), Practical Handbook of Environmental Site Characterization and Ground-Water Monitoring, 2nd Ed., Taylor & Francis Group, LLC, Boca Raton, Fla., Ch. 11, pp. 807-848.

Kraemer, C., et al., 2006, Monitoring well post-installation considerations: in Nielsen, D. (ed.), Practical Handbook of Environmental Site Characterization and Ground-Water Monitoring, 2nd Ed., Taylor & Francis Group, LLC, Boca Raton, Fla., Ch. 12, pp. 849-882.

Nielsen, D., et al., 2006, Ground-water sampling: in Nielsen, D. (ed.), Practical Handbook of Environmental Site Characterization and Ground-Water Monitoring, 2nd Ed., Taylor & Francis Group, LLC, Boca Raton, Fla., Ch. 1215 pp. 959-1112.

McCall, W., et al., 2006, Use of direct-push technologies in environmental site characterization and ground-water monitoring: in Nielsen, D. (ed.), Practical Handbook of Environmental Site Characterization and Ground-Water Monitoring, 2nd Ed., Taylor & Francis Group, LLC, Boca Raton, Fla., Ch. 5, pp. 345-471.

Ninyo & Moore, 2011a, Limited Phase II Environmental Site Assessment, Crown Chevrolet, 7544 Dublin Boulevard, Dublin, California, January 7.

Ninyo & Moore, 2011b, Additional Phase II Environmental Site Assessment, Crown Chevrolet, 7544 Dublin Boulevard, Dublin, California, September 16.

Ruda, T. and Farrar, J., 2006, Environmental drilling for soil sampling, rock coring, borehole logging, and monitoring well installation: in Nielsen, D. (ed.), Practical Handbook of Environmental Site Characterization and Ground-Water Monitoring, 2nd Ed., Taylor & Francis Group, LLC, Boca Raton, Fla., Ch. 5, pp. 297-344.

U.S. Environmental Protection Agency, 1992, Quick Reference Fact Sheet entitled “Estimating Potential for Occurrence of DNAPL at Superfund Sites,” January.

TABLES

TABLE 1

INITIAL SITE CONCEPTUAL MODEL
Crown Chevrolet
7544 Dublin Boulevard
Dublin, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Geology and Hydrogeology	Regional	The site is in the northwest portion of the Livermore Valley, which consists of a structural trough within the Diablo Range and contains the Livermore Valley Groundwater Basin (referred to as “the Basin”) (DWR, 2006). Several faults traverse the Basin, which act as barriers to groundwater flow, as evidenced by large differences in water levels between the upgradient and downgradient sides of these faults (DWR, 2006). The Basin is divided into 12 groundwater basins, which are defined by faults and non-water-bearing geologic units (DWR, 1974). The hydrogeology of the Basin consists of a thick sequence of fresh-water-bearing continental deposits from alluvial fans, outwash plains, and lacustrine environments to up to approximately 5,000 feet bgs (DWR, 2006). Three defined fresh-water bearing geologic units exist within the Basin: Holocene Valley Fill (up to approximately 400 feet bgs in the central portion of the Basin), the Plio-Pleistocene Livermore Formation (generally between approximately 400 and 4,000 feet bgs in the central portion of the Basin), and the Pliocene Tassajara Formation (generally between approximately 250 and 5,000 or more feet bgs) (DWR, 1974). The Valley Fill units in the western portion of the Basin are capped by up to 40 feet of clay (DWR, 2006).	None	NA
	Site	***Geology:*** Borings advanced at the site indicate that subsurface materials consist primarily of finer-grained deposits (clay, sandy clay, silt and sandy silt) with interbedded sand lenses to 20 feet below ground surface (bgs), the approximate depth to which these borings were advanced. The documented lithology for one on-site boring that was logged to approximately 45 feet bgs indicates that beyond approximately 20 feet bgs, fine-grained soils are present to approximately 45 feet bgs. A cone penetrometer technology test indicated the presence of sandier lenses from approximately 45 to 58 feet bgs and even coarser materials (interbedded with finer-grained materials) from approximately 58 feet to 75 feet bgs, the total depth drilled. The lithology documented at the site is similar to that reported at other nearby sites, specifically the Montgomery Ward site (7575 Dublin Boulevard), the Quest laboratory site (6511 Golden Gate Drive), the Shell-branded Service Station site (11989 Dublin Boulevard), and the Chevron site (7007 San Ramon Road). ***Hydrogeology:*** Shallow groundwater has been encountered at depths of approximately 9 to 15 feet bgs. The hydraulic gradient and groundwater flow direction have not been specifically evaluated at the site.	As noted, most borings at the site have been advanced to approximately 20 feet bgs, and one boring has been advanced and logged to 45 feet bgs; CPT data was collected to 75 feet bgs at one location. Lithologic data will be obtained from additional borings that will be advanced on site to further the understanding of the subsurface, especially with respect to deeper lithology. The on-site shallow groundwater horizontal gradient has not been confirmed. Additionally, it is not known if there may be a vertical component to the hydraulic gradient.	Two direct push borings and four multi-port wells will be advanced to depth (up to approximately 75 feet bgs) and soil lithology will be logged. See items 4 and 5 on Table 2. Shallow and deeper groundwater monitoring wells will be installed to provide information on lateral and vertical gradients. See Items 2 and 5 on Table 2.
Surface Water Bodies		The closest surface water bodies are culverted creeks. Martin Canyon Creek flows from a gully west of the site, enters a culvert north of the site, and then bends to the south, passing approximately 1,000 feet east of the site before flowing into the Alamo Canal. Dublin Creek flows from a gully west of the site, enters a culvert approximately 750 feet south of the site, and then joins Martin Canyon Creek approximately 750 feet southeast of the site.	None	NA
Nearby Wells		The State Water Resources Control Board's GeoTracker GAMA website includes information regarding the approximate locations of water supply wells in California. In the vicinity of the site, the closest water supply wells presented on this website are depicted approximately 2 miles southeast of the site; the locations shown are approximate (within 1 mile of actual location for California Department of Public Health supply wells and 0.5 mile for other supply wells). No water-producing wells were identified within 1/4 mile of the site in the well survey conducted for the Quest Laboratory site (6511 Golden Gate Drive; documented in 2009); information documented in a 2005 report for the Chevron site at 7007 San Ramon Road indicates that a water-producing well may exist within 1/2 mile of the site.	A formal well survey is needed to identify water-producing, monitoring, cathodic protection, and dewatering wells.	Obtain data regarding nearby, permitted wells from the California Department of Water Resources and Zone 7 Water Agency (Item 11 on Table 2).

TABLE 1

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7544 Dublin Boulevard
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CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Constituents of Concern		Constituents of concern have been identified by comparing analytical results to environmental screening levels for residential land use and for groundwater that is a current or potential drinking water source, developed by the California Regional Water Quality Control Board, San Francisco Bay Region (May 2008). PCE and TCE have been identified as the primary constituents of concern at the site; these constituents have been detected in soil, groundwater and soil vapor in the northern portion of the site. Biodegradation byproducts (e.g., cis-1,2-DCE) are present in groundwater, but at lower concentrations relative to PCE and TCE and below their respective environmental screening levels. Vinyl chloride has been detected in soil vapor at concentrations above its screening level. In the northern portion of the site, benzene and ethylbenzene have been detected in soil vapor at concentrations above their respective screening levels. Chlorobenzene and related constituents, and to a lesser extent, benzene, are present in soil, groundwater, and soil vapor at the former sump and pit in Building B.	None	NA
Potential Sources	On-site	Building B has been used for servicing automobiles since the 1960s. Based on the minor detections of PCE in soil vapor (in an area where groundwater is not impacted) beneath Building B and in groundwater beneath the former sump in another portion of Building B, it is possible that PCE entered the drain line from the sump within Building B, and was released to the subsurface from the sewer line northeast of Building A between 1968 and the present. There is no likely source in Building A, which has only been used as a showroom. Investigation performed within and downgradient of Building C indicates that there are no significant impacts in this area.	Concentrations of PCE in groundwater and soil vapor are highest approximately 50 feet west of the sewer line; the mechanism for these constituents to be present west of the sewer line is not currently known.	A subsurface utility locator, using ground penetrating radar, will evaluate the area north of Building A to ascertain the possible presence of unknown, buried utilities that could serve as a PCE source or migration conduit in the area. See Item 10 on Table 2.
		Two USTs (one 1,000-gallon gasoline and one 1,000-gallon waste oil) are present just south of Building B). The tanks appear to have been replaced in the 1980s and upgraded in 1998. Recent data collected in the vicinity of the USTs indicate that there are no significant impacts.	The absence of localized impacts to soil in the vicinity of the USTs has not been confirmed.	No additional investigation is recommended at this time. Additional sampling may be conducted as part of the formal UST closure process, and any impacts addressed at that time.
Potential Sources	Off-site	The site is located within a commercial/industrial area, and several vehicle-maintenance related shops are located south of the site; these facilities appear to be served by a sewer that flows north along the western edge of the Crown site. It is possible that PCE was released to the subsurface upgradient of the site via the sewer line. Additionally, there are three dry cleaners located hydraulically upgradient of the Crown site, including Crow Canyon Cleaners at 7272 San Ramon Road, which has a known groundwater contamination issue (however, that site is approximately 0.5 mile from the Crown site and groundwater at the site has limited impact with maximum concentrations of 24 parts per billion). The other two sites, VIP Cleaners at 7214 Regional Street and “Dry Clean 1 Hour” at 7257 Regional Street, are slightly closer to the Crown site (0.3 mile) and may have had an undocumented release to soil or groundwater. All three of the sites are served by sewers that flow north, away from the Crown site, but sewer releases in the general area, if any, could have impacted groundwater flowing toward the Crown site.	A specific off-site source is not known at this time. It is possible that additional research and/or investigation will be warranted at a later time, pending the results of this investigation.	NA

TABLE 1

INITIAL SITE CONCEPTUAL MODEL
Crown Chevrolet
7544 Dublin Boulevard
Dublin, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Potential Presence of DNAPL		Based on the currently available information, there does not appear to be separate-phase product (i.e., DNAPL) in soil or groundwater at the site. The U.S. EPA Fact Sheet entitled "Estimating Potential for Occurrence of DNAPL at Superfund Sites" (Fact Sheet) includes two flow charts that provide guidance for assessing whether site characterization data indicate the presence of DNAPL. The EPA approach uses lines of evidence that include consideration of historical site use and site characterization data. Based on the historical site use flow chart, some activities may have been performed (i.e., metal cleaning/degreasing and paint removing/stripping) that possibly may have resulted in historical DNAPL releases. However, review of available historical site chemical inventories does not indicate the presence of pure product PCE; it was likely present within other products at lower concentrations (percentage of product mixtures). Laboratory data generated from site characterization activities conducted to date do not indicate the potential for DNAPL, based on the following conditions, which are components of the laboratory data flow chart in the Fact Sheet: • Concentrations of PCE in groundwater are not greater than 1% of the solubility of PCE (i.e., greater than 2,000 µg/L, which is 1% of the pure product solubility of PCE)[1]; • Concentrations of PCE on soils are not greater than 10,000 mg/kg (and PID readings collected every 1 to 3 feet in the area of elevated groundwater concentrations were all 0, with the exception of several readings at 0.1 parts per million); and • Concentrations of PCE in groundwater calculated from water/soil partitioning relationships and soil samples are not greater than 1,500 µg/L.	Some elements listed in the Fact Sheet that would further our understanding of whether DNAPL is present at the site include additional knowledge of site stratigraphy and vertical distribution of PCE.	Four multi-port wells will be advanced to depth (up to approximately 75 feet bgs) and soil lithology will be logged. See items 4 and 5 on Table 2.
Nature and Extent of Environmental Impacts	Extent in Soil	PCE and TCE have been detected in soil samples collected north of Buildings A and B. All concentrations are less than their respective screening levels for residential shallow soil, applicable to groundwater considered to be a potential source of drinking water (screening levels of 370 and 460 µg/kg for PCE and TCE, respectively). PCE was detected at concentrations up to 6.8 µg/kg in soil at a depth of approximately 5.5 feet bgs in the vicinity of the highest PCE concentrations in groundwater and soil vapor (locations NM-B-32 and SV-22, respectively). It is likely that these PCE detections represent PCE in the vapor phase and not a source of PCE in soil. PCE and TCE were detected in deeper soil samples (between 12.5 and 14.5 feet bgs) at concentrations up to 36 µg/kg (in borings NM-B-23B, -24, -25, -26, 29, and -30). These soil samples were generally located within the saturated zone and it is likely that the detected concentrations represent PCE and TCE in groundwater. Soil was screened during advancement of the direct-push probe approximately every 1 to 4 feet using a PID; readings in most borings were 0 ppm; the highest PID readings (up to 22 ppmv of total VOCs) were observed at SB-02 within a likely saturated zone.	Additional samples will be collected to confirm absence of significant VOC concentrations in soil.	Soil samples will be collected from select borings, as indicated on Table 2 (Items 1, 3, and 8); sampling locations are prescribed and/or will be collected based on field observations.
		Chlorobenzenes and petroleum-related constituents were detected in soil in the vicinity of the former sump and pit at concentrations greater than their respective ESLs; soil remediation was performed in 2011. Currently inaccessible impacted soil remains in place under existing building foundation walls at concentrations greater than ESLs.	Soil samples have collected to a total depth of 11.5 feet bgs pre-remediation and 8 feet bgs post-remediation beneath the sump. The remediation consisted of soil excavation to a depth of 16 feet bgs. No soil samples were collected at the base of the excavation because the soil was saturated; there is currently no data confirming the absence of significant impacts to soil beneath the sump.	No additional investigation is recommended at this time. Additional soil removal and sampling may be conducted at the time of redevelopment.

TABLE 1

INITIAL SITE CONCEPTUAL MODEL
Crown Chevrolet
7544 Dublin Boulevard
Dublin, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Nature and Extent of Environmental Impacts	Extent in Soil	TPHho (at concentrations greater than the residential ESL) was detected in soil sample SB-20-11 near a hydraulic lift east of the former pit in Building B (an elevated concentration of TPHho also was detected in soil sample SB-25-8; this sample location subsequently was excavated). Analysis for PCBs was performed on 13 samples, which were collected in the vicinity of hydraulic lifts within Building B. One PCB, Arochlor 1242, was detected in a soil sample collected at location NM-B-5 just north of the pit in Building B; however, the concentration of Aroclor 1242 at this location was an order of magnitude lower than its screening level. No other PCBs were detected in soil samples (however, the detection limit for Aroclor in 1 sample of the 13 samples analyzed was above the screening level).	None	NA
Nature and Extent of Environmental Impacts	Extent in Shallow Groundwater	Grab groundwater data are available for VOCs on approximately 50- to 100-foot centers throughout the northern portion of the site, indicating that PCE, TCE, and some related breakdown products (other VOCs) are present in groundwater at concentrations greater than their respective screening levels that consider groundwater to be a current or potential drinking water resource (the screening level is 5 µg/L for both PCE and TCE). The current data indicate that the highest concentrations of PCE in groundwater are limited to a small area just north of Building A, adjacent to and near a sewer line (concentrations in this area range from 120 to 190 µg/L at locations NM-B-23B2 and NM-B-32, respectively; these concentrations are not indicative of separate-phase product in groundwater). PCE also was detected at concentrations less than 50 µg/L upgradient (to the north and west) and downgradient (to the east) of the highest concentration area. TCE is present at higher concentrations relative to PCE at sampling locations NM-B-26-W and NM-B-28-W, in the northeast corner of the site; cis- and trans-1,2-DCE also were detected in these groundwater samples (at concentrations below their respective screening levels). Cis- and trans-1,2-DCE also have been detected (below screening levels) at other groundwater sampling locations. The results suggest that natural biodegradation could be occurring. With the exception of one shallow grab groundwater sample (Basics sample B8 located at the former sump) in which PCE was detected at 9.6 µg/L, only low concentrations of PCE (less than 5 µg/L) were detected in shallow groundwater in the vicinity of the former sump and pit.	Groundwater concentrations are not defined to less than the ESL in the following areas: • The northern and western property boundaries. • The eastern property boundary and the adjacent property to the east. • Within Building A, south of the highest concentration area. No temporal data are available. Specific data to confirm that natural biodegradation processes may be occurring has not been collected.	Seven monitoring wells will be installed to collect groundwater samples for evaluation of current and long-term concentration trends. See items 1, 2, 3, 5, 4, 7, and 8 in Table 2. Groundwater samples will be analyzed for field parameters that could indicate that natural biodegradation is occurring. See Item 2 in Table 2.
		Chlorobenzenes and petroleum-related constituents are present in shallow groundwater at concentrations greater than ESLs in the vicinity of the former sump within Building B (where soil remediation was conducted in 2011). The presence of these constituents (e.g., gasoline-range organics, benzene, and chlorobenzene) in groundwater appears to be limited to an area within approximately 15 feet of the former sump. These constituents were not detected above ESLs in groundwater samples collected at the former pit in Building B.	No temporal data are available.	One shallow groundwater monitoring well will be installed within the area of known impacts. See Item 2 on Table 2.
Nature and Extent of Environmental Impacts	Extent in Shallow Groundwater	TPHho (at a concentration greater than its screening level) was detected in an unfiltered groundwater sample (SB-20) collected near one hydraulic lift east of the former pit in Building B; however, no TPHho was detected in the filtered groundwater sample. The unfiltered sample result is likely representative of TPHho sorbed onto soil particles, as TPHho was also detected in soil at 11 feet bgs at this location. The reporting limits for TPHho (and TPHd and TPHmo) in groundwater are greater than the respective screening levels for these constituents. However, no TPH was detected down to the laboratory's method detection limit for the filtered samples. While concentrations less than the laboratory reporting limit are estimated, the absence of detections indicates that dissolved TPHd, TPHmo, and TPHho are not present.	None	NA
		Total chromium was detected above the residential ESL at one location (SB-06), but dissolved concentrations in the vicinity were less than the screening level.	None	NA

TABLE 1

INITIAL SITE CONCEPTUAL MODEL
Crown Chevrolet
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Dublin, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Nature and Extent of Environmental Impacts	Extent in Deeper Groundwater	Grab groundwater samples have been collected from two deeper water-bearing zones. Samples were collected from approximately 42 to 47 feet bgs and from 58 to 63 feet bgs from a boring just downgradient of the former sump within building B, and from approximately 43.5 feet bgs from a boring adjacent to the sewer line (northeast of Building A, just east of the highest concentration area). No constituents were detected in the deeper groundwater samples.	Limited data are available within the area of known PCE impacts to shallow groundwater, and no temporal data are available.	Nested, multi-port groundwater monitoring wells will be installed at four locations. Ports will be located within the shallowest water-bearing zone, in addition to one to two deeper water bearing zones (as possible based on saturated units encountered). See Item 5 of Table 2.
Nature and Extent of Environmental Impacts	Extent in Soil Vapor	PCE, TCE, vinyl chloride, and some related breakdown products, were detected in soil vapor in the northern portion of the north parcel; PCE, TCE, and vinyl chloride concentrations are greater than residential screening levels for evaluation of potential vapor intrusion concerns (410, 1,200, and 31 µg/m^3, respectively [Table E-2 of the May 2008 Water Board publication]) in some areas. The highest concentrations of PCE detected in soil vapor (up to a maximum concentration of 35,000 µg/m^3 at location SV-22) were in the vicinity of the highest concentrations of PCE in groundwater (north of Building A, near the sewer line). PCE has been detected in soil vapor at concentrations greater than the ESL (up to 9,600 µg/m^3 at location SV-24) at various locations north of Buildings A and B, along the sewer line running from between Buildings A and B to Dublin Boulevard, and along the floor drain lateral to the sewer line within Building B. (It should be noted that PCE was detected at 4,700 µg/m^3 in sample SV-3, collected from within a former pit in Building B; this pit has since been removed). The higher concentrations of TCE in soil vapor also generally correlate with the higher concentrations of TCE in groundwater. The concentration of vinyl chloride in soil vapor exceeded its screening level in three samples collected in the north-central area of the north parcel (SG-03, SG-04, and SV-23).	Only limited soil vapor data is available at the eastern property boundary.	A transect of four nested temporary soil vapor probes will be installed at the eastern property boundary. Based on results of initial sampling, at least two of these probes will be converted to permanent vapor monitoring probes. See Item 6 on Table 2.
		PCE was detected in one vapor sample, at a concentration that is approximately an order of magnitude less than its screening level, at the northwestern corner of the southern parcel. No auto servicing activities are known to have been conducted in this area, which was historically used as a parking lot. PCE was not detected in groundwater at this location.	The source and extent of PCE in soil vapor is not known.	Four temporary soil vapor probes will be installed and sampled in the southern parcel around the location of the PCE detection. See Item 9 on Table 2.
Nature and Extent of Environmental Impacts	Extent in Soil Vapor	Benzene and ethylbenzene have been detected in shallow soil vapor (i.e., collected from 1.5 to 5 feet bgs) north of Buildings A and B at concentrations exceeding their respective screening levels. Benzene was detected at concentrations generally ranging from 90 to 160 µg/m^3, with one detected concentration of 1,300 µg/m^3 (the shallowest soil vapor sample, which was collected from a depth of 1.5 to 2 feet bgs at location SV-16) in the northeastern portion of the north parcel. Ethylbenzene concentrations were greater than the screening level at two locations, up to a maximum concentration of 1,300 µg/m^3 at location SV-16. These constituents were not detected in corresponding soil and groundwater samples, and there was not a visible pattern to the soil vapor sample concentrations. Additionally, there is no known source of petroleum-related constituents in the northern portion of the north parcel.	The extent of benzene and ethylbenzene at concentrations greater than screening levels has not been defined. While shallow soil will be removed during the proposed redevelopment, and engineering controls are expected to be implemented in this area due to PCE concentrations in soil vapor, only limited soil vapor data is available at the eastern property boundary.	A transect of four nested temporary soil vapor probes will be installed at the eastern property boundary. Based on results of initial sampling, at least two of these probes will be converted to permanent vapor monitoring probes. See Item 6 on Table 2.
		Soil vapor sampling was conducted in the vicinity of the former sump and pit in Building B prior to remediation, and some concentrations of PCE, benzene, 1,2-dichlorobenzene, and 1,4-dichlorobenzene were greater than their respective screening levels at that time.	Post-remediation soil vapor concentrations are not known.	No additional investigation is recommended at this time. Additional sampling may be conducted at the time of redevelopment.
Migration Pathways	Potential Conduits	Figure 2 shows the known locations of on-site utilities, including sanitary sewer laterals, water, gas, and electrical lines. These facilities could act as conduits for vapor migration. From the data collected at the site, it appears that concentrations of VOCs in soil vapor generally correlate with concentrations of VOCs in groundwater. Based on this observation, it appears that these utilities act as only a minor conduit, if at all.	While we believe that PCE was released to the subsurface via the main on-site sewer line and lateral from Building B, the highest concentrations of PCE in soil vapor and groundwater are west (in the presumed upgradient direction) of the on-site sewer main. The extent of possible subsurface utilities just north of Building A, which may have acted as a source for a PCE release, is not known.	A subsurface utility locator will evaluate the area, including with ground-penetrating radar, to evaluate if there are potential conduits in the area. See Item 10 on Table 2.

TABLE 1

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Dublin, California

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Potential Receptors/Risk	On-site	Potable water at the site currently is provided via municipal supply and will continue to be in the foreseeable future. As such, direct contact to groundwater is not contemplated. Receptors at the site could include the following: • Current worker via vapor intrusion to indoor air • Future construction worker via soil, groundwater, and soil vapor • Future resident via vapor intrusion to indoor air • Future maintenance worker via soil and soil vapor	Potential impacts to on-site receptors are not known.	Human health risks will be evaluated following additional data collection.
Potential Receptors/Risk	Off-site	Potential off-site receptors include: • Nearby water-producing wells, if any are present • Concrete-lined Dublin Creek and Martin Canyon Creek	Potential impacts to off-site receptors are not known.	Data will be obtained from the California Department of Water Resources and Zone 7 Water Agency regarding the location of nearby water-producing wells, including the depth at which groundwater is extracted, will be obtained. See Item 11 on Table 2. The potential for constituents at the site to impact off-site receptors will be evaluated pending the results of the proposed investigation.

Abbreviations
bgs = below ground surface
cis-1,2-DCE = cis-1,2-dichloroethene
trans-1,2-DCE = trans-1,2-dichloroethene
DNAPL = dense non-aqueous phase liquid
mg/kg = milligrams per kilogram
PCE = tetrachloroethene
PCBs = polychlorinated biphenyls
PID = photoionization detector
ppm = parts per million
ppmv = parts per million by volume
TCE = trichloroethene
TPHho = total petroleum hydrocarbons as hydraulic oil
TPHd = total petroleum hydrocarbons as diesel
TPHmo = total petroleum hydrocarbons as motor oil
µg/kg = micrograms per kilogram
µg/L = micrograms per liter
µg/m^3 = micrograms per cubic meter

Note
1. Pankow, J., et al, 1996, Dense chlorinated solvents in groundwater: background and history of the problem: in Pankow D. and Cherry J. (eds.), Dense Chlorinated Solvents and other DNAPLs in Groundwater, Waterloo Press, Portland, Ore., Ch. 1, pp. 1-52.

amec

TABLE 2

DATA GAPS AND PROPOSED INVESTIGATION
Crown Chevrolet
7544 Dublin Boulevard
Dublin, California

Item	Data Gap	Proposed Investigation	Rationale	Analysis
1	Refine groundwater contours beneath Building A. Collect data relevant to the potential for biodegradation.	Advance two borings to approximately 20 feet bgs within Building A for collection of soil and grab groundwater samples.[1] Soil samples will be collected at two depths in the vadose zone. Soil samples will be collected based on field indications of impacts (PID readings, odor, staining) or, in the absence of field indications of impacts, at 5 and 10 feet bgs.	The highest concentrations of PCE in groundwater were detected at boring NM-B-32, just north of Building A. One boring will be advanced approximately 15 feet from the northern building wall to provide data close to the highest concentration area. A second boring will be advanced approximately halfway between the first boring and existing boring NM-B-31 to provide additional spatial data for contouring purposes. These borings will be part of a transect in the highest concentration area.	*Groundwater:* VOCs by EPA Method 8260, dissolved oxygen, oxidation/reduction potential, temperature, pH, and specific conductance. *Soil:* VOCs by EPA Method 8260 (soil samples to be collected using field preservation in accordance with EPA Method 5035).
2	Confirm shallow groundwater flow direction. Evaluate VOC concentration trends over time. Collect data relevant to the potential for biodegradation.	Install seven shallow groundwater monitoring wells to approximately 15 to 20 feet bgs in northern portion of site (monitoring well locations may be adjusted pending results of grab groundwater samples). • Three of these wells will be pre-pack wells installed using direct push technology, and a grab groundwater sample will be collected from these borings prior to installation of the well. • Four of these wells will be part of nested, multi-port wells that will also allow collection of chemical and water level data from deeper groundwater (see Item 6, below). • Soil samples will be collected only if there are field indications of impacts (with the exception of the well planned in the highest PCE concentration area, where soil samples will be collected at two depths in the vadose zone based on field indications of impacts (PID readings, odor, staining) or, in the absence of field indications of impacts, at 5 and 10 feet bgs.). • Groundwater monitoring frequency to be determined.	To evaluate groundwater flow direction, a minimum of three wells is needed; the seven proposed wells will provide for a more robust analysis. It is proposed that the wells be spaced throughout the northern portion of the north parcel to evaluate concentration trends while also evaluating groundwater flow direction. • In the west, one well is proposed at the western property boundary at the location where PCE concentrations are highest (the location may be adjusted based on the results of grab groundwater samples to be collected nearby). • A second well is proposed in the area with the highest concentrations of PCE in groundwater, north of Building A. • Three wells are proposed in a north-south line through the middle of the northern parking lot to evaluate spatial variations in PCE and TCE concentrations. • A sixth well is proposed just southwest (downgradent) of the former sump, where VOCs have been detected in groundwater. • A seventh well is proposed at the eastern property boundary; its distance from the northern property boundary is based on where existing data indicate the highest concentrations of PCE are present.	*Groundwater:* VOCs by EPA Method 8260, dissolved oxygen, oxidation/reduction potential, temperature, pH, and specific conductance. Soil: VOCs by EPA Method 8260 (soil samples to be collected using field preservation in accordance with EPA Method 5035).
3	Evaluate groundwater impacts along western property boundary (presumed upgradient boundary).	Advance a transect of three borings to approximately 20 feet bgs at the western property boundary for collection of soil and grab groundwater samples (one will be converted to a monitoring well; see Item 2, above). Soil samples will be collected at two depths in the vadose zone based on field indications of impacts (PID readings, odor, staining) or, in the absence of field indications of impacts, at 5 and 10 feet bgs.	PCE was detected in boring NM-B-34, at the western property boundary. A transect of three additional borings is proposed at an approximately 15-foot spacing to the south to provide more data regarding PCE at the upgradient property boundary. Data from these borings may be used to modify the location of one of the monitoring wells.	*Groundwater:* VOCs by EPA Method 8260, dissolved oxygen, oxidation/reduction potential, temperature, pH, and specific conductance. *Soil:* VOCs by EPA Method 8260 (soil samples to be collected using field preservation in accordance with EPA Method 5035).
4	Evaluate deeper lithology at the site.	Advance two direct push borings to approximately 75 feet bgs (one downgradient of the highest concentration area and one upgradient). Soil samples will be collected only if there are field indications of impacts. Soil lithology will be logged.	One boring is proposed adjacent to the location of the westernmost nested well, and one is proposed between the two nested wells in the central portion of the northern parking lot (see Item 6, below). No borings are proposed in the highest concentration area, as a precaution to avoid potential cross-contamination.	None

TABLE 2

DATA GAPS AND PROPOSED INVESTIGATION
Crown Chevrolet
7544 Dublin Boulevard
Dublin, California

Item	Data Gap	Proposed Investigation	Rationale	Analysis
5	Evaluate the possible presence of impacts to deeper groundwater. Evaluate deeper groundwater concentration trends over time. Obtain data regarding the vertical groundwater gradient. Obtain more lithological data below 20 feet bgs.	Install four continuous multichannel tubing (CMT) groundwater monitoring wells (aka multi-port wells) to approximately 65 feet bgs in the northern parking lot with ports at three depths (monitoring well locations may be adjusted pending results of shallow grab groundwater samples; we will discuss any potential changes with ACEH before proceeding). Groundwater monitoring frequency to be determined. Soil samples will be collected only if there are field indications of impacts. Soil lithology will be logged. However, information regarding the moisture content of soil may not be reliable using sonic drilling technology (two borings will be logged using direct push technology; see Item 4, above).	One well is proposed at the western (upgradient) property boundary to confirm that there are no deeper groundwater impacts from upgradient. Two wells are proposed near the center of the northern parking lot to evaluate potential impacts in an area where deeper impacts, if any, would most likely to be found. One well is proposed at the eastern (downgradient) property boundary to confirm that there are no impacts extending off-site. Port depths will be chosen based on the locations of saturated soils (as logged in direct push borings; see Item 4, above), but are expected at approximately 15, 45, and 60 feet bgs.	*Groundwater:* VOCs by EPA Method 8260, dissolved oxygen, oxidation/reduction potential, temperature, pH, and specific conductance.
6	Evaluate possible off-site migration of impacted soil vapor in the downgradient direction (east). Evaluate concentration trends over time.	Install 4 temporary nested soil vapor probes at approximately 4 and 8 feet bgs along the eastern property boundary. Based on the results of the sampling, two sets of nested probes will be converted to vapor monitoring wells to allow for evaluation of VOC concentration trends over time.	Available data indicate that PCE and TCE are present in soil vapor in the eastern portion of the northern parking lot. Samples are proposed on approximately 50-foot intervals along the eastern property boundary to provide a transect of concentrations through the vapor plume. The depths of 4 and 8 feet bgs are chosen to provide data closest to the source (i.e., groundwater) while avoiding saturated soil, and also provide shallower data to help evaluate potential attenuation within the soil column. Two sets of nested vapor probes will be converted into vapor monitoring wells (by installing well boxes at ground surface); the locations of the permanent wells will be chosen based on the results of samples from the temporary probes.	*Soil vapor* : VOCs by EPA Method TO-15.
7	Evaluate potential for off-site migration of impacted groundwater in the downgradient direction (east).	Advance two borings to approximately 20 feet bgs in the parking lot of the property east of the Crown site for collection of grab groundwater samples.	Two borings are proposed off-site, on the property east of the Crown site, just east of the building in the expected area of highest potential VOC concentrations.	*Groundwater:* VOCs by EPA Method 8260, dissolved oxygen, oxidation/reduction potential, temperature, pH, and specific conductance.
8	Evaluate VOC concentrations just north of the highest concentration area.	Advance two borings to approximately 20 feet bgs north of Building A for collection of soil and grab groundwater samples. Soil samples will be collected at two depths in the vadose zone. Soil samples will be collected based on field indications of impacts (PID readings, odor, staining) or, in the absence of field indications of impacts, at 5 and 10 feet bgs.	The highest concentrations of PCE in groundwater were detected at boring NM-B-32, just north of Building A. The nearest available data to the north are approximately 75 feet away. One of the borings will be advanced approximately 20 feet north of NM-B-32 to provide data close to the highest concentration area. A second boring will be advanced approximately halfway between the first boring and former boring NM-B-33 to provide additional spatial data for contouring purposes. These borings will be part of a transect in the highest concentration area.	*Groundwater:* VOCs by EPA Method 8260, dissolved oxygen, oxidation/reduction potential, temperature, pH, and specific conductance. *Soil:* VOCs by EPA Method 8260 (soil samples to be collected using field preservation in accordance with EPA Method 5035).
9	Evaluate VOC concentrations in soil vapor in the south parcel of the site.	Install four temporary soil vapor probes at approximately 5 feet bgs around boring SV-25, where PCE was detected in soil vapor at a low concentration.	PCE was detected in soil vapor sample SV-25 in the southern parcel, although was not detected in groundwater in that area. Three probes will be installed approximately 30 feet from of boring SV-25 to attempt to delineate the extent of impacts. A fourth probe is proposed west of the original sample, close to the property boundary and the location of mapped utility lines, which may be a potential conduit, to evaluate potential impacts from the west.	*Soil vapor* : VOCs by EPA Method TO-15.
10	Obtain additional information regarding subsurface structures and utilities to further evaluate migration pathways and sources.	Ground penetrating radar (GPR) and other utility locating methodologies will be used, as appropriate, to further evaluate the presence of unknown utilities and structures at the site.	Utilities have been identified at the site that include an on-site sewer lateral and drain line, and shallow water, electric, and gas lines. Given the current understanding of the distribution of PCE in groundwater at the site, it is possible that other subsurface utilities, and specifically sewer laterals, exist that may act as a source or migration pathway for distribution of VOCs in the subsurface.	NA

TABLE 2

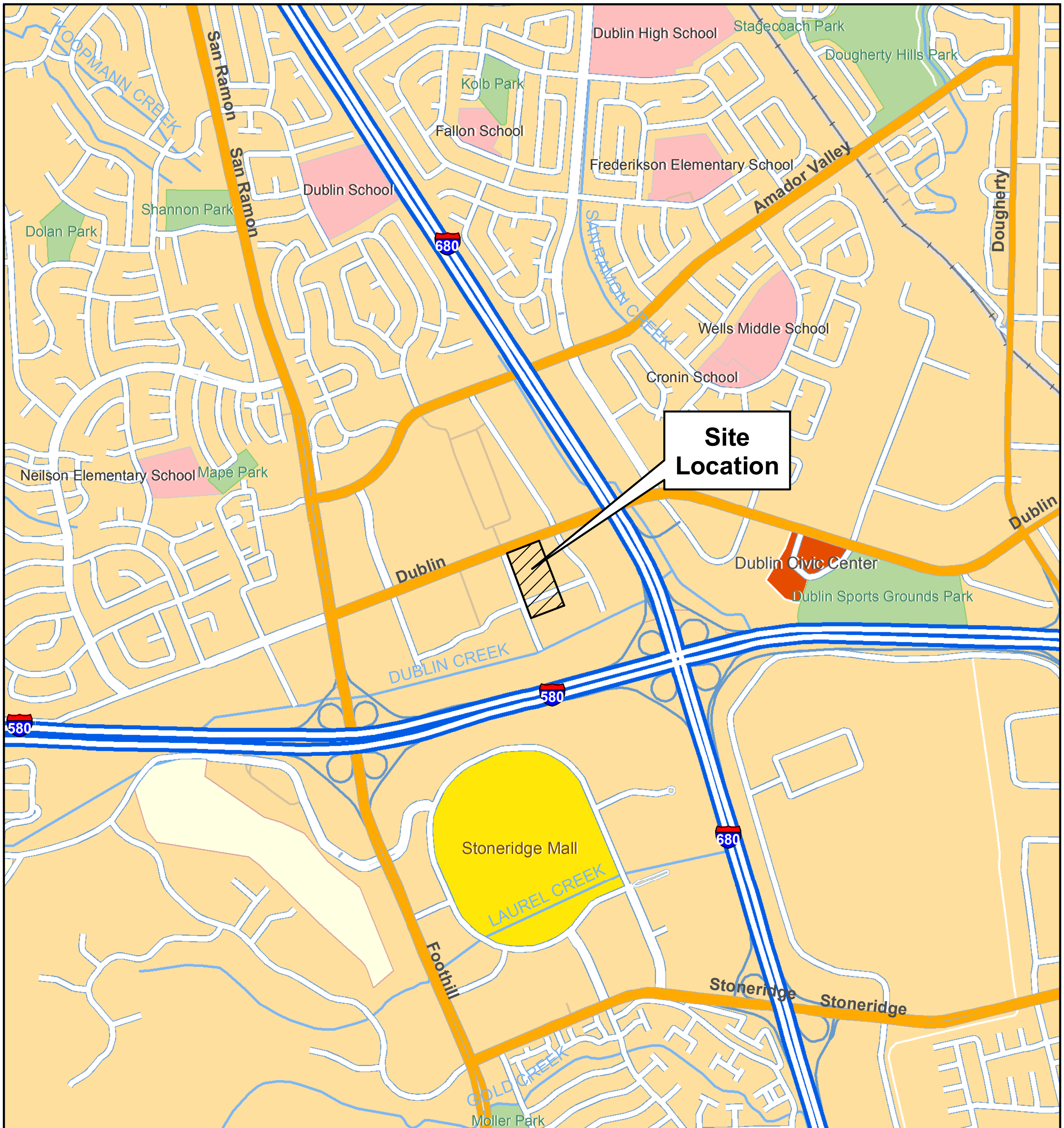
DATA GAPS AND PROPOSED INVESTIGATION
Crown Chevrolet
7544 Dublin Boulevard
Dublin, California

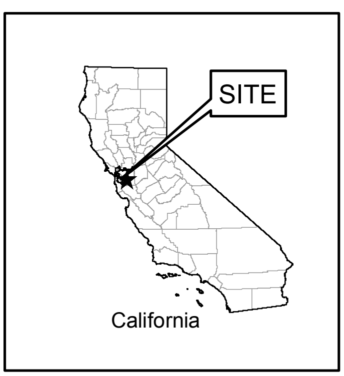
Item	Data Gap	Proposed Investigation	Rationale	Analysis
11	Perform a formal well survey to identify water-producing wells.	A formal well survey will be performed to identify water-producing, monitoring, and cathodic protection wells. Data will be obtained regarding nearby, permitted wells from the California Department of Water Resources and Zone 7 Water Agency (Item 11 on Table 2).	If groundwater downgradient of the site is being used for supply purposes, it is possible that VOCs related to the site could be impacting groundwater.	NA

Notes
1. Borings for soil/grab groundwater collection may be terminated at 15 feet bgs if groundwater is encountered and grab groundwater sample collection is possible at that depth. Soil lithology will be logged at all borings.

Abbreviations
bgs = below ground surface
EPA = U.S. Environmental Protection Agency
PCE = tetrachloroethene
TPHg = total petroleum hydrocarbons quantified as gasoline
VOCs = volatile organic compounds

FIGURES





0 2,000 4,000 Feet

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SITE LOCATION MAP
Crown Chevrolet Cadillac Isuzu
7544 Dublin Boulevard and 6707 Golden Gate Drive
Dublin, California

By: AWP	Date: 07/30/2012	Project No. OD10160070
amec		Figure 1

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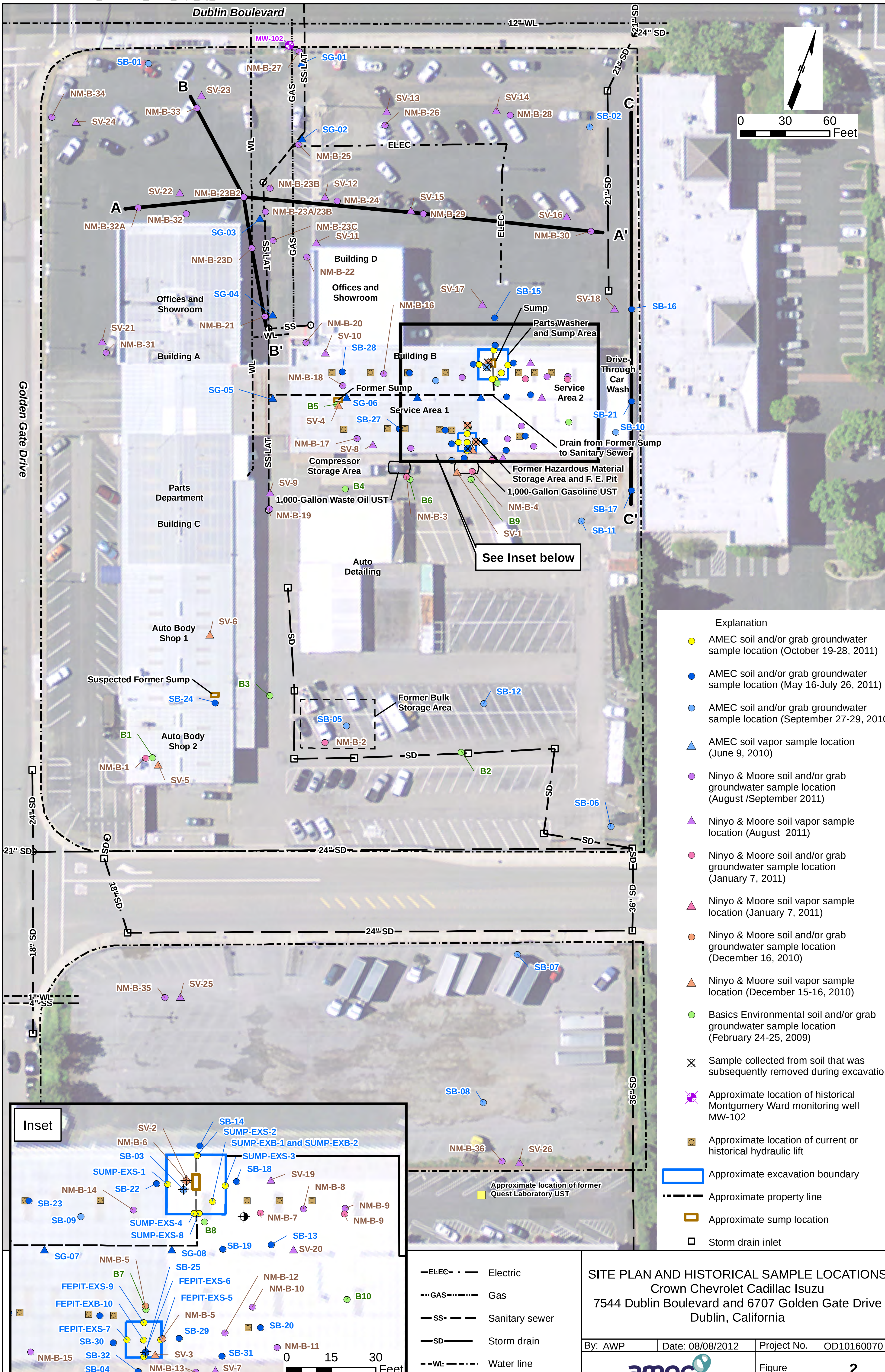
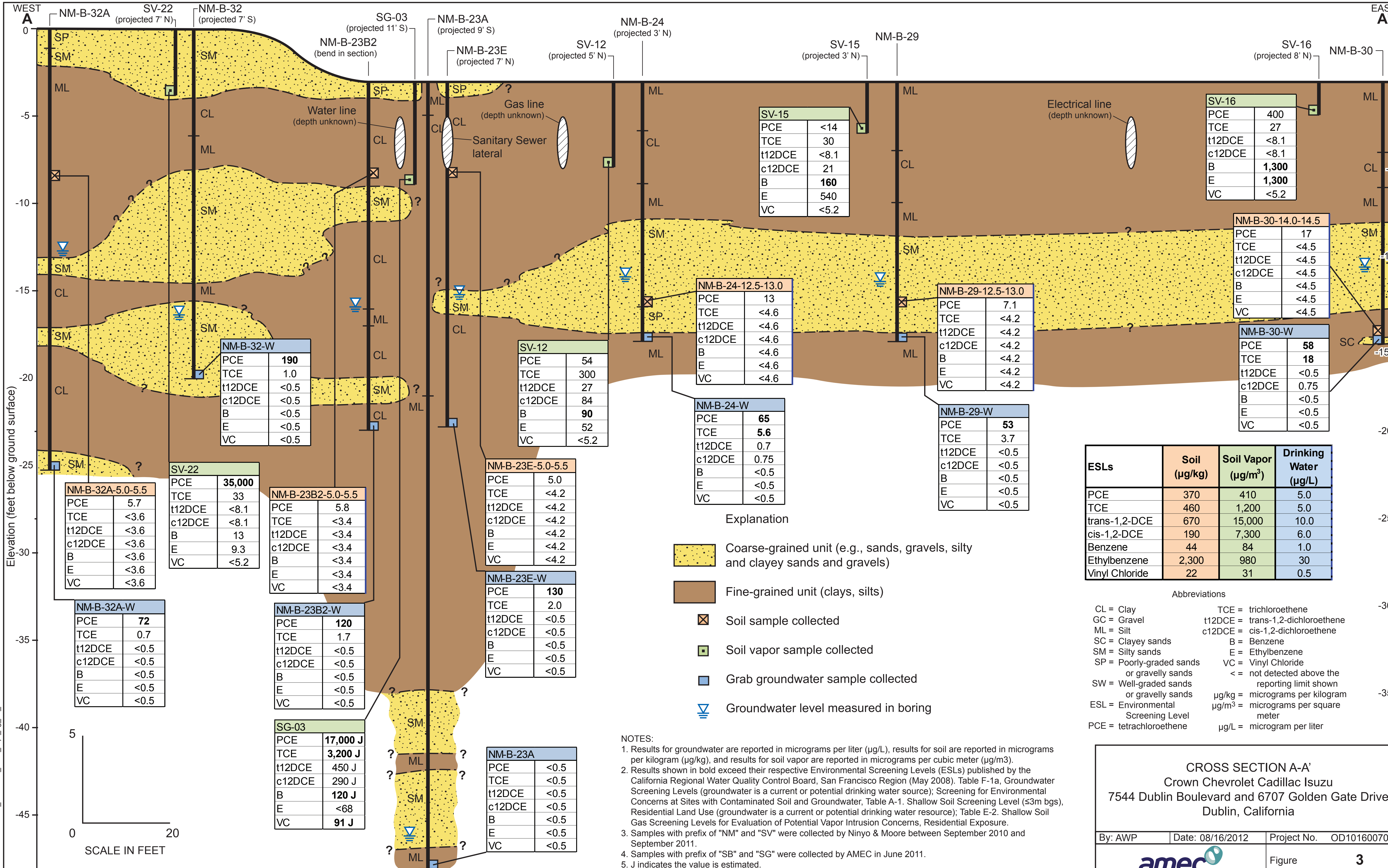




SV-15	
PCE	<14
TCE	30
t12DCE	<8.1
c12DCE	21
B	**160**
E	540
VC	<5.2

SV-16	
PCE	400
TCE	27
t12DCE	<8.1
c12DCE	<8.1
B	**1,300**
E	**1,300**
VC	<5.2

NM-B-30-14.0-14.5	
PCE	17
TCE	<4.5
t12DCE	<4.5
c12DCE	<4.5
B	<4.5
E	<4.5
VC	<4.5

NM-B-30-W	
PCE	**58**
TCE	**18**
t12DCE	<0.5
c12DCE	0.75
B	<0.5
E	<0.5
VC	<0.5

NM-B-24-12.5-13.0	
PCE	13
TCE	<4.6
t12DCE	<4.6
c12DCE	<4.6
B	<4.6
E	<4.6
VC	<4.6

NM-B-29-12.5-13.0	
PCE	7.1
TCE	<4.2
t12DCE	<4.2
c12DCE	<4.2
B	<4.2
E	<4.2
VC	<4.2

NM-B-24-W	
PCE	**65**
TCE	**5.6**
t12DCE	0.7
c12DCE	0.75
B	<0.5
E	<0.5
VC	<0.5

NM-B-29-W	
PCE	**53**
TCE	3.7
t12DCE	<0.5
c12DCE	<0.5
B	<0.5
E	<0.5
VC	<0.5

SV-12	
PCE	54
TCE	300
t12DCE	27
c12DCE	84
B	**90**
E	52
VC	<5.2

NM-B-32-W	
PCE	**190**
TCE	1.0
t12DCE	<0.5
c12DCE	<0.5
B	<0.5
E	<0.5
VC	<0.5

NM-B-23E-5.0-5.5	
PCE	5.0
TCE	<4.2
t12DCE	<4.2
c12DCE	<4.2
B	<4.2
E	<4.2
VC	<4.2

NM-B-23E-W	
PCE	**130**
TCE	2.0
t12DCE	<0.5
c12DCE	<0.5
B	<0.5
E	<0.5
VC	<0.5

NM-B-32A-5.0-5.5	
PCE	5.7
TCE	<3.6
t12DCE	<3.6
c12DCE	<3.6
B	<3.6
E	<3.6
VC	<3.6

SV-22	
PCE	**35,000**
TCE	33
t12DCE	<8.1
c12DCE	<8.1
B	13
E	9.3
VC	<5.2

NM-B-23B2-5.0-5.5	
PCE	5.8
TCE	<3.4
t12DCE	<3.4
c12DCE	<3.4
B	<3.4
E	<3.4
VC	<3.4

NM-B-32A-W	
PCE	**72**
TCE	0.7
t12DCE	<0.5
c12DCE	<0.5
B	<0.5
E	<0.5
VC	<0.5

NM-B-23B2-W	
PCE	**120**
TCE	1.7
t12DCE	<0.5
c12DCE	<0.5
B	<0.5
E	<0.5
VC	<0.5

SG-03	
PCE	**17,000 J**
TCE	**3,200 J**
t12DCE	450 J
c12DCE	290 J
B	**120 J**
E	<68
VC	**91 J**

NM-B-23A	
PCE	<0.5
TCE	<0.5
t12DCE	<0.5
c12DCE	<0.5
B	<0.5
E	<0.5
VC	<0.5

ESLs	Soil (µg/kg)	Soil Vapor (µg/m³)	Drinking Water (µg/L)
PCE	370	410	5.0
TCE	460	1,200	5.0
trans-1,2-DCE	670	15,000	10.0
cis-1,2-DCE	190	7,300	6.0
Benzene	44	84	1.0
Ethylbenzene	2,300	980	30
Vinyl Chloride	22	31	0.5

Explanation

- Coarse-grained unit (e.g., sands, gravels, silty and clayey sands and gravels)
- Fine-grained unit (clays, silts)
- Soil sample collected
- Soil vapor sample collected
- Grab groundwater sample collected
- Groundwater level measured in boring

Abbreviations

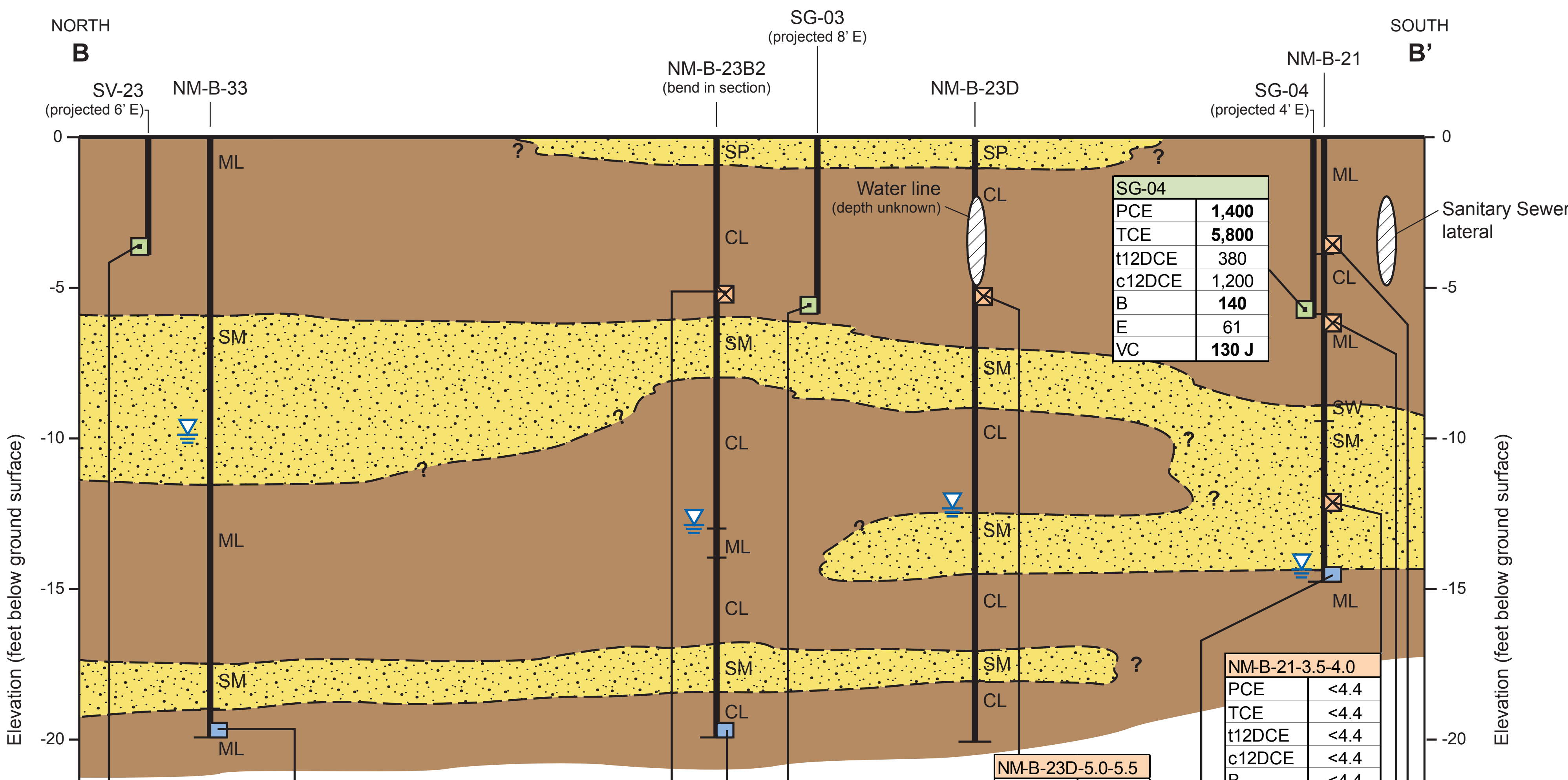
CL = Clay
GC = Gravel
ML = Silt
SC = Clayey sands
SM = Silty sands
SP = Poorly-graded sands or gravelly sands
SW = Well-graded sands or gravelly sands
ESL = Environmental Screening Level
PCE = tetrachloroethene
TCE = trichloroethene
t12DCE = trans-1,2-dichloroethene
c12DCE = cis-1,2-dichloroethene
B = Benzene
E = Ethylbenzene
VC = Vinyl Chloride
< = not detected above the reporting limit shown
µg/kg = micrograms per kilogram
µg/m³ = micrograms per square meter
µg/L = microgram per liter

NOTES:

1. Results for groundwater are reported in micrograms per liter (µg/L), results for soil are reported in micrograms per kilogram (µg/kg), and results for soil vapor are reported in micrograms per cubic meter (µg/m3).
2. Results shown in bold exceed their respective Environmental Screening Levels (ESLs) published by the California Regional Water Quality Control Board, San Francisco Region (May 2008). Table F-1a, Groundwater Screening Levels (groundwater is a current or potential drinking water source); Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Table A-1. Shallow Soil Screening Level (≤3m bgs), Residential Land Use (groundwater is a current or potential drinking water resource); Table E-2. Shallow Soil Gas Screening Levels for Evaluation of Potential Vapor Intrusion Concerns, Residential Exposure.
3. Samples with prefix of "NM" and "SV" were collected by Ninyo & Moore between September 2010 and September 2011.
4. Samples with prefix of "SB" and "SG" were collected by AMEC in June 2011.
5. J indicates the value is estimated.

CROSS SECTION A-A'
Crown Chevrolet Cadillac Isuzu
7544 Dublin Boulevard and 6707 Golden Gate Drive
Dublin, California

By: AWP	Date: 08/16/2012	Project No. OD10160070
amec		Figure 3



SV-23	
PCE	**2,300**
TCE	**9,100**
t12DCE	1,100
c12DCE	1,200
B	<6.5
E	<500
VC	**510**

NM-B-33-W	
PCE	**25**
TCE	2.1
t12DCE	<0.5
c12DCE	<0.5
B	<0.5
E	<0.5
VC	<0.5

NM-B-23B2-5.0-5.5	
PCE	5.8
TCE	<3.4
t12DCE	<3.4
c12DCE	<3.4
B	<3.4
E	<3.4
VC	<3.4

NM-B-23B2-W	
PCE	**120**
TCE	1.7
t12DCE	<0.5
c12DCE	<0.5
B	<0.5
E	<0.5
VC	<0.5

SG-03	
PCE	**17,000 J**
TCE	**3,200 J**
t12DCE	450 J
c12DCE	290 J
B	**120 J**
E	<68
VC	**91 J**

NM-B-23D-5.0-5.5	
PCE	4.5
TCE	<3.6
t12DCE	<3.6
c12DCE	<3.6
B	<3.6
E	<3.6
VC	<3.6

SG-04	
PCE	**1,400**
TCE	**5,800**
t12DCE	380
c12DCE	1,200
B	**140**
E	61
VC	**130 J**

NM-B-21-W	
PCE	2.4
TCE	0.51
t12DCE	<0.5
c12DCE	<0.5
B	<0.5
E	<0.5
VC	<0.5

NM-B-21-3.5-4.0	
PCE	<4.4
TCE	<4.4
t12DCE	<4.4
c12DCE	<4.4
B	<4.4
E	<4.4
VC	<4.4

NM-B-21-6.0-6.5	
PCE	<4.1
TCE	<4.1
t12DCE	<4.1
c12DCE	<4.1
B	<4.1
E	<4.1
VC	<4.1

NM-B-21-12.0-12.5	
PCE	<4.5
TCE	<4.5
t12DCE	<4.5
c12DCE	<4.5
B	<4.5
E	<4.5
VC	<4.5

Explanation

- Coarse-grained unit (e.g., sands, gravels, silty and clayey sands and gravels)
- Fine-grained unit (clays, silts)
- Soil sample collected
- Soil vapor sample collected
- Grab groundwater sample collected
- Groundwater level measured in boring

Abbreviations

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E = Ethylbenzene
VC = Vinyl Chloride
< = not detected above the reporting limit shown
µg/kg = micrograms per kilogram
µg/m³ = micrograms per square meter
µg/L = microgram per liter

ESLs	Soil (µg/kg)	Soil Vapor (µg/m³)	Drinking Water (µg/L)
PCE	370	410	5.0
TCE	460	1,200	5.0
trans-1,2-DCE	670	15,000	10.0
cis-1,2-DCE	190	7,300	6.0
Benzene	44	84	1.0
Ethylbenzene	2,300	980	30
Vinyl Chloride	22	31	0.5

5
0
20
SCALE IN FEET

NOTES:
1. Results for groundwater are reported in micrograms per liter (µg/L), results for soil are reported in micrograms per kilogram (µg/kg), and results for soil vapor are reported in micrograms per cubic meter (µg/m3).
2. Results shown in bold exceed their respective Environmental Screening Levels (ESLs) published by the California Regional Water Quality Control Board, San Francisco Region (May 2008). Table F-1a, Groundwater Screening Levels (groundwater is a current or potential drinking water source); Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Table A-1. Shallow Soil Screening Level (≤3m bgs), Residential Land Use (groundwater is a current or potential drinking water resource); Table E-2. Shallow Soil Gas Screening Levels for Evaluation of Potential Vapor Intrusion Concerns, Residential Exposure.
3. Samples with prefix of "NM" and "SV" were collected by Ninyo & Moore between September 2010 and September 2011.
4. Samples with prefix of "SB" and "SG" were collected by AMEC in June 2011.
5. J indicates the value is estimated.

CROSS SECTION B-B'
Crown Chevrolet Cadillac Isuzu
7544 Dublin Boulevard and 6707 Golden Gate Drive
Dublin, California

By: AWP | Date: 08/16/2012 | Project No. OD10160070

amec | Figure 4

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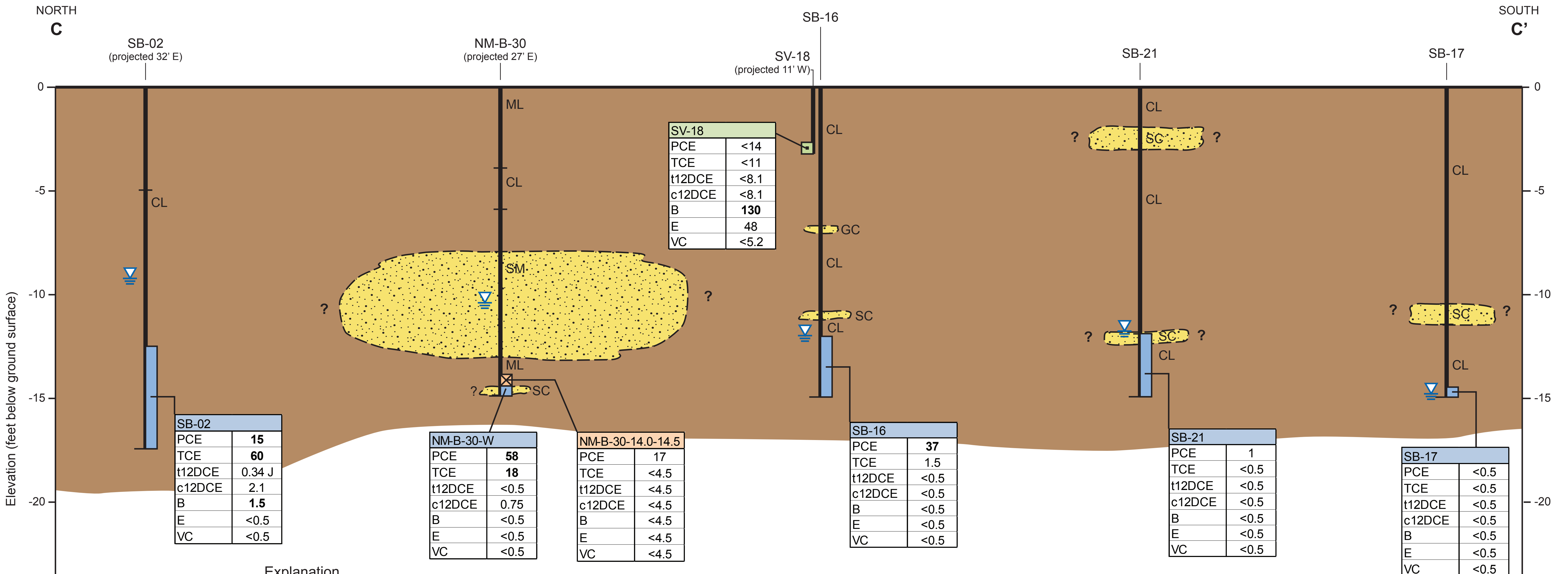

Explanation

Coarse-grained unit (e.g., sands, gravels, silty and clayey sands and gravels)

Fine-grained unit (clays, silts)

Soil sample collected

Soil vapor sample collected

Grab groundwater sample collected

Groundwater level measured in boring

ESLs	Soil (µg/kg)	Soil Vapor (µg/m^3)	Drinking Water (µg/L)
PCE	370	410	5.0
TCE	460	1,200	5.0
trans-1,2-DCE	670	15,000	10.0
cis-1,2-DCE	190	7,300	6.0
Benzene	44	84	1.0
Ethylbenzene	2,300	980	30
Vinyl Chloride	22	31	0.5

5

0 20

SCALE IN FEET

Abbreviations

CL = Clay
GC = Gravel
ML = Silt
SC = Clayey sands
SM = Silty sands
SP = Poorly-graded sands or gravelly sands
SW = Well-graded sands or gravelly sands
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TCE = trichloroethene
t12DCE = trans-1,2-dichloroethene
c12DCE = cis-1,2-dichloroethene
B = Benzene
E = Ethylbenzene
VC = Vinyl Chloride
< = not detected above the reporting limit shown
µg/kg = micrograms per kilogram
µg/m^3 = micrograms per square meter
µg/L = microgram per liter

NOTES:
1. Results for groundwater are reported in micrograms per liter (µg/L), results for soil are reported in micrograms per kilogram (µg/kg), and results for soil vapor are reported in micrograms per cubic meter (µg/m3).
2. Results shown in **bold** exceed their respective Environmental Screening Levels (ESLs) published by the California Regional Water Quality Control Board, San Francisco Region (May 2008). Table F-1a, Groundwater Screening Levels (groundwater is a current or potential drinking water source); Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Table A-1. Shallow Soil Screening Level (≤3m bgs), Residential Land Use (groundwater is a current or potential drinking water resource); Table E-2. Shallow Soil Gas Screening Levels for Evaluation of Potential Vapor Intrusion Concerns, Residential Exposure.
3. Samples with prefix of "NM" and "SV" were collected by Ninyo & Moore between September 2010 and September 2011.
4. Samples with prefix of "SB" and "SG" were collected by AMEC in June 2011.
5. J indicates the value is estimated.

CROSS SECTION C-C'
Crown Chevrolet Cadillac Isuzu
7544 Dublin Boulevard and 6707 Golden Gate Drive
Dublin, California

By: AWP	Date: 08/16/2012	Project No. OD10160070
amec		Figure 5

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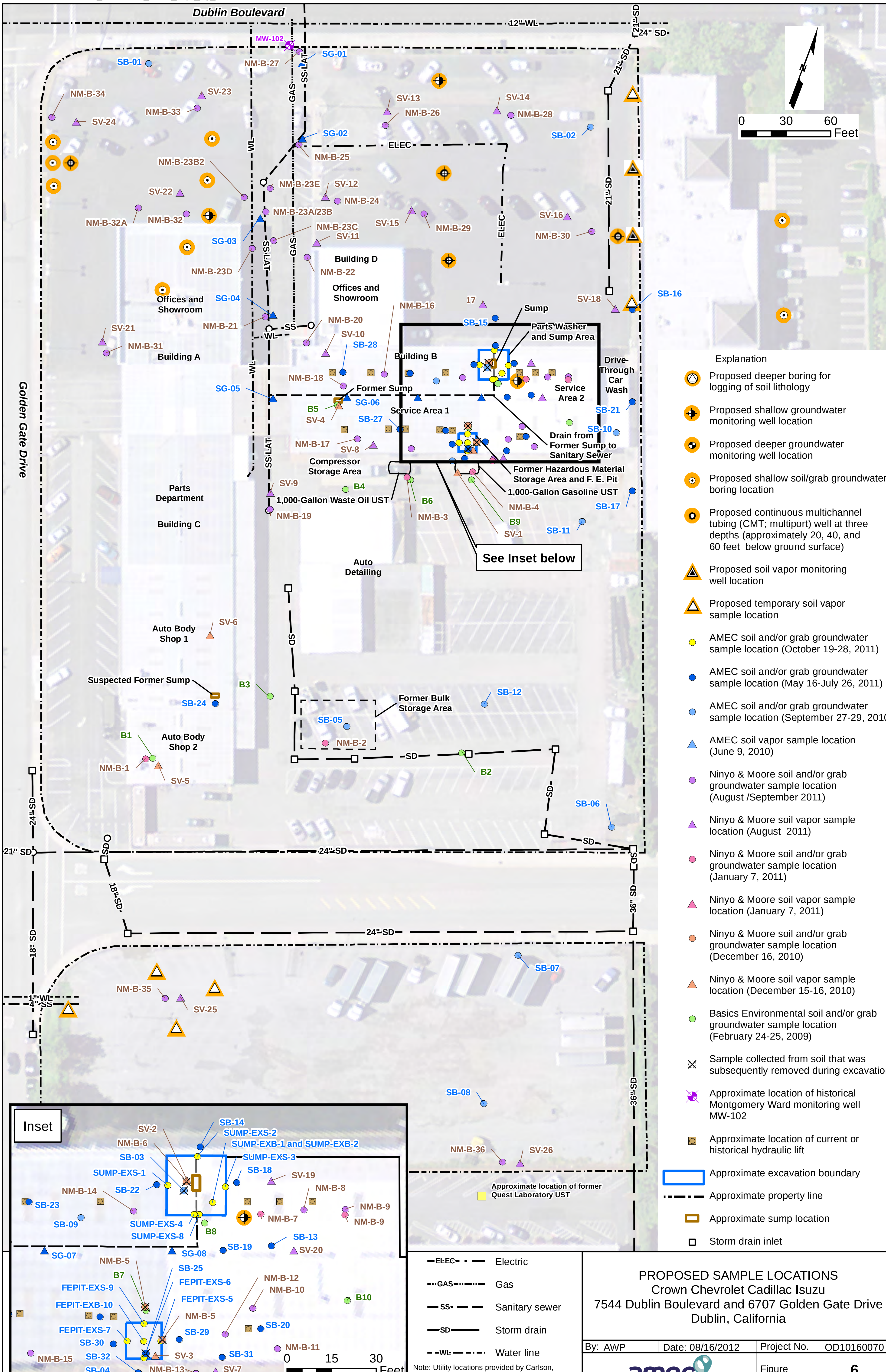
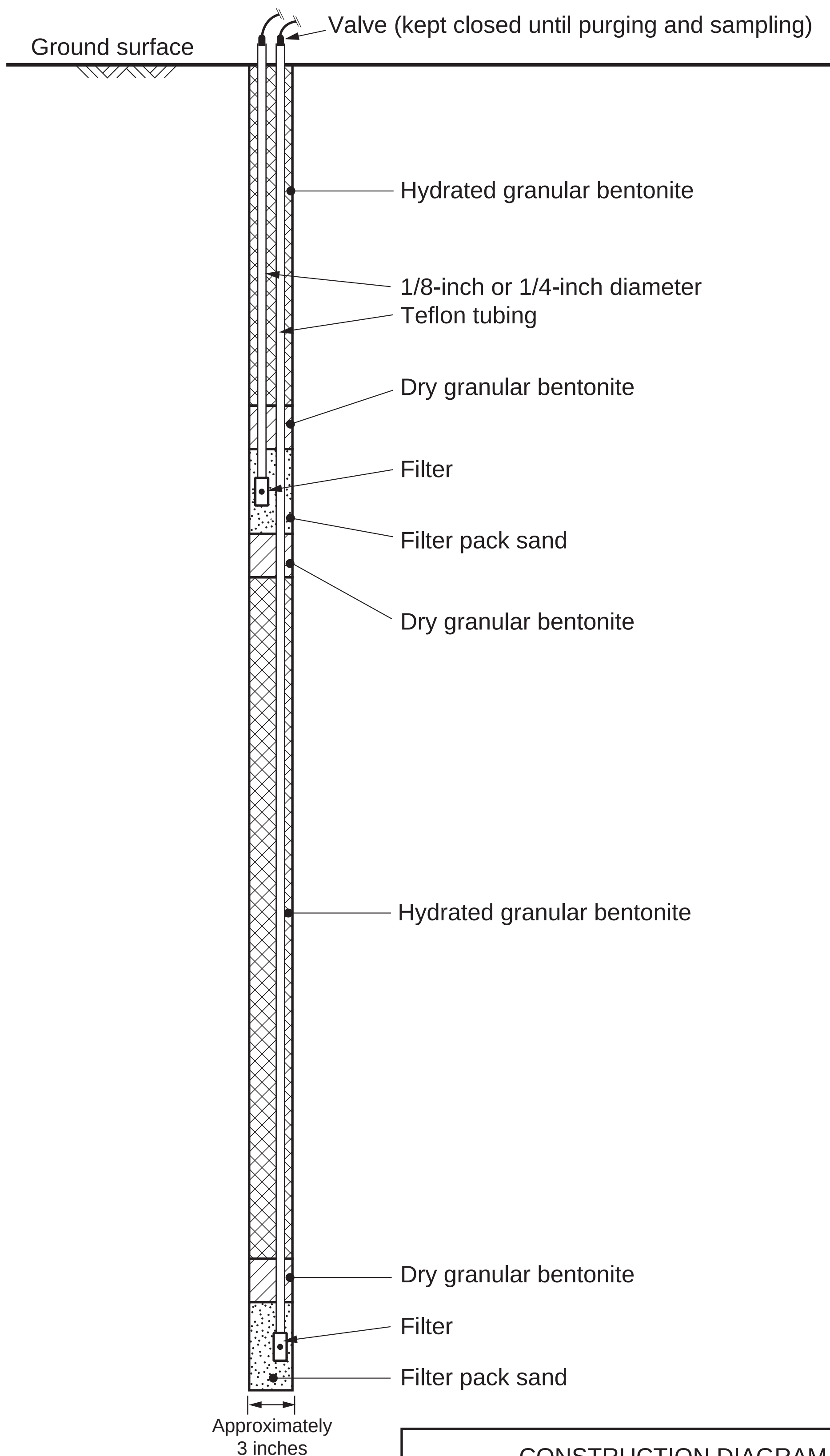
S:\OD10\160070\task_00002\12_0730_iwp_fig_06.mxd



PROPOSED SAMPLE LOCATIONS
Crown Chevrolet Cadillac Isuzu
7544 Dublin Boulevard and 6707 Golden Gate Drive
Dublin, California

By: AWP	Date: 08/16/2012	Project No.	OD10160070
amec		Figure	6



Note:
Soil gas wells will be constructed with sample inlets placed at one or two different depths. The specific depths for sample inlets may be adjusted based on site conditions.

CONSTRUCTION DIAGRAM FOR
NESTED SOIL GAS WELL
Crown Chevrolet Cadillac Isuzu
7544 Dublin Boulevard and 6707 Golden Gate Drive
Dublin, California

By: AWP	Date: 08/16/2012	Project No. OD10160070
amec		Figure 7

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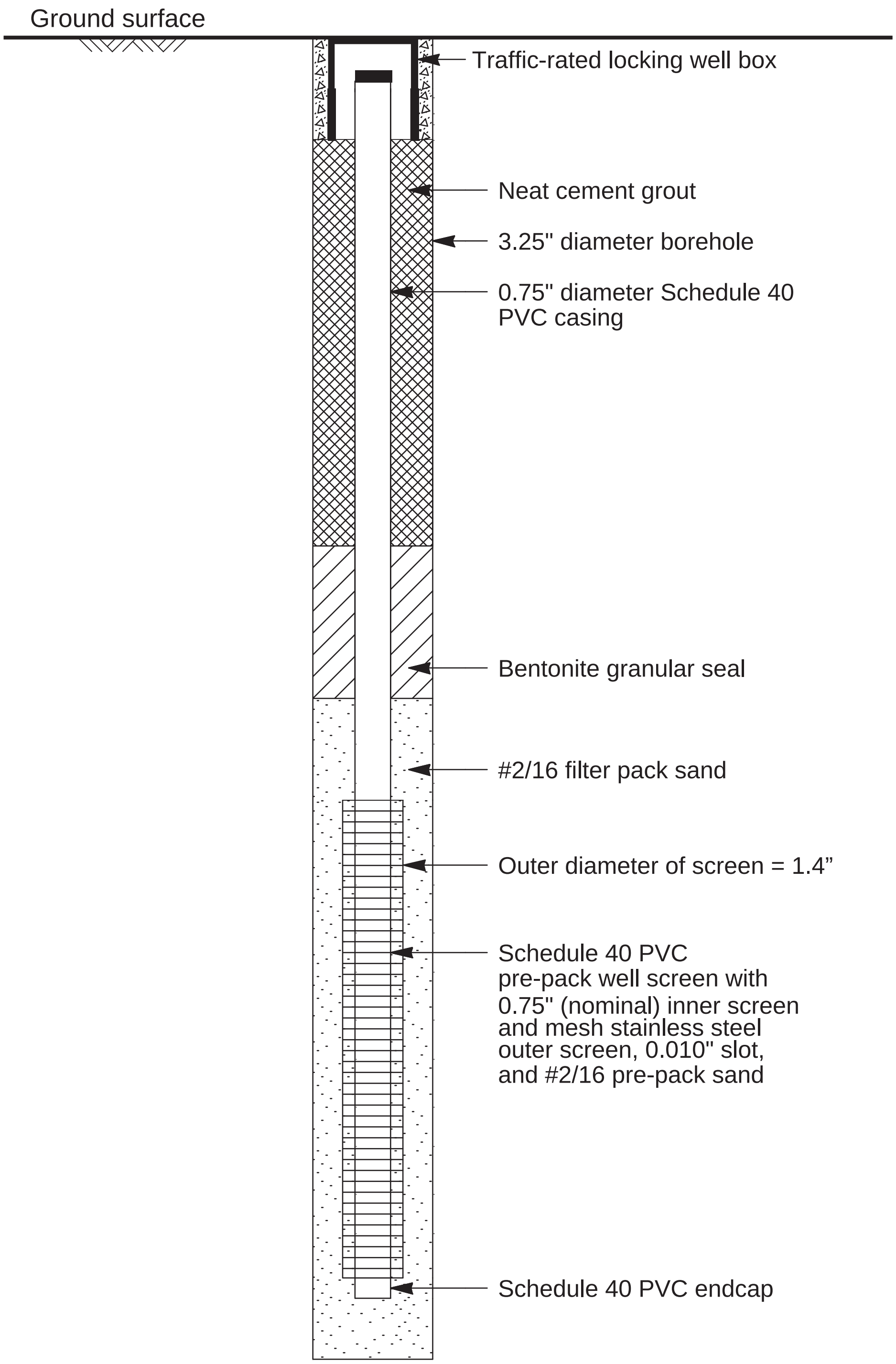

NOT TO SCALE

SCHEMATIC - DIRECT PUSH PRE-PACK WELL
Crown Chevrolet Cadillac Isuzu
7544 Dublin Boulevard and 6707 Golden Gate Drive
Dublin, California

By: AWP	Date: 08/15/2012	Project No. OD10160070
amec		Figure 8

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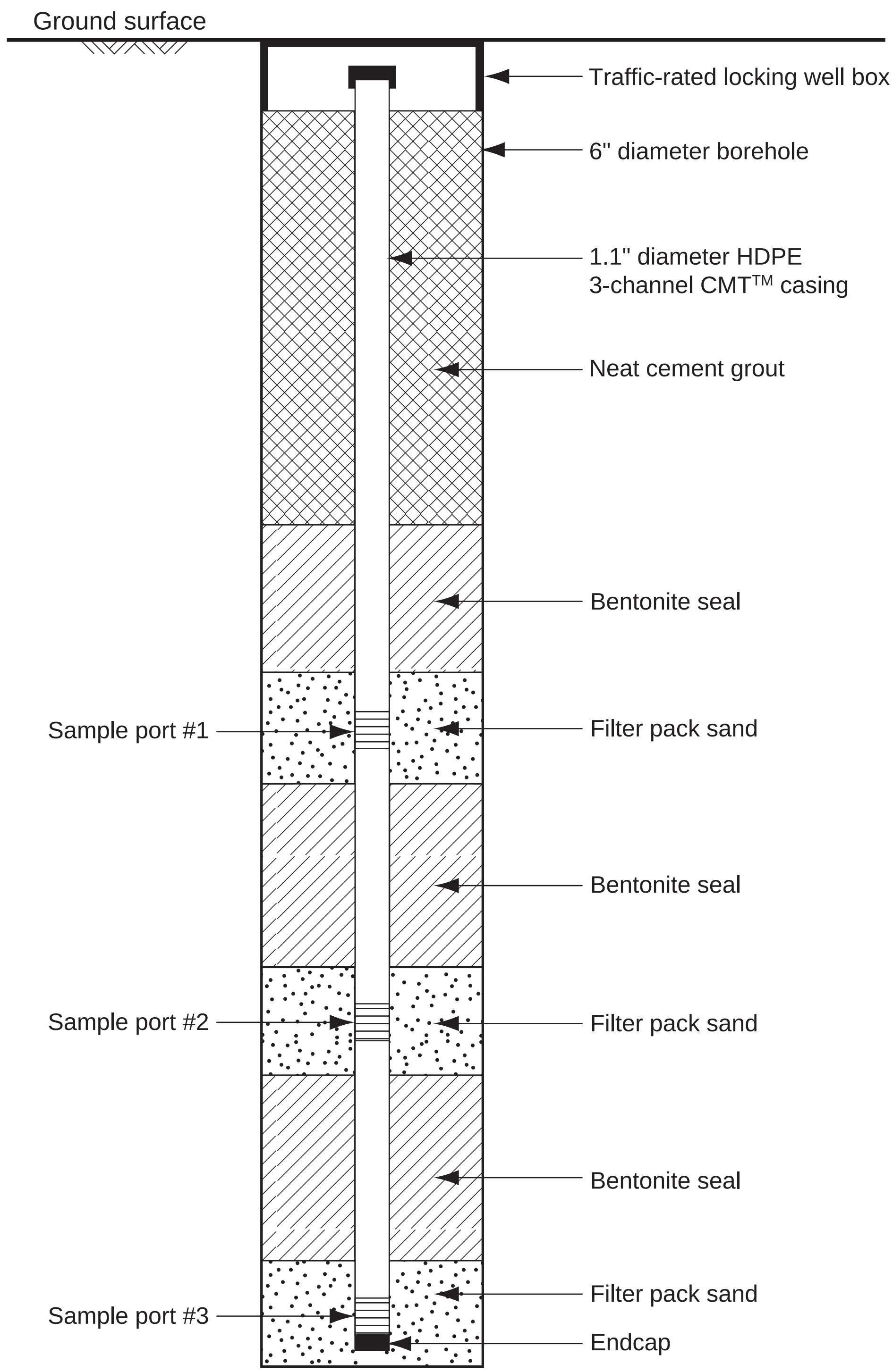

NOT TO SCALE

SCHEMATIC - CMT WELL
Crown Chevrolet Cadillac Isuzu
7544 Dublin Boulevard and 6707 Golden Gate Drive
Dublin, California

By: AWP	Date: 08/15/2012	Project No.	OD10160070
amec		Figure	9

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