AUTUMNWOOD DEVELOPMENT INVESTIGATION REPORT AUTUMNWOOD DEVELOPMENT WILDOMAR, CALIFORNIA

Prepared by the Department of Toxic Substances Control

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Autumnwood Development Investigation Report
Autumnwood Development
Wildomar, California

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December 2013

Prepared By:

_____ Date: _____

Theodore Johnson, C.E.G., C.Hg.
Senior Engineering Geologist

_____ Date: _____

William Bosan, Ph.D
Senior Toxicologist

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1.0 INTRODUCTION

This Investigation Report (Report) summarizes analytical results of soil, soil gas, and groundwater sampling conducted at the Autumnwood Development in the City of Wildomar (City), California (herein referred to as the Study Area; Figures 1 and 2). (DTSC 2013). AMEC Environment and Infrastructure, Inc. (AMEC) implemented field sampling activities in the Study Area on behalf of the Department of Toxic Substances Control (DTSC). The work was conducted in general accordance with the *Soil, Soil Gas, and Groundwater Sampling Workplan for Autumnwood Development, Amaryllis Court and Vicinity Wildomar, California* [Workplan, October 2013]. Figures 1 and 2 show the Study Area location.

The Study Area consists of single-family residential homes and roadways. As shown on Figure 2, it is located between Penrose Street and South Pasadena Street to the northwest and southeast, respectively. Palomar Street and a drainage channel/gully south of Front Street define the approximate northeastern and southwestern boundaries of the Study Area, respectively. Reportedly, groundwater flow is generally towards the south-southeast.

1.1 OBJECTIVES AND SCOPE

In general, the purpose of this investigation was 1) to determine whether volatile organic compounds (VOCs) in the subsurface are present in soil and groundwater and if VOCs are present in sufficient concentrations to pose a health risk via the vapor intrusion pathway; and 2) to determine if hazardous substances were released that may pose a threat to human health. Risk to human health from VOCs are primarily driven by exposure through the inhalation and ingestion pathways. Residences in this development use municipal water, hence ingestion of groundwater is not considered to be an exposure pathway. Inhalation may be a complete exposure pathway if VOCs are intruding into indoor air spaces. Soil gas sampling is the primary method used to gather data to assess potential vapor intrusion into indoor air and evaluate the resulting risk to human health.

Through the Orphan Site Fund, DTSC allocated limited funding to conduct soil, soil gas, and groundwater sampling at sites where there is a potential health risk. To meet these objectives, investigation activities were conducted to evaluate VOC concentrations in soil, soil gas, and groundwater in portions of the Study Area through a field sampling and analysis program described in the Workplan (DTSC 2013). The field investigation was conducted on November 7, 8, 9, and 13 through 15, 2013. Sampling was conducted on

Amaryllis Court, Pink Ginger Court, Protea Court, Front Street, Penrose Street, Palomar Street, and South Pasadena Street in the City of Wildomar. Additionally, sub-slab sampling was conducted inside 3 residences within the Development (See Figure 2).

1.2 REPORT ORGANIZATION

This report is organized as follows:

Section 1.0	Introduction
Section 2.0	Study Area Background
Section 3.0	Environmental Setting
Section 4.0	Field Investigation
Section 5.0	Investigation Results
Section 6.0	Summary of Findings
Section 7.0	References

Additional supporting information is presented in the Tables, Figures, and Attachments.

Work performed pursuant to the *Soil, Soil Gas, and Groundwater Sampling Workplan, October 2013* and applicable state and federal guidance. The work was done under the direction and supervision of the AMEC Project Manager who is a qualified registered professional geologist (PG) in compliance with the requirements of the Professional Engineers Act, Business and Professions Code Sections 6700-6899 and Section 7838, and the Geologist and Geophysicists Act, Business and Professions Code sections 7800-7887.

2.0 STUDY AREA BACKGROUND

The Site is a residential housing tract identified as the Autumnwood Development in Wildomar, California. The Autumnwood Development is bound by South Pasadena Street on the southeast, Penrose Street on the northwest, Palomar Street on the northeast and drainage canal south of Front Street on the southwest. The development was constructed between 2004, and 2006, and consists of single and multistory homes constructed with slabs on grade (Figure 1 and 2).

2.1 Previous Investigations

Prior to construction of the Autumnwood Development, C.H.J. Incorporated (CHJ), of Colton, California, prepared a *Preliminary Environmental Site Assessment* (Phase 1),

dated June 13, 2003. Based on aerial photographs dating back to 1949, CHJ indicated that the site was primarily vacant and undeveloped between 1949, and 2001(Adini 2012).

Pre-grading reports described the site soils as “low to medium” density and consisting of silty and clayey sands and silts. These sediments required densification to prevent dynamic settlement due to liquefaction and differential settlement of the proposed structures. To remedy the low density soils, the soils were removed to 10 to 15 feet below original grade and re-compacted to form a stable base for the planned structures.

Environmental assessments conducted in May and July 2012 indicated low levels of volatile organic compounds (VOCs) in sub-slab soil gas and indoor and outdoor air samples collected from several of the houses. In September 2012, soil gas and soil samples collected from the surrounding subsurface areas on Amaryllis Court in the Autumnwood Development also detected low levels of VOCs. The Adini report concluded that the chlorobenzene, chloroform, chloromethane, toluene, trichloroethylene, and trichlorofloromethane detected in soil gas did not exceeded their respective residential California Human Health Screening Levels (CHHSLs) for soil-gas below buildings constructed on engineered fill (Adini 2012).

Soil samples were also collected from seven borings for lithologic description and laboratory analysis for VOCs, semi-VOCs, total petroleum hydrocarbons, organochlorine pesticides (OCPs), and polychlorinated biphenyls (PCBs). Analytical results for the soil samples indicated that none of the analytes were present above the analytical laboratory’s method detection limits in any of the soil samples submitted for analysis (Adini 2012).

Additionally, the South Coast Air Quality Management District (SCAQMD) collected various environmental samples, mainly to evaluate indoor air quality and evaluate drinking water quality. The Office of Environmental Health Hazard Assessment (OEHHA) and the California Department of Public Health (CDPH) have also evaluated environmental data collected to date in the Autumnwood Development.

3.0 ENVIRONMENTAL SETTING

The information on the environmental characteristics of the Study Area, as presented in the following subsections, was summarized from various sources/documents referenced herein.

3.1 GEOLOGIC SETTING

The site is located in the Perris Block between San Jacinto and Santa Ana Blocks in the Peninsular Ranges geomorphic province of California. The Perris Block is bound by the San Jacinto Fault to the north and Elsinore and Chino, Willard, and Wildomar Faults to the South. The Peninsular Ranges province is characterized by northwest-trending mountain ranges and valleys and extends from the San Gabriel and San Bernardino Mountains in the north to California's southern border and beyond, forming Baja California (Adini 2012).

According to the Geologic Map of California, Santa Ana Sheet, the site is located above Quaternary Age alluvium in the Elsinore Fault Zone between the Wildomar Fault, adjacent to the north, and the Willard Fault approximately 0.5-miles to the southwest. Quaternary alluvium within the Elsinore Fault Zone and Temecula Valley Groundwater Basin is estimated to exceed 2,500 feet in thickness (DWR, 2004). Mesozoic age granitic rock form the Elsinore Mountains to the south of the site and Mesozoic age granitic rock and basic intrusive rock form the hills to the north (Adini 2012).

Sediments encountered during drilling in the Study Area show that the property is underlain by engineered fill and alluvium consisting primarily of silty and clayey sands with some sandier and gravely zones, to depths of approximately 36 feet below ground surface (bgs). A zone of potential engineered fill in the central portion of the Study Area was encountered from the surface to approximately eight feet bgs, consisting mainly of inter-layered clayey and silty sands.

Soil borings at locations 1, 6, 7, 8, 11, 12, and 13 were continuously cored to depths up to 36 feet bgs. Sediments encountered within the borings are classified as sand with varying amounts of clay. Some gravely zones were also encountered mainly in the central section of the Study Area. No staining was observed in the soil borings. Photoionization Detector (PID) readings ranged between 0.0 and 5.3 parts per million (ppm) with the majority of readings below 1.0 ppm. Groundwater was encountered at depths of approximately 20 ft. bgs. at location 1 to 30 ft. bgs. at location 13. Boring logs are provided in Attachment C.

Figures 3 and 4 show geologic cross sections A-A' and B-B' across the Study Area using lithologic logs from boring locations 1, 6, 8, 12 (A-A') and locations 11, 9, 8, and 7 (B-B').

3.3 HYDROGEOLOGIC SETTING

The City of Wildomar lies between the south-southwestern boarder of the San Jacinto Sub-basin of the Santa Ana drainage basin and the northeastern boundary of the San Dieguito Basin of the greater San Diego drainage basin. The sediments of the hydrologic

basin below Wildomar can be characterized as a series of interconnected alluvium filled valleys, bounded by bedrock mountains and hills cut by the Elsinore Fault Zone. Within the Elsinore Fault Zone are the parallel Wildomar Fault to the east and the Willard Fault to the west of Wildomar. These faults form a down dropped fault block or graben, creating scarps and sag ponds, such as Lake Elsinore. Water flows from the Murrieta-Temecula Basin, to the southeast of Wildomar, to the Lake Elsinore area in the northwest (Kennedy 1977).

Groundwater produced for potable purposes in the area north of Wildomar is in excess of 250 ft. bgs. (City 2011). During the November 2013 investigation conducted by AMEC, groundwater was encountered in grab groundwater sampling locations 1, 7, 11, and 13 at depths of approximately 21 to 28 feet. bgs. (See cross sections A-A' and B-B').

4.0 FIELD INVESTIGATION

Soil, soil gas, and grab groundwater samples were collected from the Study Area following the methods and procedures described in the DTSC Work Plan October 2013. The field investigation was conducted in two phases. The first phase occurred November 6 through 9, 2013 and included soil and grab groundwater sampling, and installing nested soil gas probes. The second phase occurred November 13 through 15, 2013 and included collecting and analyzing soil gas samples from nested soil gas probes, and installation and sampling of sub-slab soil gas probes. DTSC staff was present during both phases of field investigation.

Sample locations are shown on Figure 2.

4.1 DEVIATIONS FROM PROPOSED WORK SCOPE

The field investigation was implemented following the procedures and methods described in the DTSC Work Plan. Deviations from the DTSC Work Plan included the following:

- Some proposed sample locations were moved based on access constraints or subsurface utilities.
- Soil samples were collected from locations 6, 8, and 12 (placed in the assumed center of the fill area) and submitted to Calscience Environmental Laboratories, Inc. (Calscience) for analysis.
- Groundwater samples were collected from locations 1, 7, 11, and 13 placed around the perimeter of the Study Area.
- Soil and groundwater sample locations 1, 6, 7, 8, 11, 12 and 13 were continuously cored and used to generate soil boring logs following visual-manual

procedures of ASTM D2488 for guidance, which are based on the Unified Soil Classification System.

- Groundwater samples were submitted to Calscience and analyzed for volatile organic compounds (VOCs) and formaldehyde.
- A groundwater split sample was collected in preserved VOA vials from sample location 7 and provided to Nancy Caraway, a community representative.
- Groundwater samples were not screened for field parameters due to time constraints.
- The 5-foot depth soil gas probe at location 6 had no vapor flow and a replacement probe was installed at depth of 3 feet.
- The 5-foot depth soil gas probe at location 8 contained water and a replacement probe was installed at depth of 3 feet.
- The 15-foot depth soil gas probe at location 1 had no vapor flow and a replacement probe was installed at depth of 10 feet.
- Selected soil gas samples were collected in dinitrophenylhydrazine (DNPH) coated cartridges and were analyzed for formaldehyde by Environmental Analytical Services, Inc. using United States Environmental Protection Agency (U.S. EPA) Method TO-11A.
- Sub-slab soil gas samples were collected in 400 milliliter stainless steel Summa canisters and were analyzed for VOCs using U.S. EPA Method TO-15 allowing for methanol to be added to the compound reporting list.

Field conditions and deviations to the Workplan (2013) were performed with DTSC staff's directions and/or concurrence.

4.2 WORK PLAN IMPLEMENTATION

The following activities were performed during the implementation of the scope of work:

- Pre-Field Activities;
- Soil Sampling;
- Groundwater Sampling;
- Soil Gas Sampling; and
- Sub-Slab Soil Gas Sampling.

Each activity is described in the following subsections.

4.2.1 Pre-field Activities

Before initiating each phase of the field work, AMEC conducted the following pre-field activities:

- Obtained an encroachment permit from the City of Wildomar (City) to work in public right-of-ways;
- Attend pre-construction meeting with the City;
- Notified DTSC and the City of planned field activities;
- DTSC notified the Autumnwood Development residents with a Work Notice
- Notified Underground Service Alert of the planned field activities;
- Erected “No Parking” signs in advance of conducting sampling activities;
- Retained Subsurface Surveys & Associates, Inc., a private utility locating company, to conduct geophysical surveys around the drilling and sampling locations to check for underground utilities and/or other obstructions; and
- Contracted and scheduled the drilling and laboratory services.

A copy of the City encroachment permit is provided in Attachment A. A copy of the Community Work Notice is provided in Attachment B.

4.2.2 Soil Sampling

To assess soil conditions in the Study Area, continuous core soil samples were collected from sample locations 6, 8, and 12 located in the assumed central portion of the former fill area. The subsurface materials encountered were described in the field by an AMEC geologist, licensed by the State of California as a Professional Geologist (PG). Soil characteristics were described following visual-manual procedures of ASTM D2488 for guidance, which are based on the Unified Soil Classification System. Soil was screened in the field using a photoionization detector (PID) for potential presence of VOCs. Color, moisture content, grain size, PID reading, and other pertinent soil characteristics were recorded on the boring logs. Following soil sampling, the boreholes were subsequently converted to soil gas monitoring points (see Section 4.2.4 Soil Gas Sampling). Soil boring logs for sample locations 6, 8, and 12 are provided in Attachment C.

Soil samples were collected from sample locations 6, 8, and 12 at approximate depths of 5, 10, and 15 feet. A duplicate soil sample collected from a depth of 10 feet at sample location 6 was designated as “60” and was submitted as a “blind” sample to the laboratory. The soil samples were submitted to Calscience and select samples were analyzed for the following:

- Title 22 metals (metals) using U.S. EPA Method 6010B/7470A;
- Semi-Volatile Organic Compounds (SVOCs) using U.S. EPA Method 8270C;
- Polychlorinated biphenyls (PCBs) using U.S. EPA Method 8082; and
- Organochlorine Pesticides (OCPs) using U.S. EPA Method 8081A.

Soil samples analytical results are summarized in Table 1. PCBs and pesticide compounds were not detected in any of the soil samples. Bis (2-ethylhexyl) Phthalate was the only SVOC detected and was reported at a concentration of 2.6 milligrams per kilogram (mg/kg) in the soil sample collected from a depth of 5 feet in sample location 12. Metal results are summarized in Table 1. A more detailed discussion of the results are in Section 6.1.1.

Laboratory reports and chain-of-custody records for the soil sample analyses are provided in Attachment D.

4.2.3 Groundwater Sampling

To assess groundwater conditions in the Study Area, groundwater samples were collected from sample locations 1, 7, 11, 13 (Figure 2). Groundwater was encountered in each sample locations at depths ranging from approximately 21 to 28 feet. Temporary PVC well casing was installed in each boring and was used to collect a groundwater sample. Groundwater samples were collected from each temporary well using a new disposable bailer. Duplicate samples designated as “110” and “130” were collected from sample locations 11 and 13, respectively, and were submitted as “blind” samples to the laboratory. The groundwater samples were submitted to Calscience and analyzed for the following:

- VOCs using U.S. EPA Method 8260B; and
- Formaldehyde using U.S. EPA Method 8315A.

The samples for formaldehyde analysis were subcontracted to Weck Laboratories, Inc. As shown in Table 2, VOCs and formaldehyde were not detected in any of the groundwater samples. Laboratory reports and chain-of-custody records for the groundwater sample analyses are provided in Attachment D.

Continuous core soil samples were collected from sample locations 1, 7, 11, and 13 located around the perimeter of in the Study Area (Figure 2). The geologic materials encountered were described in the field by an AMEC geologist, licensed by the State of California as a PG. Soil characteristics were described following visual-manual procedures of ASTM D2488 for guidance. The boreholes were subsequently converted

to soil gas monitoring points (see Section 4.2.4 Soil Gas Sampling). Soil boring logs for sample locations 1, 7, 11, and 13 are provided in Attachment C.

4.2.4 Soil Gas Sampling

To assess soil gas conditions in the Study Area, soil gas samples were collected and analyzed following the DTSC April 2012 *Advisory-Active Soil Gas Investigations* (Advisory). Soil gas samples were collected by H&P Mobile Geochemistry, Inc. (H&P) from temporary-type probes installed using direct push techniques. The temporary-type probes were installed during the first phase of field investigation and allowed to equilibrate for minimum of 48 hours before sampling commenced. At each location, soil gas probes were installed at approximate depths of 5 and 15 feet.

Soil gas probe construction details are noted on the soil boring logs for each location cored and are similar to the multilevel figure, Figure 1, in the Advisory. Typical soil gas probe construction consisted of placing a one-foot layer of #3 silica sand with the probe tip centrally emplaced in the sand pack. The sand layer was followed by a one-foot layer of dry granular bentonite followed by a layer of hydrated powdered bentonite to six inches below the shallow soil gas probe at 5 feet bgs. The process was repeated for the five-foot probe to approximately 1-foot below the top of the asphalt layer where the soil gas tubes were enclosed in a plastic baggie for protection and then embedded in #3 silica sand placed to one-half inch from the top of the asphalt layer. A temporary protective concrete patch covered the silica sand to the level of the asphalt.

Soil gas samples were collected from a total of 12 locations (Figure 2). Purge-volume tests were conducted at sampling locations 2 at 5 feet and 12 at 15 feet by collecting soil vapor samples after purging 1, 3 and 10 system volumes, as recommended by the Advisory. Based on the test results, a 3 purge volume was optimal at the 5-foot depth, while a 1 purge volume was optimal at the 15-foot depth.

Soil gas samples were analyzed for VOCs and fuel oxygenate compounds by an on-site mobile laboratory operated by H&P using U.S. EPA Method 8260.

During sampling, no flow conditions were observed at locations 1 (15-foot probe) and 6 (5-foot probe) and replacement probes were installed at depths of 10 and 3 feet, respectively. In addition, water was observed in location 8 (5-foot probe) and a replacement probe was installed at depth of 3 feet at that location. During initial purge testing, elevated concentrations of leak check compound (LCC) or tracer gas 1,1-difluoroethane were detected in location 12 at a depth of 5 feet. The source of LCC was later traced to faulty hardware at the surface. Following replacement of the faulty system parts, subsequent sample results were within acceptable limits. As shown in Table 3,

several VOC analytes were detected in soil gas samples. In general, VOC concentrations, where detected, are relatively low and consistent with background or ambient levels detected in soil gas throughout southern California.

Soil gas samples were collected from locations 2, 6 (and its duplicate), 8, 12, and 13 in DNPH cartridges and were submitted to Environmental Analytical Services, Inc. for analysis of formaldehyde using U.S. EPA Method TO-11A. As shown in Table 4, formaldehyde was not detected in any of these soil gas probe samples.

Laboratory reports and chain-of-custody records for the VOC and formaldehyde analyses are provided in Attachments E and F, respectively.

4.2.5 Sub-slab Sampling

To assess soil gas conditions beneath concrete slabs for select residential homes, sub-slab soil gas samples were collected from three properties in the Study Area. These include:

- 21689 Front Street address (samples 3B-SV located beneath the bedroom and 3G-SV located beneath the garage);
- 21645 Protea Court address (samples 10B-SV located beneath the bedroom and 10L-SV located beneath in living room); and
- 21730 Amaryllis Court address (samples 14B-SV located beneath the bedroom and 14G-SV located beneath the garage).

Soil gas samples were collected by H&P Mobile Geochemistry, Inc. from temporary-type, sub-slab probes drilled through the concrete slab and into sub-slab fill. Soil gas samples were collected in Summa canisters and analyzed for VOCs including methanol using U.S. EPA Method TO-15. As shown in Table 5, several VOC analytes (including methanol) were detected in sub-slab soil gas samples. In general, VOC concentrations, where detected, are relatively low. Elevated concentrations of LCC were also detected in samples 10B-SV and its duplicate 10B-SV-Rep. However, the elevated concentrations of LCC are most likely attributed to cracks in the concrete slab. Sub-slab soil gas samples 3B-SV, 10L-SV, and 14B-SV were collected in DNPH cartridges and analyzed for formaldehyde using U.S. EPA Method TO-11A. As shown in Table 4, formaldehyde was detected in each sub-slab soil gas sample at concentrations ranging from 6.53 to 8.10 micrograms per cubic meter ($\mu g/m^3$). A more detailed discussion of the results are in Section 6.1.4.

Laboratory reports and chain-of-custody records for the formaldehyde and VOC analyses are provided in Attachments F and G, respectively.

4.2.6 Equipment Cleaning and Investigative Derived Waste Management

During this investigation, all reusable downhole drilling and sampling equipment were cleaned before use by using Alconox-water solution, and rinsed twice using potable water. Soil cuttings and purged groundwater/equipment rinse water generated during this investigation were contained in Department of Transportation-approved 55-gallon drums. Each drum was labeled with the content, date of accumulation, and project contact information. Based on the sample results, the soil and waste water were characterized as non-hazardous and were subsequently transported by for disposal at offsite facilities.

5.0 INVESTIGATION RESULTS

As noted in Section 1.0, the overall purpose of this investigation was to assess the presence, distribution, and potential origin of VOC impact to the subsurface in the Study Area. To meet this purpose, the investigation included implementation of a Sampling and Analysis Plan (SAP) to obtain data to evaluate the potential nature and concentrations of VOCs present in subsurface soil, soil gas, and groundwater, and their relationship, if any, to vapor intrusion in the Study Area.

The results of the data collection and quality assurance/quality control (QA/QC) evaluation are summarized in the following subsections.

5.1 LABORATORY RESULTS

The soil, soil gas, groundwater, and QA/QC sample results are summarized in the following subsections. The field procedures were described in Section 4.0.

5.1.1 Soil Sample Results

A total of 10 soil samples, including 1 duplicate, were collected at 3 locations (6, 8, and 12) from approximate depths of 5, 10, and 15 feet. Soil samples were analyzed for SVOCs, PCBs, OCPs, and metals.

Soil samples analytical results are summarized in Table 1. PCBs and pesticide compounds were not detected in any of the soil samples. Bis (2-ethylhexyl) phthalate was the only SVOC detected and was reported at a concentration of 2.6 milligrams per kilogram (mg/kg) in the soil sample collected from a depth of 5 feet in sample location 12. Metal results are summarized in Table 1 and are considered within background levels for metals in soil. The laboratory analytical reports for soil samples are provided in Attachment D.

5.1.2 Grab Groundwater Sample Results

A total of 6 grab groundwater samples, including 1 duplicate and 1 split, were collected from 4 locations (1, 7, 11, and 13) from depth intervals between approximately 20 and 30 feet.

Groundwater samples were analyzed for VOCs using U.S. EPA Method 8260B. As shown in Table 2, VOCs and formaldehyde were not detected in any of the groundwater samples. Laboratory reports and chain-of-custody records for the groundwater sample analyses are provided in Attachment D.

5.1.3 Soil Gas Results

During this investigation, a total of 24 soil gas probes were installed at 12 locations (1, 2, 4-10, 11 through 13, and 15) at approximate depths of 5 and 15 feet except as noted in Section 4.2.4.

A total of 33 soil gas samples, including 6 purge volume test samples for the 5 and 15 foot depths and 3 replicate samples, were collected and analyzed for VOCs using U.S. EPA Method 8260B.

BTEX compounds were the primary VOCs detected in soil gas samples. VOC concentrations were generally approximately double in the 15 foot samples compared to the five foot samples although both concentrations are considered very low level. The following is a breakdown of the VOC concentration ranges detected in soil gas with depth during the investigation.

- Sampling depth intervals between approximately 3 and 5 feet:
    - Benzene was detected concentrations ranging from ND to 0.06 micrograms per liter (µg/L).
    - Chloroform was detected at concentrations ranging from ND to 0.04 µg/L.
    - m, p-Xylene was detected at concentrations ranging from ND to 0.27 µg/L.
    - 1,2,4-Trimethylbenzene at concentrations ranging from ND to 0.11 µg/L.
- Sampling depth intervals between approximately 10 and 15 feet:
    - Benzene was detected at concentrations ranging from ND to 0.10 µg/L.
    - Toluene was detected at concentrations ranging from ND to 0.29 µg/L.

- Ethylbenzene was detected at concentrations ranging from ND to 0.25 µg/L.
- m, p-Xylene was detected at concentrations ranging from ND to 1.5 µg/L.
- o-Xylene was detected at concentrations ranging from ND to 0.42 µg/L.
- 1,2,4-Trimethylbenzene at concentrations ranging from ND to 0.37 µg/L.
- 1,3,5- Trimethylbenzene at concentrations ranging from ND to 0.14 µg/L.
- Naphthalene at concentrations ranging from ND to 0.20 µg/L.
- p-Isopropyltoluene at concentrations ranging from ND to 0.22 µg/L.

Analytical results for VOCs detected in the soil gas samples are summarized in Table 2. A comparison between the primary and replicate VOC sample are presented in Table 6. The laboratory analytical reports for soil gas samples analyzed by the mobile laboratory are provided in Attachment E.

Additionally, soil gas samples were collected from locations 2, 6 (and its duplicate), 8, 12, and 13 in DNPH cartridges and were submitted to Environmental Analytical Services, Inc. for analysis of formaldehyde using U.S. EPA Method TO-11A. As shown in Table 4, formaldehyde was not detected in any of these soil gas probe samples.

5.1.4 Sub-Slab Sample Results

A total of 10 sub-slab soil gas samples were collected including 6 primary VOC and 1 replicate, and 3 for formaldehyde analysis. As shown in Table 5, several VOC analytes (including methanol) were detected in sub-slab soil gas samples. The following is a breakdown of the VOC concentration ranges detected in soil gas with depth during the investigation:

- Tetrachloroethylene was detected at concentrations ranging from ND to 0.02 µg/L.
- Chloroform was detected at concentrations ranging from ND to 0.01 µg/L.
- Benzene was detected at concentrations ranging from 0.01 to 0.11 µg/L.
- Toluene was detected at concentrations ranging from 0.01 to 0.16 µg/L.
- Ethylbenzene was detected at concentrations ranging from ND to 0.04 µg/L.
- m, p-Xylene was detected at concentrations ranging from 0.01 to 0.08 µg/L.
- o-Xylene was detected at concentrations ranging from 0.01 to 0.03 µg/L.

- o 1,2,4-Trimethylbenzene was detected at concentrations ranging from 0.01 to 0.02 µg/L.
- o Methyl tert-butyl ether was detected at concentrations ranging from ND to 0.01 µg/L.
- o Methylene Chloride was detected at concentrations ranging from ND to 0.01 µg/L.
- o Methanol was detected at concentrations ranging from ND to 0.54 µg/L.

In general, VOC concentrations, where detected, are relatively low. Elevated concentrations of LCC were also detected in samples 10B-SV and its duplicate 10B-SV-Rep. However, the elevated concentrations of LCC are most likely attributed to cracks in the concrete slab. Sub-slab soil gas samples 3B-SV, 10L-SV, and 14B-SV were collected in DNPH cartridges and analyzed for formaldehyde using U.S. EPA Method TO-11A. As shown in Table 4, formaldehyde was detected in each sub-slab soil gas sample at concentrations ranging from 6.53 to 8.10 micrograms per cubic meter ($\mu g/m^3$).

Laboratory reports and chain-of-custody records for the formaldehyde and VOC analyses are provided in Attachments F and G, respectively.

5.2 Quality Assurance/Quality Control

Throughout the investigation, AMEC followed quality assurance (QA) and quality control (QC) procedures described in the DTSC Work Plan to demonstrate the proper collection of environmental samples and laboratory measurements of chemical concentrations.

5.2.1 Field Quality Control Samples

During implementation of the work plan, the following types of field QC samples were collected:

- trip blanks
- field equipment blanks
- field duplicates

The field QC sampling results are discussed in the following subsections.

5.2.1.1 Trip Blanks

A total of two trip blanks were collected and analyzed for VOCs using U.S. EPA Method 8260B. No VOCs were detected in any of the trip blanks.

5.2.1.2 Field Equipment Blanks

One field equipment blank was collected from non-dedicated soil sampling equipment and were analyzed for metals using U.S. EPA Method 6010B/7470A, SVOCs using U.S. EPA Method 8270C, PCBs using U.S. EPA Method 8082, and pesticides using U.S. EPA Method 8081A. No analytes were detected in the field equipment blank samples.

5.2.1.3 Field Duplicate Samples

A total of 4 field duplicate samples were collected (1 soil sample, 1 groundwater samples, 2 soil gas samples, and 2 sub-slab soil gas samples) and analyzed using the same methods as the primary samples. Primary/duplicate sample pair results were assessed using the relative percent difference (RPD) between the primary sample and the duplicate sample measurements. As shown on Table 6, the precision goals for field duplicate were all within 30% for water samples and 50% for soil and soil gas samples.

5.2.2 Laboratory Quality Assurance/Quality Control Samples

The analytical data presented in this report were reviewed in general accordance with the U.S. EPA data review methods.

- All samples were analyzed within the appropriate holding times specified by each laboratory method;
- No analytes were detected in the laboratory method blanks at concentrations above laboratory reporting limits;
- Matrix spike/matrix spike duplicate (MS/MSD) samples were analyzed and the percent recovery (%R) for the MS and MSD samples and RPDs for the MS/MSD pairs for both analyses were within laboratory QC limits except for antimony in soil samples and formaldehyde in groundwater samples;
    - The MS/MSD %R was below QC limits for antimony due to suspected matrix interference. Antimony was not detected in any of the associated soil samples and thus, the results were qualified with UJ flags;
    - The MSD %R was above QC limits for formaldehyde. All other associated QA/QC sample analyses were within limits and data qualification was not necessary;
- Laboratory control samples (LCS) and duplicate (LCSD) were analyzed and the %R and RPD for the LCS and LCSD samples were within laboratory QC limits; and

- Surrogates recoveries were within the laboratory QC limits.

5.2.3 Summary of Data Quality Review

All samples proposed in the Workplan (DTSC, 2013) and as modified based on site/field conditions were collected and analyzed as planned. The specified numbers of QA/QC samples were also collected and analyzed as planned. Overall, the results of the QA/QC review indicate that the laboratory results are acceptable and meet the data quality objectives of the project. Other than antimony noted above, none of the assessment data for soil gas, soil, or groundwater required qualification because of the laboratory QA/QC results. The data obtained are considered sufficiently complete and acceptable for the purposes and intended use of this investigation.

6.0 SUMMARY OF FINDINGS

As discussed in Section 1.0, the purpose of this investigation was to determine whether hazardous substances, including VOCs, are present in the soil and groundwater and if detected, do these hazardous substances pose a risk to human health.

6.1 Evaluation of Investigation Results

The following subsections evaluate the data summarized in Section 5.1 and discuss the Investigation findings as they relate to potential human health risk from vapor intrusion or direct contact with soil.

6.1.1 Soil Sample Results

The metals results presented in Table 1 are considered background for southern California, and as such, none of the detected metals would be considered a chemical of potential concern (COPC). No PCBs or OCPs were detected in the soil matrix samples. As shown in Table 1, only one SVOC, bis(2-ethylhexyl)Phthalate was detected in one sample (location 12) at the 5-foot depth. Bis(2-ethylhexyl)Phthalate is a very common environmental contaminant resulting from its use as a plasticizer in all types of plastic products. This SVOC was detected at a concentration of 2.6 mg/kg, just above the reporting limit of 2.5 mg/kg. The EPA Regional Screening Levels (RSLs) in soil are 35 mg/kg for cancer effects and 1,200 mg/kg for non-cancer effects. Unrestricted, direct contact with soil through incidental ingestion, dermal contact and inhalation of particulate would result in a cancer risk and hazard of 7E-08 and 0.002, respectively. Consequently, exposure to bis(2-ethylhexyl)Phthalate would result in a negligible risk and hazard from unlimited exposure to soil, conservatively assuming that it was present at this concentration in soil throughout the Development.

6.1.2 Groundwater Sample Results

As shown in Table 2, no VOCs, including formaldehyde, were detected in shallow groundwater beneath the Autumnwood Development. Therefore, groundwater beneath the Development does not represent a source of VOCs and would not contribute to vapor intrusion.

6.1.3 Soil Gas Results

Soil gas sample results are summarized in Table 3. The majority of soil gas detections were fuel-related VOCs, specifically benzene, ethylbenzene, toluene, xylenes (otherwise known as BTEX), and 1,2,4-trimethylbenzene. Naphthalene was detected in only two samples at 15-feet (2-SV-15 and 12-SV-15). 1,3,5-trimethylbenzene was detected in only one sample at 15-feet (9-SV-15). Isopropyltoluene was detected in only two samples at 15-feet (7-SV-15 and 8-SV-15). The only chlorinated VOC detected was chloroform, which was detected in only two samples at 5-feet (2-SV-5 and 5-SV-5). Table 3 also presents the soil gas screening criteria, specifically, the soil gas California Human Health Screening Levels (CHHSLs) developed by the Office of Environmental Health Hazard Assessment (OEHHA)(Cal/EPA 2005, 2010). If CHHSLs were not available for a specific chemical, a soil gas screening concentration was derived using the Indoor Air Regional Screening Level (RSL) (EPA 2013) and applying the default residential soil gas attenuation factor of 0.002, as recommended in the Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance) (DTSC 2011). As shown in Table 3, benzene slightly exceeded its CHHSL at one location (4-SV-15) and naphthalene slightly exceeded its CHHSL at one location (2-SV-15).

The levels of BTEX and fuel-related VOCs detected in soil gas are routinely observed in any soil gas investigation and DTSC considers these levels to be background or ambient soil gas concentrations in southern California. Even though these levels are consistent with ambient levels, the potential for vapor intrusion for each VOC detected in soil gas was evaluated. As a conservative and very health protective assumption, the maximum soil gas concentration was selected and assumed to be the maximum reported soil gas concentrations uniformly distributed throughout the Autumnwood Development. Consistent with the Vapor Intrusion Guidance, we conducted a screening-level vapor intrusion risk evaluation using the DTSC-modified Johnson and Ettinger Vapor Intrusion Model. Consistent with the boring logs and previous geotechnical investigations, a sandy clay loam (SCL) soil type was selected and default model parameters for SCL used. The Johnson and Ettinger Screening Model Outputs are presented in Attachment H. The soil gas screening-level indoor air risks and hazards are summarized in Table 7. The maximum estimated indoor air cancer risk and hazard were 1E-06 and 0.04,

respectively. Based on the results of this very health protective screening evaluation of soil gas results, VOCs detected in soil gas do not pose an indoor air risk or hazard and soil gas does not pose a vapor intrusion threat for the Autumnwood Development.

In addition to the full suite of VOCs analyzed in soil gas samples, formaldehyde was also analyzed by EPA Method TO-11A. No formaldehyde was detected in soil gas.

6.1.4 Sub-Slab Soil Gas Results

The sub-slab analytical results for three homes are summarized in Table 4. As seen for the soil gas samples, low levels of BTEX and fuel-related VOCs were detected in the sub-slab soil gas samples. In addition, low levels of tetrachloroethene were also detected in the sub-slab samples. Consistent with the Vapor Intrusion Guidance, maximum potential indoor air concentrations were estimated from the sub-slab concentrations using a conservative, default attenuation factor of 0.05. Based on our experience, this health protective attenuation factor overestimates potential indoor air concentrations from the sub-slab. Table 8 compares the predicted maximum indoor air concentrations to their respective indoor air screening concentrations, which were either indoor air CHHSLs or RSLs. As can be seen, most of the VOCs were at or below their risk-based indoor air concentrations, with the exception of benzene. However, the predicted indoor air concentrations of benzene were within the range of median or average background indoor air concentrations for homes with no vapor intrusion, as determined by EPA (EPA 2011). Consequently, sub-slab soil gas concentrations of benzene are unlikely to contribute to indoor air quality, as compared to other indoor air sources and ambient air levels.

Table 5 presents the soil gas and sub-slab soil gas results for formaldehyde. As discussed previously, no formaldehyde was detected in the soil gas samples. Low levels of formaldehyde were detected in the sub-slab samples and ranged from 6.5 to 8.1 $\mu g/m^3$. These concentrations of formaldehyde likely come from indoor air, as a 30 Liter volume of air was sampled to achieve risk-based detections limits. As can be seen from Table 4, leak check compound was detected in the sub-slab samples collected using 400 ml Summa canisters, suggesting that the formaldehyde came from indoor air breakthrough. Previous indoor air sampling by the Swanson Law Firm at four homes on Amaryllis Court showed formaldehyde between 23 and 82 $\mu g/m^3$. Again, using the health protective, default attenuation factor of 0.05, if the formaldehyde was coming from the subsurface, the sub-slab soil gas concentrations would have to be between 460 and 1,640 $\mu g/m^3$. Likewise, using the default soil gas attenuation factor of 0.002, the soil gas concentration of formaldehyde would have to be between 11,500 and 41,000 $\mu g/m^3$ to account for the measured indoor air concentrations of formaldehyde; no formaldehyde

was ever detected in soil gas. Based on multiple lines of evidence, the formaldehyde detected in the residences is the result of an indoor air source(s).

6.1.5 Conclusions

Based on multiple lines of evidence, the following conclusions were reached regarding the potential for vapor intrusion or a release of hazardous substances at the Autumnwood Development.

1. Because all metals detected in soil were within background and no PCBs, OCPs or SVOCs of concern were detected in soil, there is no evidence of a release of hazardous substances;

2. VOCs detected in soil gas are consistent with background or ambient levels of VOCs in soil gas throughout southern California;

3. Shallow groundwater is not a source of VOCs;

4. VOCs detected in soil gas do not pose a significant indoor air risk or hazard;

5. Per DTSC's VI Guidance, vapor intrusion is not occurring at the Autumnwood Development;

6. VOCs detected in indoor air are not originating from the subsurface. While elevated levels of VOCs were previously detected in indoor air quality samples at certain homes, these VOCs are not a result of contaminated soil, soil gas or groundwater beneath the homes in the Autumnwood Development.

7.0 REFERENCES

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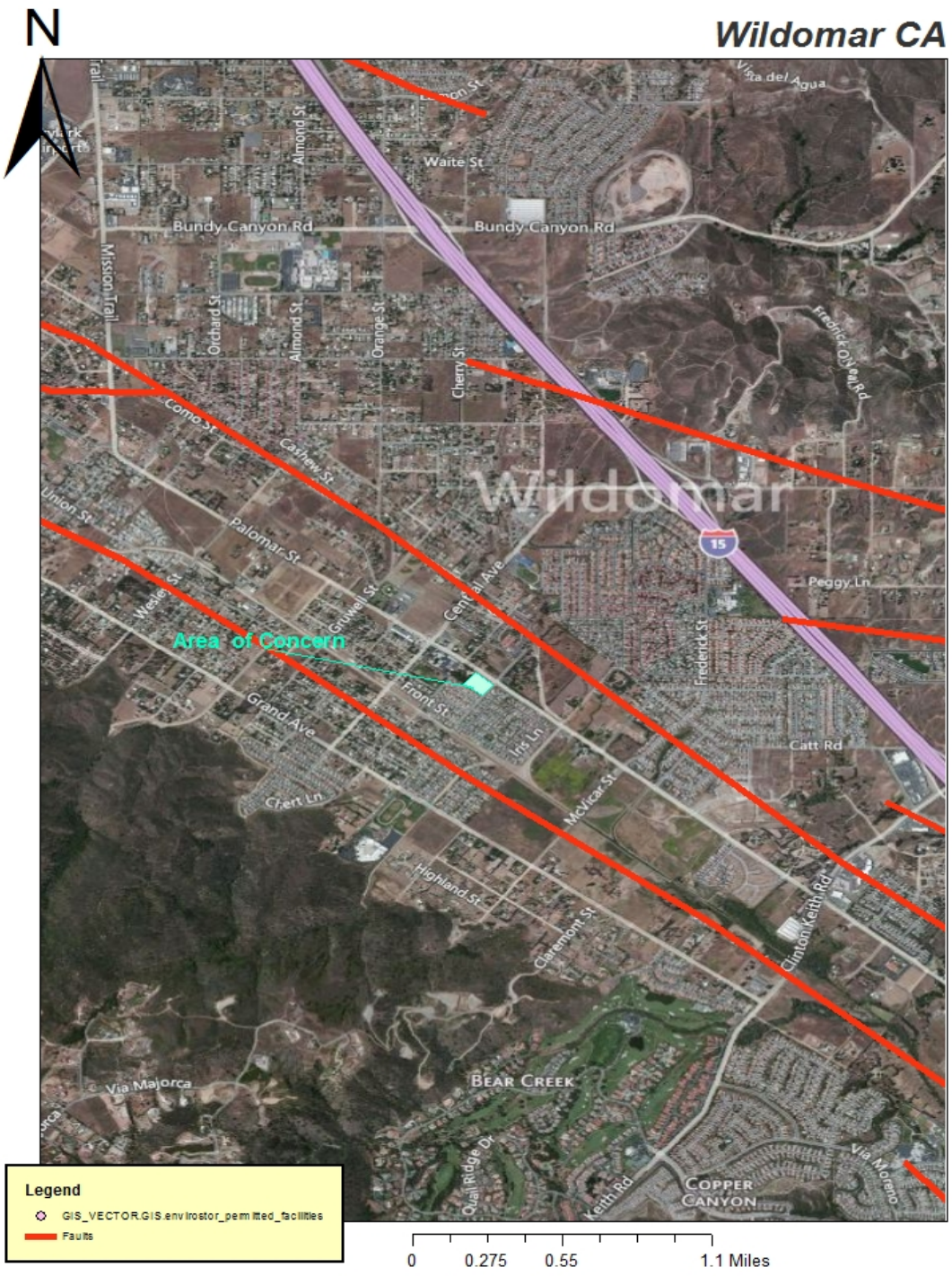
FIGURES


N
Wildomar CA
Area of Concern
Wildomar
Bundy Canyon Rd
Bundy Canyon Rd
Waite St
Mission Trail
Orchard St
Almond St
Orange St
Cherry St
Como St
Cashew St
Palomar St
Union St
Grand Ave
Front St
Inf Ln
Clint Ln
McVicar St
Highland St
Claremont St
Catt Rd
Peggy Ln
Frederick St
Central Ave
Grunwell St
Wesley St
Vista del Agua
Fredrick O'Neal Rd
Clinton Keith Rd
Via Majorca
Bear Creek
Quail Ridge Dr
Keith Rd
Copper Canyon
Via Moreno
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Legend
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Faults
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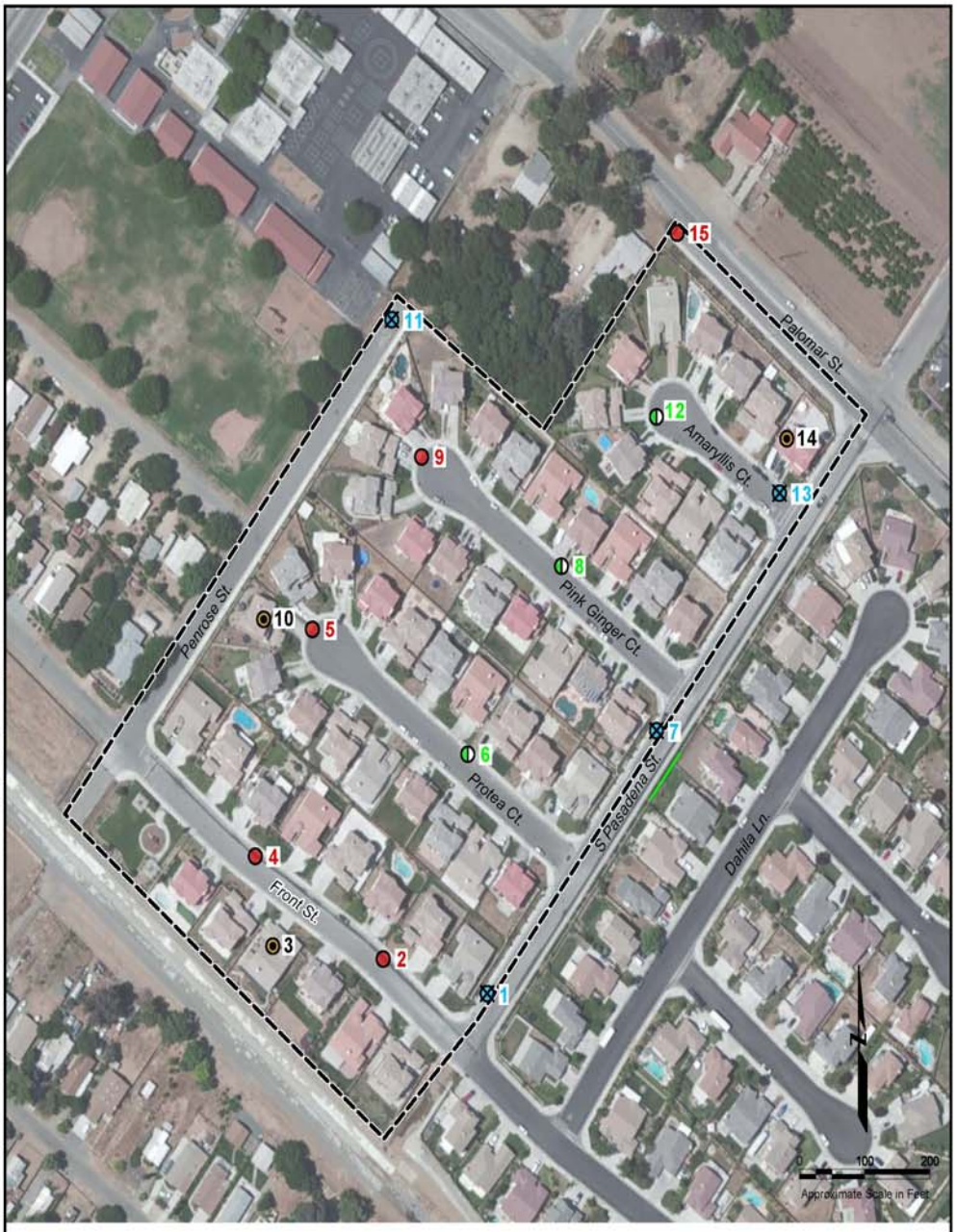
0.275
0.55
1.1 Miles



Explanation:

- Soil Gas sample location
- Sub-slab sample location
- Soil/Soil Gas sample location
- Soil/Soil Gas/Groundwater sample location
- Limits of project area

All locations are approximate

Basemap modified from ESRI World Imagery 2013

SAMPLE LOCATIONS
Autumnwood Development
Wildomar, California

By: jbd	Date: 11/25/2013	Project No. NB1016075P
amec		Figure 2

Plot Date: 11/27/2013 11:42:59 AM, Plotted by: pat.herring
Drawing Path: Y:\NB\1016075\PVA\CAD_TB-003_SAMPLING LOCATIONS.DWG, Figure 2_Proposed Sample Locations

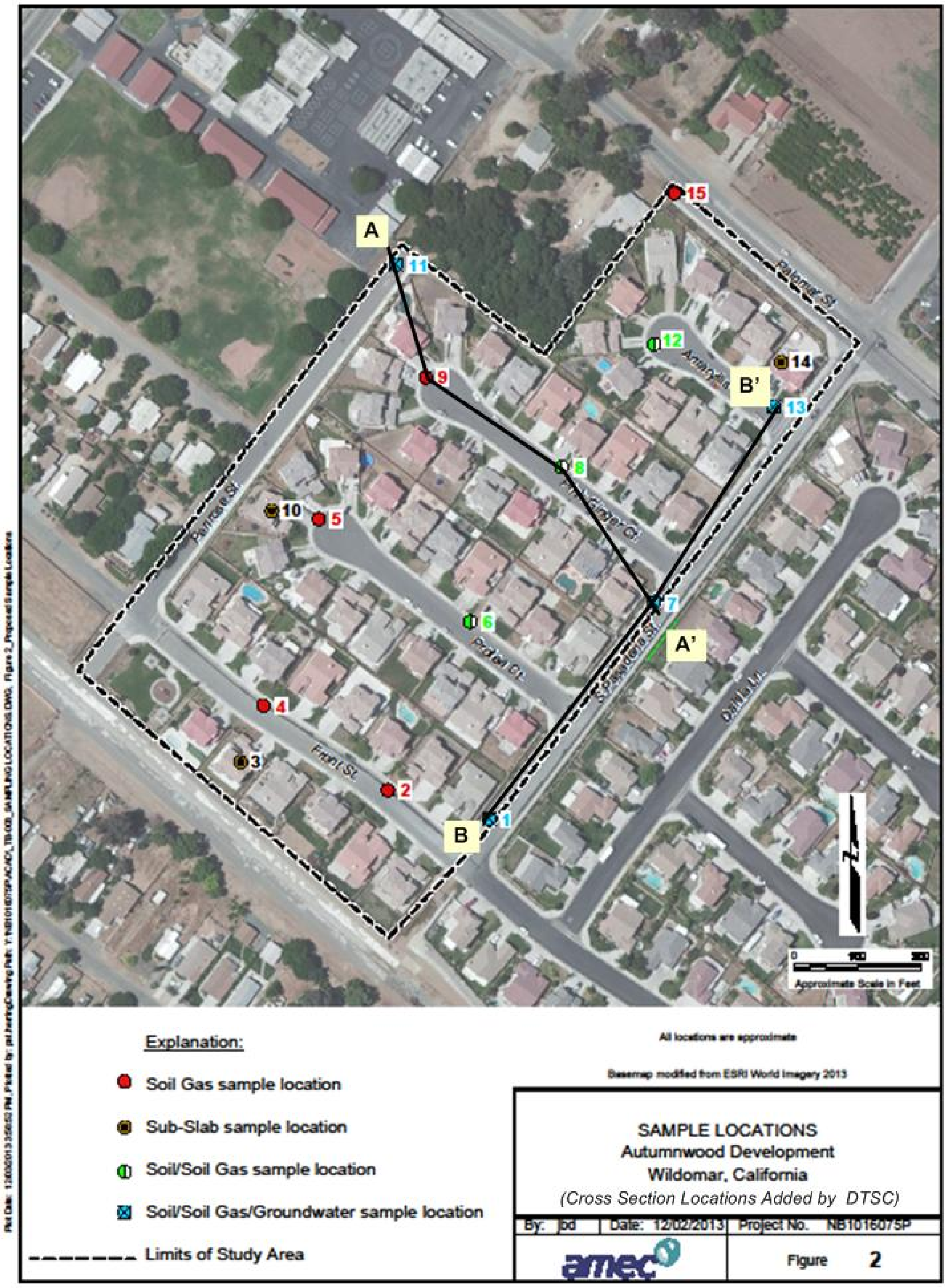

A
B
A'
B'
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Front St.
Palomar St
Explanation:
Soil Gas sample location
Sub-Slab sample location
Soil/Soil Gas sample location
Soil/Soil Gas/Groundwater sample location
Limits of Study Area
All locations are approximate
Basemap modified from ESRI World Imagery 2013
Approximate Scale in Feet
SAMPLE LOCATIONS
Autumnwood Development
Wildomar, California
(Cross Section Locations Added by DTSC)
By: jbd
Date: 12/02/2013
Project No. NB1016075P
Figure 2

Figure 3

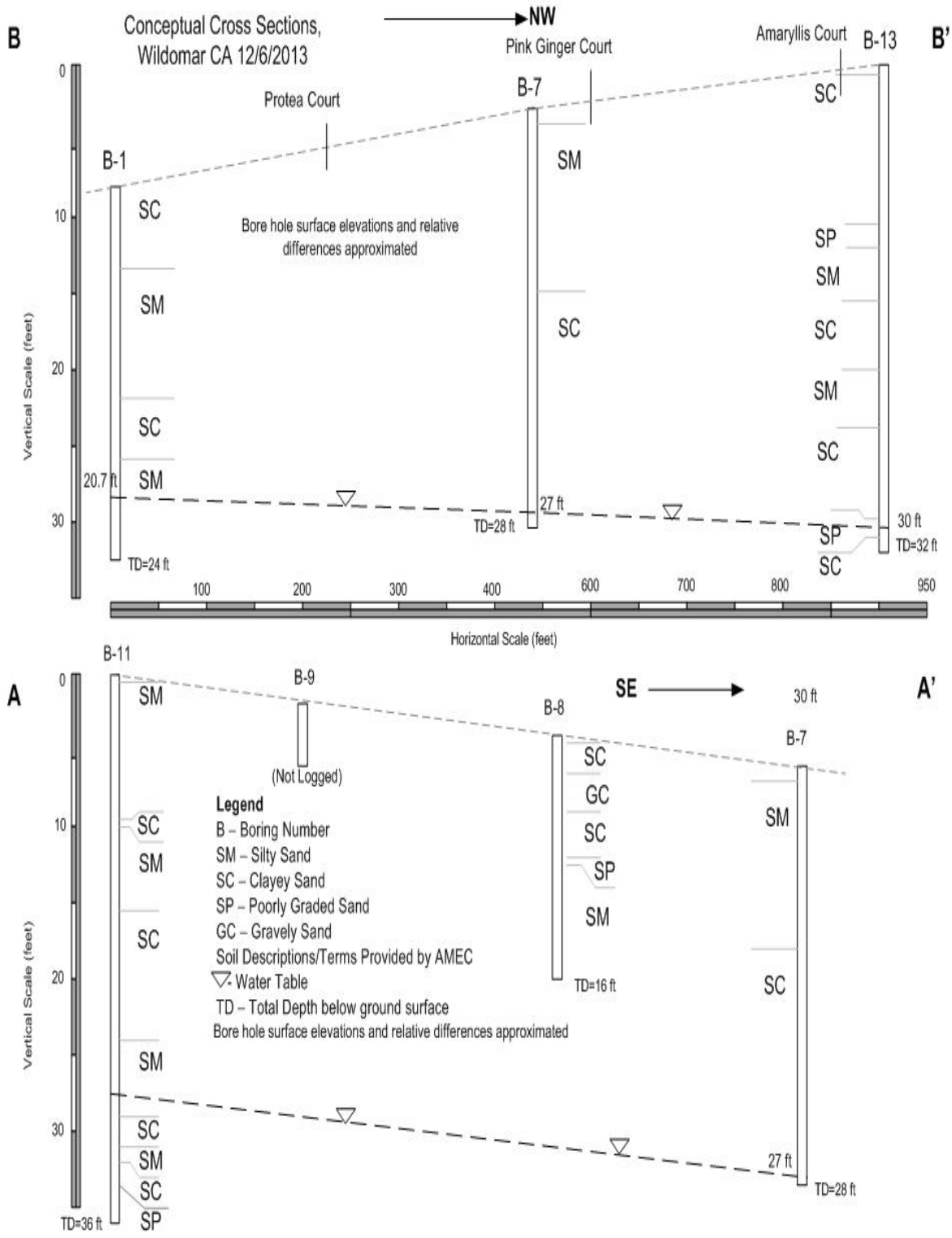

Conceptual Cross Sections,
Wildomar CA 12/6/2013
B
B'
NW
Protea Court
Pink Ginger Court
Amaryllis Court
B-1
B-7
B-13
Bore hole surface elevations and relative differences approximated
Vertical Scale (feet)
Horizontal Scale (feet)
20.7 ft
27 ft
30 ft
TD=24 ft
TD=28 ft
TD=32 ft
A
A'
SE
B-11
B-9
B-8
B-7
(Not Logged)
Legend
B – Boring Number
SM – Silty Sand
SC – Clayey Sand
SP – Poorly Graded Sand
GC – Gravely Sand
Soil Descriptions/Terms Provided by AMEC
Water Table
TD – Total Depth below ground surface
Bore hole surface elevations and relative differences approximated
TD=16 ft
TD=36 ft
TD=28 ft

Figure 4

TABLES

TABLE 1

SOIL SAMPLE ANALYTICAL RESULTS

Autumnwood Development

Wildomar, California

Concentrations reported in milligrams per kilogram (mg/kg)

Sample Location	Sample Depth (feet bgs)	Sample Identification	Sample Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Mercury	Semi-volatile organic compounds	Polychlorinated Biphenyls	Pesticides
6-SS	5-6	6-SS-5-6	11/8/2013	ND	**1.67**	**75.4**	ND	ND	**11.5**	**11.2**	**12.7**	**1.05**	ND	**5.70**	ND	ND	ND	**58.0**	**42.1**	ND	ND	ND	ND
	9-11	6-SS-9-11	11/8/2013	ND	**0.815**	**93.0**	**0.308**	ND	**13.5**	**13.7**	**13.9**	**1.51**	ND	**6.39**	ND	ND	ND	**64.3**	**43.6**	ND	ND	ND	ND
	9-11 DUP	60-SS-9-11	11/8/2013	ND	**0.822**	**101**	**0.326**	ND	**13.7**	**14.3**	**15.1**	**1.46**	ND	**6.95**	ND	ND	ND	**66.4**	**46.6**	ND	ND	ND	ND
	13.75-14.75	6-SS-13.75-14.75	11/8/2013	ND	ND	**34.4**	ND	ND	**5.43**	**4.61**	**2.62**	ND	ND	**1.51**	ND	ND	ND	**40.6**	**13.1**	ND	ND	ND	ND
8-SS	5-6	8-SS-5-6	11/8/2013	ND	**1.28**	**66.8**	ND	ND	**9.77**	**9.93**	**10.2**	**1.22**	ND	**5.12**	ND	ND	ND	**48.6**	**36.4**	ND	ND	ND	ND
	9.5-10.5	8-SS-9.5-10.5	11/8/2013	ND	ND	**68.8**	ND	ND	**9.17**	**9.79**	**9.81**	**0.566**	ND	**4.99**	ND	ND	ND	**45.9**	**37.0**	ND	ND	ND	ND
	14.25-15.25	8-SS-14.25-15.25	11/8/2013	ND	ND	**94.7**	**0.297**	ND	**12.6**	**12.9**	**13.4**	**1.41**	ND	**6.61**	ND	ND	ND	**63.0**	**44.1**	ND	ND	ND	ND
12-SS	5-6	12-SS-5-6	11/8/2013	ND	ND	**108**	**0.256**	ND	**9.69**	**6.23**	**4.95**	**0.839**	ND	**4.33**	ND	ND	ND	**29.4**	**34.7**	ND	Bis(2-Ethylhexyl) phthalate= **2.6**	ND	ND
	9.5-10.5	12-SS-9.5-10.5	11/8/2013	ND	**0.855**	**60.5**	ND	ND	**9.36**	**8.91**	**8.76**	ND	ND	**4.51**	ND	ND	ND	**51.1**	**32.4**	ND	ND	ND	ND
	13.25-15.25	12-SS-13.25-15.25	11/8/2013	ND	ND	**102**	**0.316**	ND	**12.0**	**13.4**	**13.4**	**1.48**	ND	**6.98**	ND	ND	ND	**62.0**	**48.0**	ND	ND	ND	ND

Notes:

1. Title 22 Metals were analyzed using EPA Method 6010B/7470A. Polychlorinated biphenyls, semi-volatile organic compounds, and pesticides were analyzed using EPA Method 8082, EPA Method 8270C, and EPA Method 8081A, respectively.
2. bgs = below ground surface.
3. ND = Not detected at or above laboratory reporting limit.
4. DUP = duplicate sample.
5. Detections at or above the laboratory reporting limit are shown in **bold**.

TABLE 2

GROUNDWATER SAMPLE ANALYTICAL RESULTS

Autumnwood Development
Wildomar, California

Concentrations reported in micrograms per liter (µg/L)

Sample Location	Sample Depth (feet bgs)	Sample Identification	Sample Date	Volatile Organic Compounds (VOCs)	Formaldehyde
1-GW	19-24	1-GW-19-24	11/7/2013	ND	ND
7-GW	23-28	7-GW-23-28	11/8/2013	ND	ND
11-GW	31-36	11-GW-31-36	11/7/2013	ND	ND
11-GW (DUP)	31-36	110-GW-31-36	11/7/2013	ND	--
13-GW	27-32	13-GW-27-32	11/7/2013	ND	ND
13-GW (DUP)	27-32	130-GW-27-32	11/7/2013	--	ND

Notes:

1. VOCs and formaldehyde were analyzed using EPA Method 8260B and EPA Method 8315A, respectively.
2. ND = Not detected at or above laboratory reporting limit.
3. DUP = duplicate sample.
4. bgs = below ground surface.
5. -- = Not analyzed.

TABLE 3

SOIL GAS SAMPLE ANALYTICAL RESULTS

Autumnwood Development
Wildomar, California

Concentrations reported in micrograms per liter (µg/L)

Sample Location	Sample Depth (feet bgs)	Sample Identification	Sample Date	Tetrachloroethene	Chloroform[1]	Benzene	Toluene	Ethylbenzene	m, p-Xylene	O-Xylene	1,2,4-Trimethylbenzene[2]	1,3,5- Trimethylbenzene[3]	Naphthalene	p-Isopropyltoluene[4]	Methanol	Tracer 1,1 Difluoroethane (LCC)
		CHHSL	**(µg/L)**	**0.47**	**0.42**	**0.09**	**320**	**1.1**	**800**	**740**	**3.65**	**3.65**	**0.09**	**210**		
1-SV	5	1-SV-5	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
	5-Rep	1-SV-5-Rep	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
	10	1-SV-10	11/15/13	ND	ND	**0.03**	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
2-SV-1PV	5	2-SV-5	11/14/13	ND	ND	ND	ND	ND	**0.19**	ND	ND	ND	ND	ND	--	ND
2-SV-3PV				ND	ND	**0.02**	ND	ND	**0.21**	ND	ND	ND	ND	ND	--	ND
2-SV-10PV				ND	**0.04**	**0.02**	ND	ND	**0.27**	ND	ND	ND	ND	ND	--	ND
2SV	15	2-SV-15	11/14/13	ND	ND	**0.08**	**0.25**	ND	**0.26**	ND	**0.10**	ND	**0.20**	ND	--	ND
4-SV	15	4-SV-15	11/15/13	ND	ND	**0.10**	**0.29**	ND	**0.30**	ND	ND	ND	ND	ND	--	ND
	5	4-SV-5	11/15/13	ND	ND	**0.02**	ND	ND	ND	ND	ND	ND	ND	ND	--	**1.1**
5-SV	15	5-SV-15	11/14/13	ND	ND	**0.03**	ND	ND	**0.27**	ND	**0.17**	ND	ND	ND	--	**0.27**
	5	5-SV-5	11/14/13	ND	**0.04**	ND	ND	ND	**0.14**	ND	ND	ND	ND	ND	--	ND
6-SV	15	6-SV-15	11/14/13	ND	ND	**0.02**	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
	15-Rep	6-SV-15-Rep	11/14/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
	3	6-SV-3	11/15/13	ND	ND	**0.02**	ND	ND	**0.18**	ND	ND	ND	ND	ND	--	ND
7-SV	5	7-SV-5	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
	15	7-SV-15	11/15/13	ND	ND	**0.08**	**0.23**	**0.25**	**1.5**	**0.42**	**0.13**	ND	ND	**0.15**	--	ND
8-SV	3	8-SV-3	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
	15	8-SV-15	11/15/13	ND	ND	**0.08**	ND	**0.13**	**0.71**	**0.20**	**0.14**	ND	ND	**0.22**	--	ND
9-SV	15	9-SV-15	11/15/13	ND	ND	**0.03**	ND	ND	**0.24**	ND	**0.37**	**0.14**	ND	ND	--	ND
	5	9-SV-5	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
11-SV	15	11-SV-15	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
	5	11-SV-5	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
12-SV-1PV	15	12-SV-15	11/13/13	ND	ND	**0.06**	**0.26**	ND	**0.33**	**0.12**	ND	ND	**0.02**	ND	--	**0.70**
12-SV-3PV				ND	ND	**0.02**	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
12-SV-10PV				ND	ND	**0.02**	ND	ND	**0.13**	ND	ND	ND	ND	ND	--	ND
12-SV	5	12-SV-5	11/14/13	ND	ND	**0.02**	ND	ND	**0.11**	ND	**0.11**	ND	ND	ND	--	**0.89**
13-SV	15	13-SV-15	11/14/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
	5	13-SV-5	11/14/13	ND	**0.02**	**0.06**	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
15-SV	15	15-SV-15	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
	5	15-SV-5	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND

[1] For Chloroform, the soil gas CHHSL of 420 µg/L was provided by Dr. David Siegel of OEHHA.

[2] For 1,2,4-trimethylbenzene, the soil gas screening level was calculated using the EPA indoor air RSL (7.3 µg/m^3) and a default soil gas attenuation factor of 0.002, per the DTSC Vapor Intrusion Guidance (DTSC 2011).

[3] For 1,3,5-trimethylbenzene, the soil gas screening level for 1,2,4-trimethylbenzene was used as a surrogate.

[4] For isopropyltoluene, the soil gas screening level was calculated using the indoor air RSL for cumene (420 µg/m^3) as a surrogate and a default soil gas attenuation factor of 0.002, per the DTSC Vapor Intrusion Guidance (2011).

Notes:

1. Soil gas samples analyzed by mobile laboratory for volatile organic compounds using EPA Method 8260SV (see laboratory sheets for
2. Detections at or above the laboratory reporting limit are shown in **bold**.
3. Purge volume tests were conducted at 2-SV-5 and 12-SV-15. A numeric and "PV" following the probe ID indicate the purge volume applied prior to collecting the soil gas sample. Shallow (3 and 5-foot depth) soil gas samples were collected after 3 purge volume and deeper (10-
4. bgs = below ground surface.
5. -- = Not analyzed.
6. Rep = duplicate sample.

TABLE 4

SUB-SLAB SAMPLE ANALYTICAL RESULTS

Autumnwood Development
Wildomar, California

Concentrations reported in micrograms per cubic meter (µg/m3)

Sample Location	Sample Identification	Sample Date	Tetrachloroethene	Chloroform	Benzene	Toluene	Ethylbenzene	m, p-Xylene	O-Xylene	1,2,4-Trimethylbenzene	1,3,5- Trimethylbenzene	Naphthalene	p-Isopropyltoluene	Methyl tert-butyl ether	Methylene Chloride	Methanol	Tracer 1,1 Difluoroethane (LCC)
3B (bedroom)	3B-SV	11/14/2013	ND	ND	**24**	**60**	**19**	**48**	**20**	**15**	ND	ND	ND	ND	ND	**540**	**7.5**
3G (garage)	3G-SV	11/14/2013	**15**	**11**	**55**	**140**	**26**	**66**	**22**	**14**	ND	ND	ND	ND	**6.2**	**95**	**8.2**
10L (living room)	10L-SV	11/14/2013	**16**	ND	**23**	**76**	**21**	**34**	**10**	**12**	ND	ND	ND	ND	ND	ND	**19**
10B (bedroom)	10B-SV	11/14/2013	ND	ND	**7.6**	**16**	ND	**16**	**5.2**	**14**	ND	ND	ND	ND	**3.7**	**230**	**1000**
10B duplicate	10B-SV Rep	11/14/2013	ND	ND	**5.8**	**11**	ND	**12**	**5.4**	**13**	ND	ND	ND	ND	ND	**190**	**120**
14G (garage)	14G-SV	11/14/2013	ND	ND	**26**	**59**	**11**	**30**	**12**	**17**	ND	ND	ND	ND	ND	**100**	**20**
14B (bedroom)	14B-SV	11/14/2013	**12**	ND	**110**	**160**	**35**	**79**	**29**	**15**	ND	ND	ND	**8.7**	ND	**41**	**12**

Notes:

1. Sub-slab samples analyzed for volatile organic compounds using EPA Method TO-15 (see laboratory sheets for complete list of compounds).
2. Detections at or above the laboratory reporting limit are shown in **bold**.
3. ND = Not detected at or above laboratory reporting limit.
4. Rep = duplicate sample.

TABLE 5

FORMALDEHYDE SOIL GAS SAMPLE RESULTS

Autumnwood Development
Wildomar, California

Concentrations reported in micrograms per cubic meter (µg/m3)

Sample Location	Sample Depth (feet bgs)	Sample Identification	Sample Date	Formaldehyde
2-SV	5	2-SV-5	11/14/13	ND
6-SV	15	6-SV-15	11/14/13	ND
6-SV Dup	15	60-SV-15	11/14/13	ND
8-SV	3	8-SV-3	11/14/13	ND
12-SV	15	12-SV-15	11/14/13	ND
13-SV	15	13-SV-15	11/14/13	ND
3B-SV	sub-slab	3B-SV	11/14/13	**6.53**
10L-SV	sub-slab	10L-SV	11/14/13	**6.64**
14B-SV	sub-slab	14B-SV	11/14/13	**8.10**
Blank	--	Blank	11/14/13	ND

Notes:

1. Formaldehyde was analyzed using EPA Method TO-11A.
2. ND = Not detected at or above laboratory reporting limit.
3. Dup = duplicate sample.
4. Detections at or above the laboratory reporting limit are shown in **bold**.
5. bgs = below ground surface.
6. -- = not applicable.

TABLE 6

QUALITY CONTROL SAMPLE RESULTS

Autumnwood Development

Wildomar, California

Soil Samples				
Soil Sample ID		**6-SS-9-11**	**60-SS-9-11**	**RPD**
Analyte	**Reporting Limits (mg/kg)**	**(primary)**	**(duplicate)**	
Title 22 Metals				
Antimony	0.750	<0.750	<0.750	--
Arsenic	0.750	**0.815**	**0.822**	**1**
Barium	0.500	**93.0**	**101**	**8**
Beryllium	0.250	**0.308**	**0.326**	**6**
Cadmium	0.500	<0.500	<0.500	--
Chromium	0.250	**13.5**	**13.7**	**1**
Cobalt	0.250	**13.7**	**14.3**	**4**
Copper	0.500	**13.9**	**15.1**	**8**
Lead	0.500	**1.51**	**1.46**	**3**
Molybdenum	0.250	<0.250	<0.250	--
Nickel	0.250	**6.39**	**6.95**	**8**
Selenium	0.750	<0.750	<0.750	--
Silver	0.250	<0.250	<0.250	--
Thallium	0.750	<0.750	<0.750	--
Vanadium	0.250	**64.3**	**66.4**	**3**
Zinc	1.000	**43.6**	**46.6**	**7**
Mercury	0.0835	<0.0835	<0.0835	--
Pesticides	RL	ND	ND	--
Polychlorinated biphenyls (PCBs)	50	<50	<50	--
Semi-volatile organic compounds (SVOCs)	RL	ND	ND	--

Groundwater Samples				
Groundwater Sample ID		**11-GW-31-36**	**110-GW-31-36**	**RPD**
Analyte	**Reporting Limits (µg/L)**	**(primary)**	**(duplicate)**	
Volatile Organic compounds (VOCs)	RL	ND	ND	--
Groundwater Sample ID		**13-GW-27-32**	**130-GW-27-32**	**RPD**
Analyte	**Reporting Limits (µg/L)**	**(primary)**	**(duplicate)**	
Formaldehyde	30	<30	<30	--

Soil Gas Samples							
Soil Gas Sample ID		**1-SV-5**	**1-SV-5-Rep**	**RPD**	**6-SV-15**	**6-SV-15-Rep**	**RPD**
Analyte	**Reporting Limits**	**(primary)**	**(duplicate)**		**(primary)**	**(duplicate)**	
Volatile Organic Compounds (VOCs)	RL	ND	ND	--	ND	ND	--

Sub-Slab Soil Gas Sample				
Sample ID		**10B-SV**	**10B-SV Rep**	**RPD**
Analyte	**Reporting Limits (ug/m3)**	**(primary)**	**(duplicate)**	
Methanol	27	**230**	**190**	**19**
Methylene chloride (Dichloromethane)	3.5	**3.7**	<3.5	**--**
Benzene	3.2	**7.6**	**5.8**	**27**
Toluene	3.8	**16**	**11**	**37**
m,p-Xylene	8.8	**16**	**12**	**29**
o-Xylene	4.4	**5.2**	**5.4**	**4**
1,2,4-Trimethylbenzene	5.0	**14**	**13**	**7**
Formaldehyde in Soil Vapor				
Sample ID		**6-SV-15**	**60-SV-15**	**RPD**
Analyte	**Reporting Limits (ug/m3)**	**(primary)**	**(duplicate)**	
Formaldehyde	3.75	<3.75	<3.76	--

Notes:

1. RPDs = Relative Percent Different calculated using: $$RPD = 2 \times \left[\frac{primary - duplicate}{primary + duplicate} \right] \times 100$$

2. RPD was not calculated when either primary or duplicate sample, or both samples were not detected above the reporting limits, or detected concentrations less than five times the reporting limit.

3. Detections at or above the laboratory reporting limit are shown in **bold**.

4. RL= reporting limit

5. ND = Not detected at or above laboratory reporting limit.

Table 7

Summary of Soil Gas Risks and Hazards

Autumnwood Development
Wildomar, California

Volatile Organic Compound	Maximum Soil Gas Concentration ($\mu g/m^3$)	Soil Gas Depth (feet)	Maximum Indoor Air Risk	Maximum Indoor Air Hazard
Benzene	100	15	3.5E-07	9.4E-04
Chloroform	40	5	7.3E-08	1.1E-04
Ethylbenzene	250	15	6.6E-08	6.1E-05
p-Isopropyltoluene	220	15	NC	1.2E-04
Naphthalene	200	15	5.7E-07	1.3E-02
Toluene	290	15	NC	2.7E-04
1,2,4-Trimethylbenzene	370	15	NC	1.1E-02
1,3,5-Trimethylbenzene	140	15	NC	4.7E-03
m,p-Xylene	1,500	15	NC	3.8E-03
o-Xylene	420	15	NC	1.2E-03
		Total	**1.E-06**	**0.04**

Table 8

COMPARISON of PREDICTED INDOOR AIR LEVELS to BACKGROUND INDOOR AIR LEVELS

Autumnwood Development
Wildomar, California

Volatile Organic Compound	Range of Sub-Slab Concentrations ($\mu g/m^3$)	Range of Predicted Maximum Indoor Air Concentrations [1] ($\mu g/m^3$)	Indoor Air Screening Concentration ($\mu g/m^3$)	Range of Median Background Indoor Air[2] ($\mu g/m^3$)	Range of 95th Percentile Background Indoor Air[2] ($\mu g/m^3$)
Benzene	5.8 - 110	0.3 - 5	0.09	<0.8 - 4.7	9.9 - 29
Chloroform	11	0.5	0.46	<1.2 - 2.4	4.1 - 7.5
Ethylbenzene	11 - 35	0.5 - 1.7	0.97	1 - 3.7	12 - 17
Methanol	41 - 540	2 - 27	4000	NA	NA
Methylene chloride	3.7 - 6.2	0.2 - 0.3	96	0.68 - 61	2.9 - 45
Methy tert-butyl ether	8.7	0.4	9.4	0.03 - 3.5	71 - 72
Tetrachloroethene	12 - 16	0.6 - 0.8	0.41	<1.7 - 2.2	4.1 - 9.5
Toluene	11 - 160	0.5 - 8	313	4.8 - 24	79 - 144
1,2,4-Trimethylbenzene	12 - 17	0.6 - 0.8	7.3	NA	NA
m,p-Xylene	12 - 79	0.6 - 4	730	1.5 - 14	21 - 63.5
o-Xylene	5.2 - 29	0.3 - 1.4	730	1.1 - 3.6	13 - 20

[1] Maximum predicted indoor air concentration derived from the sub-slab concentrations using a default attenuation factor of 0.05, per the DTSC Vapor Intrusion Guidance (DTSC 2011).

[2] Background indoor air concentrations measured in homes having no vapor intrusion (EPA 2011)

NA Not available.

ATTACHMENTS

Attachment A City Encroachment Permit

City of Wildomar
23873 Clinton Keith Road, Suite 201
Wildomar, CA 92595
Phone: 951-677-7751
Fax: 951-698-1463

For more information, please contact Public Works at (951) 677-7751

ENCROACHMENT PERMIT

EP13-8067
PERMIT NUMBER

USA Ticket No. A32900114
Phone No. (800) 227-2600

PERMIT INFORMATION
(TO BE COMPLETED BY PERMITTEE • PLEASE PRINT)

Thomas Bros. Map No. 897
Coordinate No. C7

Permit Type: ☐ ANNUAL ☐ MINOR ☒ UTILITY PERMIT

Autumnwood Dev / Palomar, Amaryllis, Pasadena, Protea Ct, & Front — LOCATION OF WORK PROJECT
See Attached — ASSESSOR'S PARCEL NUMBER

AMEC Environment & Infrastructure — PERMITTEE / BILLING INFORMATION
Joe Bandy — CONTACT NAME

121 Innovation Dr. #200 — ADDRESS
Irvine — CITY
CA — STATE
92617 — ZIP
949 642 0245 — TELEPHONE NUMBER

Project Cost Estimate: $ 28,000
Permittee Work Order

CONTRACTOR INFORMATION

AMEC Environment & Infrastructure — CONTRACTOR PERFORMING WORK
Joe Bandy — CONTACT NAME

121 Innovation Dr. #200 — ADDRESS
Irvine — CITY
CA — STATE
92617 — ZIP
949 642 0245 — TELEPHONE NUMBER

697810 — CONTRACTOR'S LICENSE NUMBER
A Haz — CLASS
BUSINESS LICENSE NUMBER

1. *I have read, understand and agree to comply with the permit conditions which are part of this permit. I further agree to comply with the current County of Riverside Road Improvement Standards and Specifications, County Ordinances, and conditional requirements.*
2. *Applicant must check with all utility companies serving the area covered by this permit, for location of existing underground pipes, conduits or cables.*
3. *Indemnify, defend and save the City of Wildomar, its authorized agents, officers, representatives and employees, harmless from and against any and all penalties, liabilities or loss resulting from claims or court action and arising out of any accident, loss or damage to persons or property happening or occurring as a proximate result of any work undertaken under the permit granted pursuant to this application.*
4. *Remove or relocate an encroachment installed or maintained under this permit, upon written notice from the City Engineer.*
5. *Notify the City Engineer in writing at least 48 hours in advance of the time when work will be started, and upon completion of the work, immediately notify the City Engineer in writing of such completion.*
6. *Comply with the General Provisions attached hereto, City Ordinance Chapter 12.08, any amendments thereto, the terms and conditions of the permit, and all applicable rules and regulation of the City of Wildomar and other public agencies having jurisdiction.*
7. *The permittee shall accept full responsibility for complying with Federal, State and County environmental laws receiving any necessary environmental clearances and/or permits, prior to commencing any work as authorized by this permit.*
8. *Costs incurred by the City of Wildomar Public Works Department for processing and inspection shall be billed to Permittee, City Ordinance Chapter 12.08.*

Joseph M Bandy — PERMITTEE SIGNATURE
10/17/13 — DATE

DESCRIPTION OF CONSTRUCTION: Soil, soil gas & groundwater sampling through 4-inch boring cores.

NOTE: Permittee must call Engineering @ (951) 677-7751 for Pre-Construction Meeting and Final!!!

APPROVAL

DEPARTMENT REVIEW	APPROVED	DATE
TRANSPORTATION		
INSPECTION		

*Call Leo 951.990.3600 for pre-con and permit activation.

FEES	
PERMIT FEE	$ 1290.00
PERMIT DEPOSIT	$ 2100.00
TRENCH FEE	$
TOTAL AMOUNT PAID	$ 3390.00
DEPOSIT TYPE	

PERMIT APPROVED BY: J. Chyr — ISSUED: 10/31/13

RECEIVED
OCT 17 2013
CITY OF WILDOMAR

INSPECTION

COMMENTS: Active 11-5-13 HAA
Site 7:00 to 3:30 8:00 AM to 4:00 PM Drillers & Chemists

INSPECTOR'S APPROVAL (SIGNATURE) — DATE

WHITE - PERMITTEE YELLOW - INSPECTOR PINK - FILE GOLDENROD - FINANCE

Attachment B Community Work Notice

Department of Toxic Substances Control October 2013

Work Notice

The mission of DTSC is to protect California's people and environment from harmful effects of toxic substances through the restoration of contaminated resources, enforcement, regulation and pollution prevention.

Sampling Activities Scheduled at Autumnwood Development - Wildomar, CA

The Department of Toxic Substances Control (DTSC) will oversee site assessment field work to evaluate the presence of contaminants in the subsurface at Amaryllis Court and surrounding residential properties in the Autumnwood Development in Wildomar, CA. AMEC Environment and Infrastructure (AMEC), an environmental contractor, will collect soil, soil gas, and groundwater samples at designated locations (see below).

Schedule for Work Activities:

- Thursday, November 7, 2013 and Friday, November 8, 2013 from 8AM to 5PM
- Wednesday, November 13, 2013 through Friday, November 15, 2013 from 8AM to 5PM

Work activities will be limited to a portion of the following streets:

- Front Street
- Pasadena Street
- Protea Court
- Palomar Street
- Amaryllis Court
- Pink Ginger Court

These streets will remain open during the sampling activities. However, in areas where sampling will occur, no parking will be permitted from 8AM to 5PM. "No Parking" signs will be posted prior to the start of sampling work activities. Efforts will be taken to minimize noise and disruptions to the community. Street closures are not anticipated.

DTSC will oversee the work conducted by AMEC and will update the local community of the sampling results by December 2013.

For more information regarding these activities, please contact:

- Dr. Bill Bosan, DTSC Toxicologist, *william.bosan@dtsc.ca.gov*, (714) 484-5399
- Theo Johnson, DTSC Geologist, *theo.johnson@dtsc.ca.gov*, (714) 484-5414
- Marina Perez, Public Participation Specialist, *marina.perez@dtsc.ca.gov*, (818) 717-6569 or toll-free, 1-866-495-5651
- For Media Inquiries, Jim Marxen, *jim.marxen@dtsc.ca.gov*, (916) 324-6544

Cal/EPA DTSC State of California

Attachment C Soil Boring Logs

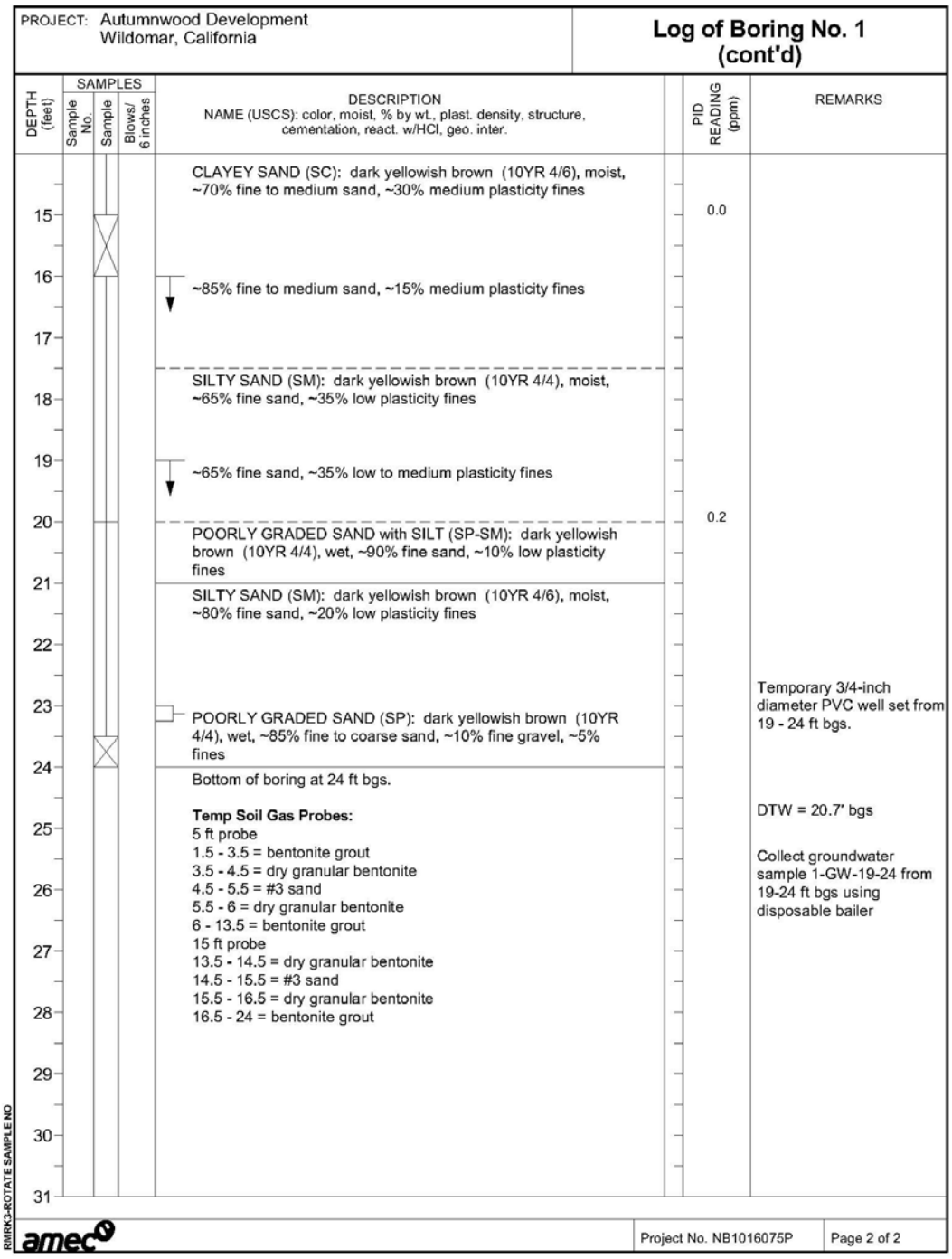
PROJECT: Autumnwood Development Wildomar, California	**Log of Boring No. 1**
BORING LOCATION: #1 Southern end of South Pasadena Street	ELEVATION AND DATUM:
DRILLING CONTRACTOR: Interphase	DATE STARTED: 11/7/13 / DATE FINISHED: 11/7/13
DRILLING METHOD: Direct Push	TOTAL DEPTH (ft.): 24.0 / MEASURING POINT: ground surface
DRILLING EQUIPMENT: 6600 GeoProbe	DEPTH TO WATER / FIRST: 20 / COMPL.: 20.77 / 24 HRS.
SAMPLING METHOD: Dual Tube	LOGGED BY: V. Robino
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: J. Bahde / REG. NO.: 7058

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6 inches	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	PID READING (ppm)	REMARKS
				Surface Elevation:		
				0.42 ft asphalt		
1				CLAYEY SAND (SC): dark olive gray (5Y 3/2), moist, ~70% fine to medium sand, predominantly fine sand, ~30% low to medium plasticity fines		PID: MiniRAE 3000 calibrated to 100 ppm Isobutylene standard.
2						Hand Auger to a depth of 5 feet below grade.
3				olive brown (2.5Y 4/3), moist, ~70% fine to medium sand, ~30% medium plasticity fines		PID readings are Headspace in resealable plastic bags.
4						
5				SILTY SAND (SM): dark yellowish brown (10YR 4/6), moist, ~80% fine sand, ~20% low plasticity fines	0.0	
6						
7						Replacement push probe constructed at 10 ft bgs. #3 sand 9.5 - 10.5 ft bgs bentonite granular (dry) 8.5 - 9.5 ft bgs bentonite granular (hydrated) 0 - 8.5 ft bgs
8				~70% sand, ~30% fines		
9						
10					0.0	
11						
12						
13						
14				CLAYEY SAND (SC): see next page		

RMRK3-ROTATE SAMPLE NO

amec

Project No. NB1016075P | Page 1 of 2


PROJECT: Autumnwood Development
Wildomar, California
Log of Boring No. 1
(cont'd)
DEPTH (feet)
SAMPLES
Sample No.
Sample
Blows/ 6 inches
DESCRIPTION
NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.
PID READING (ppm)
REMARKS
CLAYEY SAND (SC): dark yellowish brown (10YR 4/6), moist, ~70% fine to medium sand, ~30% medium plasticity fines
0.0
~85% fine to medium sand, ~15% medium plasticity fines
SILTY SAND (SM): dark yellowish brown (10YR 4/4), moist, ~65% fine sand, ~35% low plasticity fines
~65% fine sand, ~35% low to medium plasticity fines
0.2
POORLY GRADED SAND with SILT (SP-SM): dark yellowish brown (10YR 4/4), wet, ~90% fine sand, ~10% low plasticity fines
SILTY SAND (SM): dark yellowish brown (10YR 4/6), moist, ~80% fine sand, ~20% low plasticity fines
Temporary 3/4-inch diameter PVC well set from 19 - 24 ft bgs.
POORLY GRADED SAND (SP): dark yellowish brown (10YR 4/4), wet, ~85% fine to coarse sand, ~10% fine gravel, ~5% fines
Bottom of boring at 24 ft bgs.
DTW = 20.7' bgs
Collect groundwater sample 1-GW-19-24 from 19-24 ft bgs using disposable bailer
Temp Soil Gas Probes:
5 ft probe
1.5 - 3.5 = bentonite grout
3.5 - 4.5 = dry granular bentonite
4.5 - 5.5 = #3 sand
5.5 - 6 = dry granular bentonite
6 - 13.5 = bentonite grout
15 ft probe
13.5 - 14.5 = dry granular bentonite
14.5 - 15.5 = #3 sand
15.5 - 16.5 = dry granular bentonite
16.5 - 24 = bentonite grout
15
16
17
18
19
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31
RMRK3-ROTATE SAMPLE NO
amec
Project No. NB1016075P
Page 2 of 2

PROJECT: Autumnwood Development Wildomar, California	**Log of Boring No. 6**
BORING LOCATION: #6 North side of Protea Court	ELEVATION AND DATUM:
DRILLING CONTRACTOR: Interphase	DATE STARTED: 11/8/13 / DATE FINISHED: 11/8/13
DRILLING METHOD: Direct Push	TOTAL DEPTH (ft.): 16.0 / MEASURING POINT: ground surface
DRILLING EQUIPMENT: 6600 GeoProbe	DEPTH TO WATER / FIRST: NA / COMPL.: NA / 24 HRS.
SAMPLING METHOD: Dual Tube	LOGGED BY: V. Robino
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: J. Bahde / REG. NO.: 7058

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6 inches	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	PID READING (ppm)	REMARKS
				Surface Elevation:		
				0.33 ft asphalt		
1				CLAYEY SAND (SC): mottled dark greenish gray (10Y 4/1) and dark yellowish brown (10YR 4/6), moist, ~70% fine sand, trace medium sand, ~30% medium plasticity fines [POSSIBLE FILL]		PID: MiniRAE 3000 calibrated to 100 ppm Isobutylene standard.
2						Hand Auger to a depth of 5 feet below grade.
3						PID readings are Headspace in resealable plastic bags.
4						
5	6-SS-5-6			mottled brown (10YR 4/3) and dark yellowish brown (10YR 4/6), ~60% fine sand, trace medium sand, ~40% medium plasticity fines [POSSIBLE FILL]		
6					0.8	Replacement push probe constructed at 3 ft bgs. #3 sand 2.5 - 3.5 ft bgs bentonite granular (dry) 2.0 - 2.5 ft bgs bentonite granular (hydrated) 0 -2.0 ft bgs
7						
8				SILTY SAND (SM): dark yellowish brown (10YR 4/4), moist, ~70% fine sand, ~30% low plasticity fines		
9						
10	6-SS-9-11					
11					1.6	
12				CLAYEY SAND (SC): dark grayish brown (10YR 4/2), moist, ~70% fine to medium sand, ~30% medium plasticity fines		
13	6-SS-13.75 - 14.75					
14				~80% fine to medium sand, ~20% medium plasticity fines	1.2	

RMRK3-ROTATE SAMPLE NO

amec

Project No. NB1016075P | Page 1 of 2

PROJECT: Autumnwood Development
Wildomar, California

Log of Boring No. 6 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6 inches	DESCRIPTION: NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	PID READING (ppm)	REMARKS
15				CLAYEY SAND (SC): continued		
16				Bottom of boring at 16 ft bgs. Groundwater not encountered at time of drilling. **Temp Soil Gas Probes:** Probe at 5 1.5 - 3.5 = bentonite grout 3.5 - 4.5 = dry granular bentonite 4.5 - 5.5 = #3 sand 5.5 - 6 = dry granular bentonite 6 - 13.5 = bentonite grout Probe at 15 13.5 - 14.5 = dry granular bentonite 14.5 - 15.5 = #3 sand 15.5 - 16 = dry granular bentonite		
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						

RMRK3-ROTATE SAMPLE NO

amec

Project No. NB1016075P | Page 2 of 2

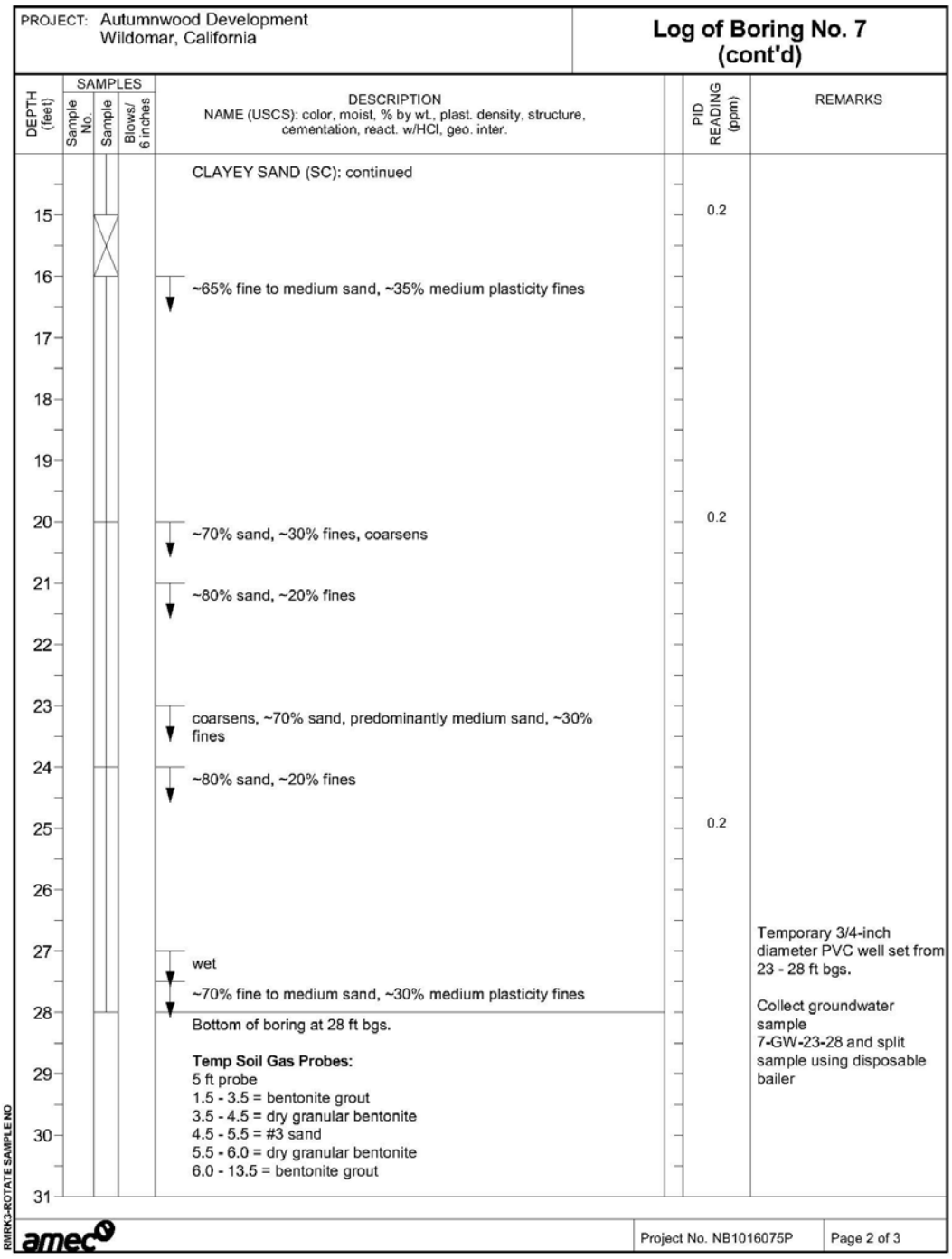
PROJECT: Autumnwood Development Wildomar, California			**Log of Boring No. 7**		
BORING LOCATION: #7 E. side of S. Pasadena St., S. of Pink Ginger Court			ELEVATION AND DATUM:		
DRILLING CONTRACTOR: Interphase			DATE STARTED: 11/8/13	DATE FINISHED: 11/8/13	
DRILLING METHOD: Direct Push			TOTAL DEPTH (ft.): 28.0	MEASURING POINT: ground surface	
DRILLING EQUIPMENT: 6600 GeoProbe			DEPTH TO WATER / FIRST: ~27	COMPL.: 26.55	24 HRS.
SAMPLING METHOD: Dual Tube			LOGGED BY: V. Robino		
HAMMER WEIGHT: NA	DROP: NA		RESPONSIBLE PROFESSIONAL: J. Bahde		REG. NO. 7058

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6 inches	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	PID READING (ppm)	REMARKS
				Surface Elevation:		
				0.42 ft asphalt and 0.58 ft base material		PID: MiniRAE 3000 calibrated to 100 ppm Isobutylene standard.
1				SILTY SAND (SM): dark yellowish brown (10YR 4/6), moist, ~70% fine sand, ~30% low plasticity fines, ~trace medium sand		
2						Hand Auger to a depth of 5 feet below grade.
3						PID readings are Headspace in resealable plastic bags.
4						
5				~80% sand, ~20% fines	0.2	
6						
7						
8				~75% sand, ~25% fines		
9						
10				~70% sand, ~30% fines	0.2	
11						
12				CLAYEY SAND (SC): dark yellowish brown (10YR 4/6), moist, ~70% fine sand, ~30% medium plasticity fines		
13						
14						

RMRK3-ROTATE SAMPLE NO

amec

Project No. NB1016075P | Page 1 of 3


PROJECT: Autumnwood Development
Wildomar, California
Log of Boring No. 7
(cont'd)
DEPTH (feet)
SAMPLES
Sample No.
Sample
Blows/ 6 inches
DESCRIPTION
NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.
PID READING (ppm)
REMARKS
CLAYEY SAND (SC): continued
~65% fine to medium sand, ~35% medium plasticity fines
~70% sand, ~30% fines, coarsens
~80% sand, ~20% fines
coarsens, ~70% sand, predominantly medium sand, ~30% fines
~80% sand, ~20% fines
wet
~70% fine to medium sand, ~30% medium plasticity fines
Bottom of boring at 28 ft bgs.
Temp Soil Gas Probes:
5 ft probe
1.5 - 3.5 = bentonite grout
3.5 - 4.5 = dry granular bentonite
4.5 - 5.5 = #3 sand
5.5 - 6.0 = dry granular bentonite
6.0 - 13.5 = bentonite grout
0.2
0.2
0.2
Temporary 3/4-inch diameter PVC well set from 23 - 28 ft bgs.
Collect groundwater sample 7-GW-23-28 and split sample using disposable bailer
RMRK3-ROTATE SAMPLE NO
amec
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PROJECT: Autumnwood Development
Wildomar, California

Log of Boring No. 7 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6 inches	DESCRIPTION: NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	PID READING (ppm)	REMARKS
32				15 ft probe 13.5 - 14.5 = dry granular bentonite 14.5 - 15.5 = #3 sand 15.5 - 16.4 = dry granular bentonite 16.4 - 28 = bentonite grout		
33						
34						
35						
36						
37						
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45						
46						
47						
48						

RMRK3-ROTATE SAMPLE NO

amec

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PROJECT: Autumnwood Development Wildomar, California	**Log of Boring No. 8**
BORING LOCATION: #8 North side of Pink Ginger Court	ELEVATION AND DATUM:
DRILLING CONTRACTOR: Interphase	DATE STARTED: 11/8/13 / DATE FINISHED: 11/8/13
DRILLING METHOD: Direct Push	TOTAL DEPTH (ft.): 16.0 / MEASURING POINT: ground surface
DRILLING EQUIPMENT: 6600 GeoProbe	DEPTH TO WATER / FIRST: NA / COMPL.: NA / 24 HRS.
SAMPLING METHOD: Dual Tube	LOGGED BY: V. Robino
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: J. Bahde / REG. NO. 7058

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6 inches	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	PID READING (ppm)	REMARKS
				Surface Elevation:		
				0.35 ft asphalt and 0.17 ft base material		PID: MiniRAE 3000 calibrated to 100 ppm Isobutylene standard.
1				CLAYEY SAND (SC): dark yellowish brown (10YR 4/4), moist, ~60% fine to medium sand, trace coarse sand, ~30% medium plasticity fines, ~10% fine gravel [FILL]		
2				CLAYEY GRAVEL with SAND (GC): dark yellowish brown (10YR 4/4), ~60% fine and coarse gravel, ~25% fine to coarse sand, ~15% medium plasticity fines [FILL]		Hand Auger to a depth of 5 feet below grade.
3						PID readings are Headspace in resealable plastic bags.
4						
5	8-SS-5-6			CLAYEY SAND (SC): mottled dark yellowish brown (10YR 4/4) and olive gray (5Y 4/2), moist, ~75% fine to medium sand, ~25% medium plasticity fines [FILL]		
6					0.8	
7				@7 ft, 1/2" diameter concrete fragment [FILL]		Replacement push probe constructed at 3 ft bgs. #3 sand 2.5 - 3.5 ft bgs bentonite granular (dry) 2.0 - 2.5 ft bgs bentonite granular (hydrated) 0 - 2 ft bgs
8				POORLY GRADED SAND (SP): yellowish brown (10YR 5/4), moist, ~95% fine to medium sand, ~5% fines		
9				SILTY SAND (SM): dark yellowish brown (10YR 3/6), moist, ~65% fine sand, ~35% low plasticity fines		
10	8-SS-9.5-10.5					
11						
12					0.6	
13						
14						

RMRK3-ROTATE SAMPLE NO

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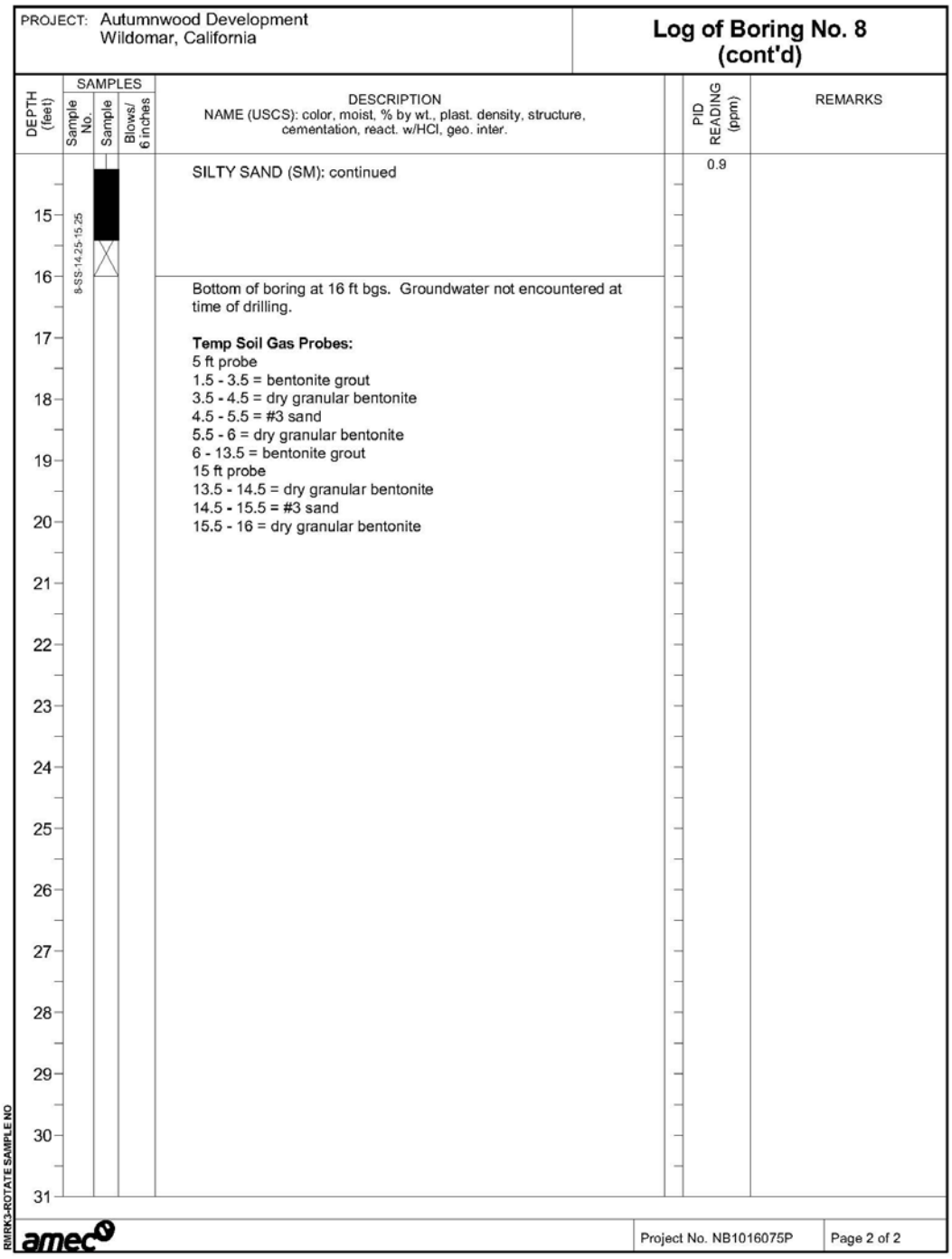
PROJECT: Autumnwood Development
Wildomar, California
Log of Boring No. 8
(cont'd)
DEPTH (feet)
SAMPLES
Sample No.
Sample
Blows/ 6 inches
DESCRIPTION
NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.
PID READING (ppm)
REMARKS
B-SS-14.25-15.25
SILTY SAND (SM): continued
0.9
Bottom of boring at 16 ft bgs. Groundwater not encountered at time of drilling.
Temp Soil Gas Probes:
5 ft probe
1.5 - 3.5 = bentonite grout
3.5 - 4.5 = dry granular bentonite
4.5 - 5.5 = #3 sand
5.5 - 6 = dry granular bentonite
6 - 13.5 = bentonite grout
15 ft probe
13.5 - 14.5 = dry granular bentonite
14.5 - 15.5 = #3 sand
15.5 - 16 = dry granular bentonite
RMRK3-ROTATE SAMPLE NO
amec
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PROJECT: Autumnwood Development Wildomar, California	**Log of Boring No. 11**
BORING LOCATION: #11 North end of Penrose Street	ELEVATION AND DATUM:
DRILLING CONTRACTOR: Interphase	DATE STARTED: 11/7/13 / DATE FINISHED: 11/7/13
DRILLING METHOD: Direct Push	TOTAL DEPTH (ft.): 36.0 / MEASURING POINT: ground surface
DRILLING EQUIPMENT: 6600 GeoProbe	DEPTH TO WATER: FIRST 27 / COMPL. 28.05 / 24 HRS.
SAMPLING METHOD: Dual Tube/Temp Well	LOGGED BY: V. Robino
HAMMER WEIGHT: NA DROP: NA	RESPONSIBLE PROFESSIONAL: J. Bahde / REG. NO. 7058

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6 inches	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	PID READING (ppm)	REMARKS
				Surface Elevation:		
				0.3 ft asphalt and base material		
1				SILTY SAND (SM): dark yellowish brown (10YR 4/6), moist, ~75% fine to medium sand, ~25% low plasticity fines		PID: MiniRAE 3000 calibrated to 100ppm Isobutylene standard.
2						Hand Auger to a depth of 5 feet below grade.
3						
4						
5				~75% fine to coarse sand, predominantly fine to medium sand, ~25% low plasticity fines, trace fine gravel	0.9	
6						
7						
8						
9				POORLY GRADED SAND (SP): dark yellowish brown (10YR 4/6), moist, ~95% fine to medium sand, ~5% fines		
10				CLAYEY SAND (SC): dark yellowish brown (10YR 4/4), moist, ~70% fine to medium sand, ~30% low to medium plasticity fines	0.8	
11				SILTY SAND (SM): dark yellowish brown (10YR 4/6), moist, ~70% fine to trace medium sand, ~30% low plasticity fines		
12						
13						
14						

RMRK3-ROTATE SAMPLE NO

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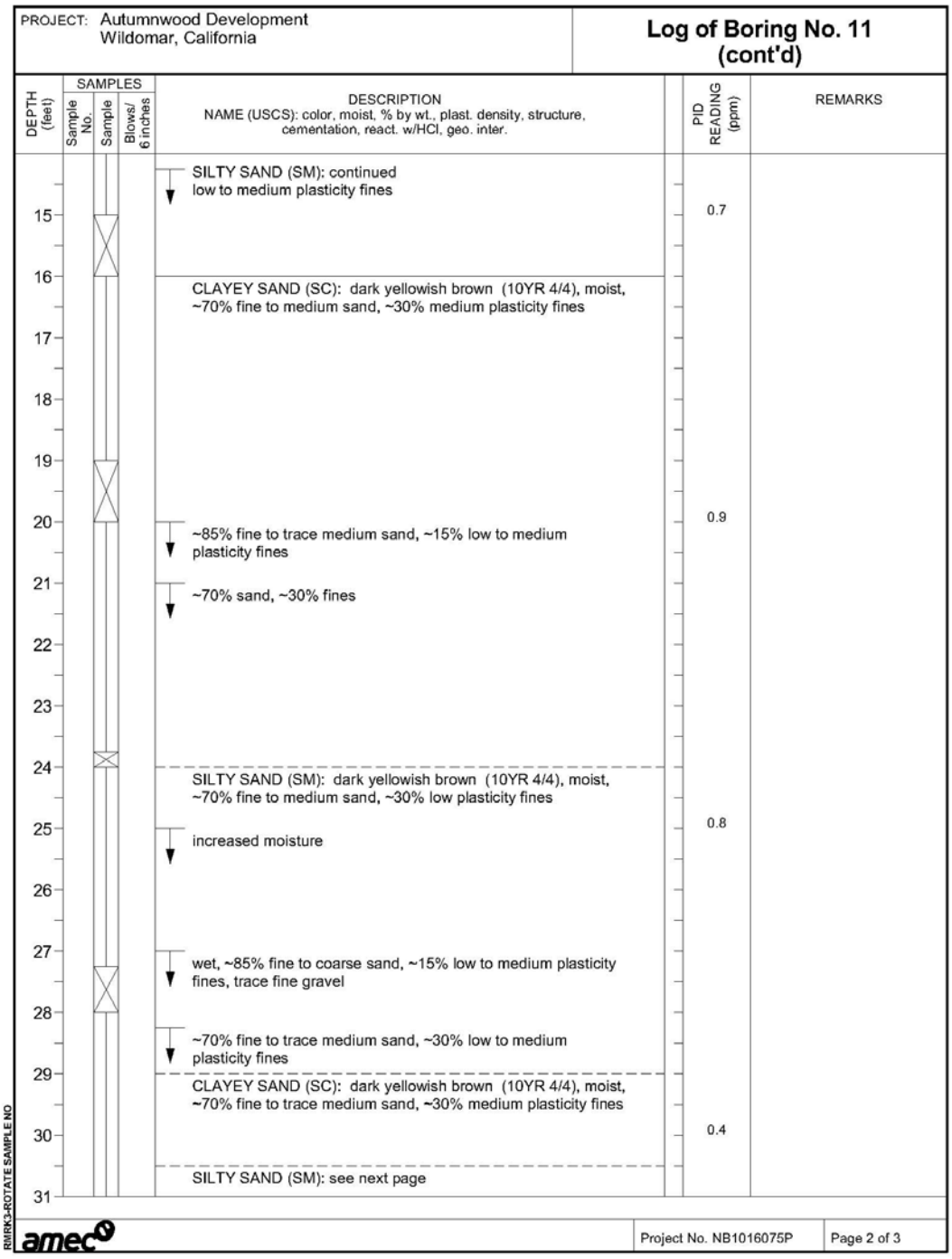
PROJECT: Autumnwood Development
Wildomar, California
Log of Boring No. 11
(cont'd)
DEPTH (feet)
SAMPLES
Sample No.
Sample
Blows/ 6 inches
DESCRIPTION
NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.
PID READING (ppm)
REMARKS
SILTY SAND (SM): continued
low to medium plasticity fines
0.7
CLAYEY SAND (SC): dark yellowish brown (10YR 4/4), moist,
~70% fine to medium sand, ~30% medium plasticity fines
~85% fine to trace medium sand, ~15% low to medium plasticity fines
0.9
~70% sand, ~30% fines
SILTY SAND (SM): dark yellowish brown (10YR 4/4), moist,
~70% fine to medium sand, ~30% low plasticity fines
increased moisture
0.8
wet, ~85% fine to coarse sand, ~15% low to medium plasticity fines, trace fine gravel
~70% fine to trace medium sand, ~30% low to medium plasticity fines
CLAYEY SAND (SC): dark yellowish brown (10YR 4/4), moist,
~70% fine to trace medium sand, ~30% medium plasticity fines
0.4
SILTY SAND (SM): see next page
15
16
17
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31
RMRK3-ROTATE SAMPLE NO
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PROJECT: Autumnwood Development
Wildomar, California

Log of Boring No. 11 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6 inches	DESCRIPTION: NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	PID READING (ppm)	REMARKS
32				SILTY SAND (SM): ~70% fine to trace medium sand, ~30% low to medium plasticity fines		
33				CLAYEY SAND (SC): dark yellowish brown (10YR 4/4), wet, ~65% fine sand, trace medium sand, ~35% low to medium plasticity fines		Set temporary 3/4-inch diameter PVC well from 27 - 32 ft bgs; dry
34				POORLY GRADED SAND (SP): mottled olive brown (2.5Y 4/4) and dark yellowish brown (10YR 4/4), wet, ~85% fine to coarse sand, ~10% fine gravel, ~5% fines		
35						
36				Bottom of boring at 36 ft bgs.		Set new temporary 3/4-inch diameter PVC well from 31 - 36 ft bgs
37				**Temp Soil Gas Probes:** 5 ft probe 1.5 - 3.5 = bentonite grout 3.5 - 4.5 = dry granular bentonite 4.5 - 5.5 = #3 sand 5.5 - 6.0 = dry granular bentonite 6.0 - 13.5 = bentonite grout 15 ft probe 13.5 - 14.5 = dry granular bentonite 14.5 - 15.5 = #3 sand 15.5 - 16 = dry granular bentonite 16 - 36 = bentonite grout		DTW = 28.05 ft bgs
38						Collect groundwater sample 11-GW-31-36 using disposable bailer
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41						
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43						
44						
45						
46						
47						
48						

RMRK3-ROTATE SAMPLE NO

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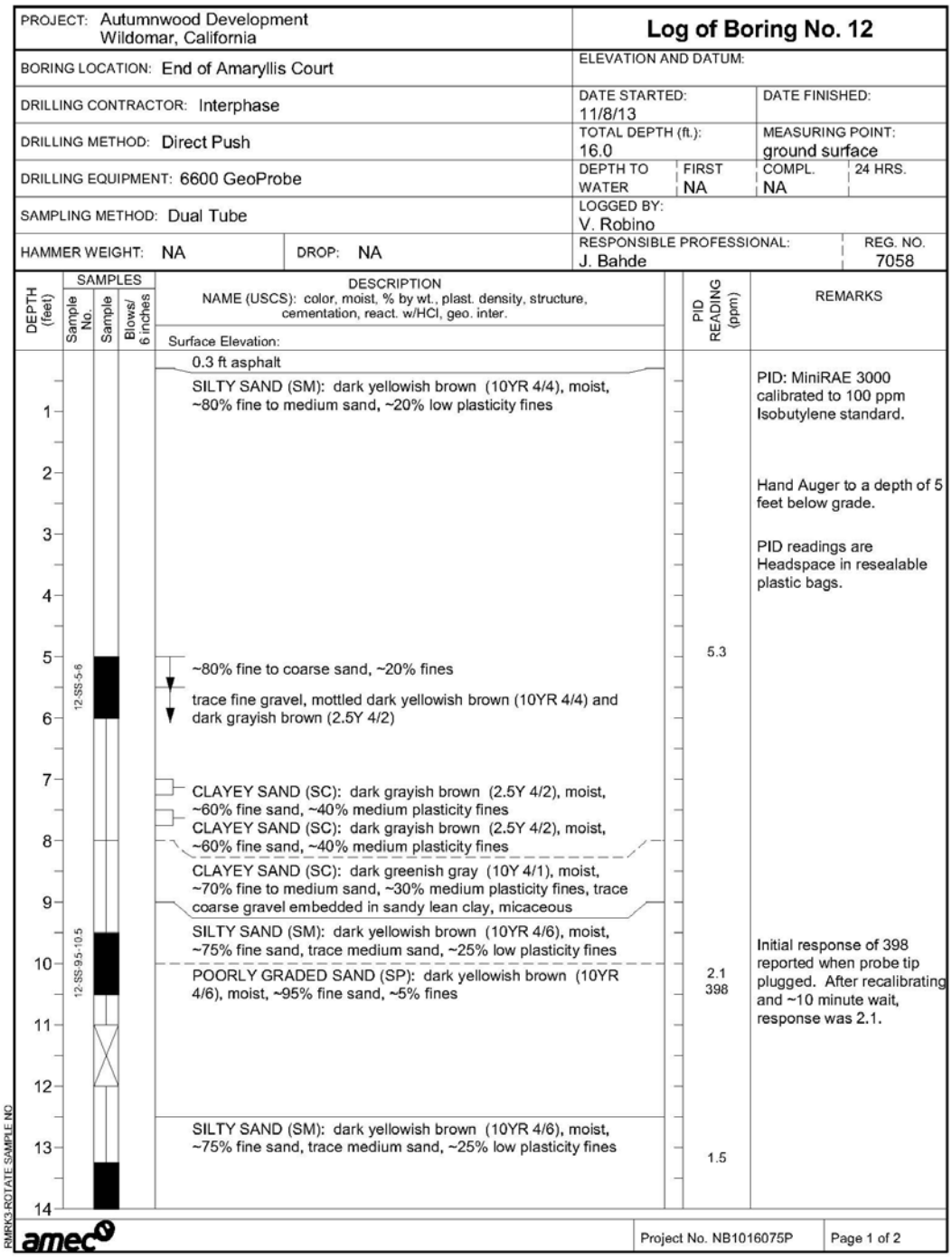
PROJECT: Autumnwood Development
Wildomar, California
Log of Boring No. 12
BORING LOCATION: End of Amaryllis Court
ELEVATION AND DATUM:
DRILLING CONTRACTOR: Interphase
DATE STARTED: 11/8/13
DATE FINISHED:
DRILLING METHOD: Direct Push
TOTAL DEPTH (ft.): 16.0
MEASURING POINT: ground surface
DRILLING EQUIPMENT: 6600 GeoProbe
DEPTH TO WATER
FIRST NA
COMPL. NA
24 HRS.
SAMPLING METHOD: Dual Tube
LOGGED BY: V. Robino
HAMMER WEIGHT: NA
DROP: NA
RESPONSIBLE PROFESSIONAL: J. Bahde
REG. NO. 7058
DEPTH (feet)
SAMPLES
Sample No.
Sample
Blows/ 6 inches
DESCRIPTION
NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.
Surface Elevation:
PID READING (ppm)
REMARKS
0.3 ft asphalt
SILTY SAND (SM): dark yellowish brown (10YR 4/4), moist, ~80% fine to medium sand, ~20% low plasticity fines
PID: MiniRAE 3000 calibrated to 100 ppm Isobutylene standard.
Hand Auger to a depth of 5 feet below grade.
PID readings are Headspace in resealable plastic bags.
12-SS-5-6
~80% fine to coarse sand, ~20% fines
5.3
trace fine gravel, mottled dark yellowish brown (10YR 4/4) and dark grayish brown (2.5Y 4/2)
CLAYEY SAND (SC): dark grayish brown (2.5Y 4/2), moist, ~60% fine sand, ~40% medium plasticity fines
CLAYEY SAND (SC): dark grayish brown (2.5Y 4/2), moist, ~60% fine sand, ~40% medium plasticity fines
CLAYEY SAND (SC): dark greenish gray (10Y 4/1), moist, ~70% fine to medium sand, ~30% medium plasticity fines, trace coarse gravel embedded in sandy lean clay, micaceous
SILTY SAND (SM): dark yellowish brown (10YR 4/6), moist, ~75% fine sand, trace medium sand, ~25% low plasticity fines
12-SS-9.5-10.5
POORLY GRADED SAND (SP): dark yellowish brown (10YR 4/6), moist, ~95% fine sand, ~5% fines
2.1
398
Initial response of 398 reported when probe tip plugged. After recalibrating and ~10 minute wait, response was 2.1.
SILTY SAND (SM): dark yellowish brown (10YR 4/6), moist, ~75% fine sand, trace medium sand, ~25% low plasticity fines
1.5
1
2
3
4
5
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10
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12
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14
RMRK3-ROTATE SAMPLE NO
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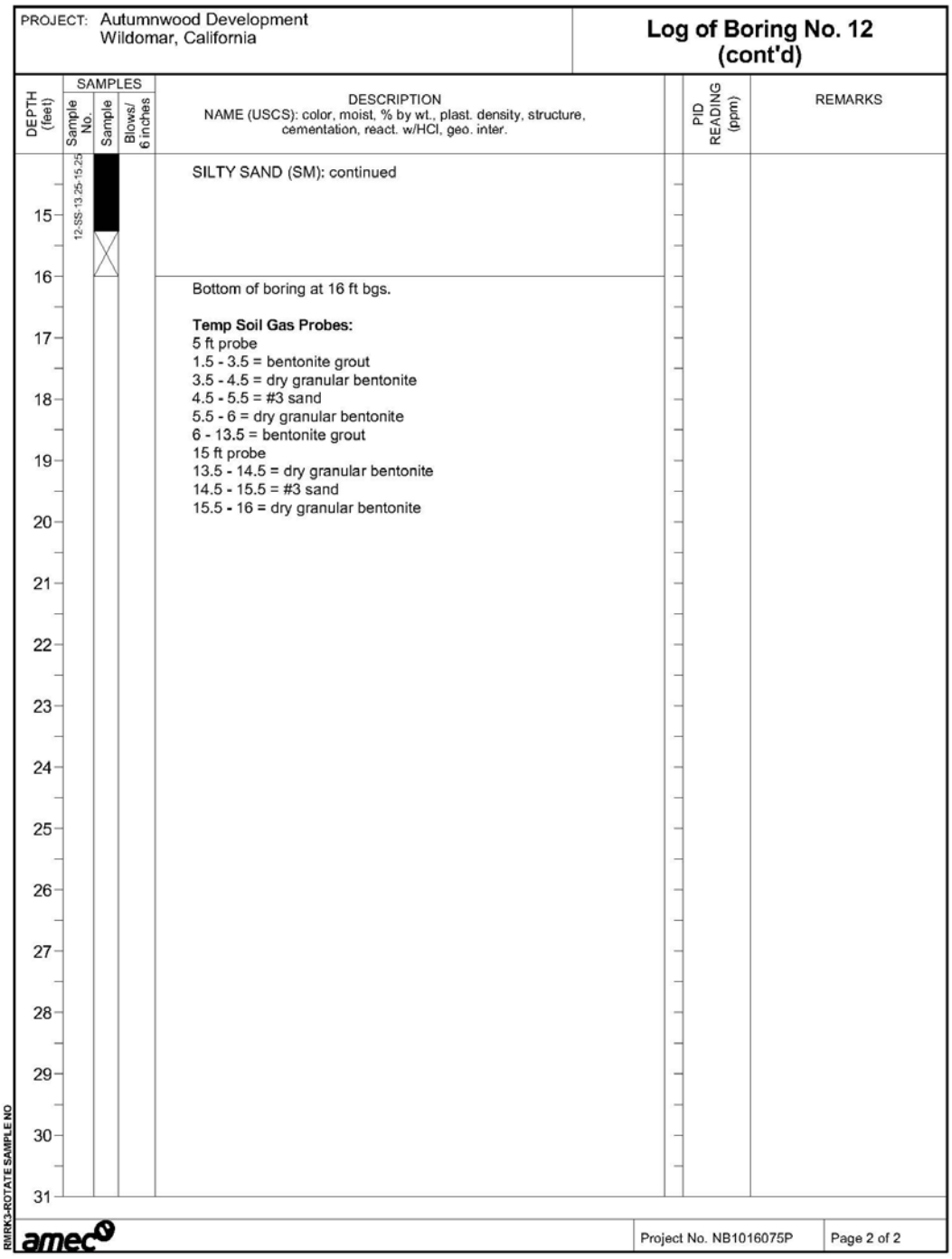
PROJECT: Autumnwood Development
Wildomar, California
Log of Boring No. 12
(cont'd)
DEPTH (feet)
SAMPLES
Sample No.
Sample
Blows/ 6 inches
DESCRIPTION
NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.
PID READING (ppm)
REMARKS
12-SS-13.25-15.25
SILTY SAND (SM): continued
Bottom of boring at 16 ft bgs.
Temp Soil Gas Probes:
5 ft probe
1.5 - 3.5 = bentonite grout
3.5 - 4.5 = dry granular bentonite
4.5 - 5.5 = #3 sand
5.5 - 6 = dry granular bentonite
6 - 13.5 = bentonite grout
15 ft probe
13.5 - 14.5 = dry granular bentonite
14.5 - 15.5 = #3 sand
15.5 - 16 = dry granular bentonite
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16
17
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19
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RMRK3-ROTATE SAMPLE NO
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PROJECT: Autumnwood Development Wildomar, California			**Log of Boring No. 13**		
BORING LOCATION: #13 South Pasadena Street, near Amaryllis Court			ELEVATION AND DATUM:		
DRILLING CONTRACTOR: Interphase			DATE STARTED: 11/7/13	DATE FINISHED: 11/7/13	
DRILLING METHOD: Direct Push			TOTAL DEPTH (ft.): 32.0	MEASURING POINT: ground surface	
DRILLING EQUIPMENT: 6600 GeoProbe			DEPTH TO WATER / FIRST: 27.21	COMPL.: NA	24 HRS.
SAMPLING METHOD: Dual Tube/Temp Well			LOGGED BY: V. Robino		
HAMMER WEIGHT: NA	DROP: NA		RESPONSIBLE PROFESSIONAL: J. Bahde		REG. NO. 7058

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6 inches	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	PID READING (ppm)	REMARKS
				0.3 ft asphalt and 0.9 ft concrete base		PID: MiniRAE 3000 calibrated to 100 ppm Isobutylene standard.
1				CLAYEY SAND (SC): dark grayish brown (2.5Y 4/2), moist, ~65% fine to medium sand, ~35% medium plasticity fines		
2						Hand Auger to a depth of 5 feet below grade.
3						PID readings are Headspace in resealable plastic bags.
4				yellowish brown (10YR 5/6), ~85% fine to medium sand, ~15% low to medium plasticity fines		
5					3.1	
				~75% sand, ~25% medium plasticity fines		
6						
7						
8				dark olive gray (5Y 3/2), ~65% fine to medium sand, trace medium sand, ~35% medium plasticity fines		
9						
10				dark yellowish brown (10YR 4/6), ~70% fine to trace medium sand, ~30% low to medium plasticity fines	2.2	
11						
12				POORLY GRADED SAND (SP): dark yellowish brown (10YR 4/6), moist, ~95% fine to medium sand, trace coarse sand, ~5% fines		
13				SILTY SAND (SM): dark yellowish brown (10YR 4/4), moist, ~65% fine to trace medium sand, ~35% low to medium plasticity fines		
14						

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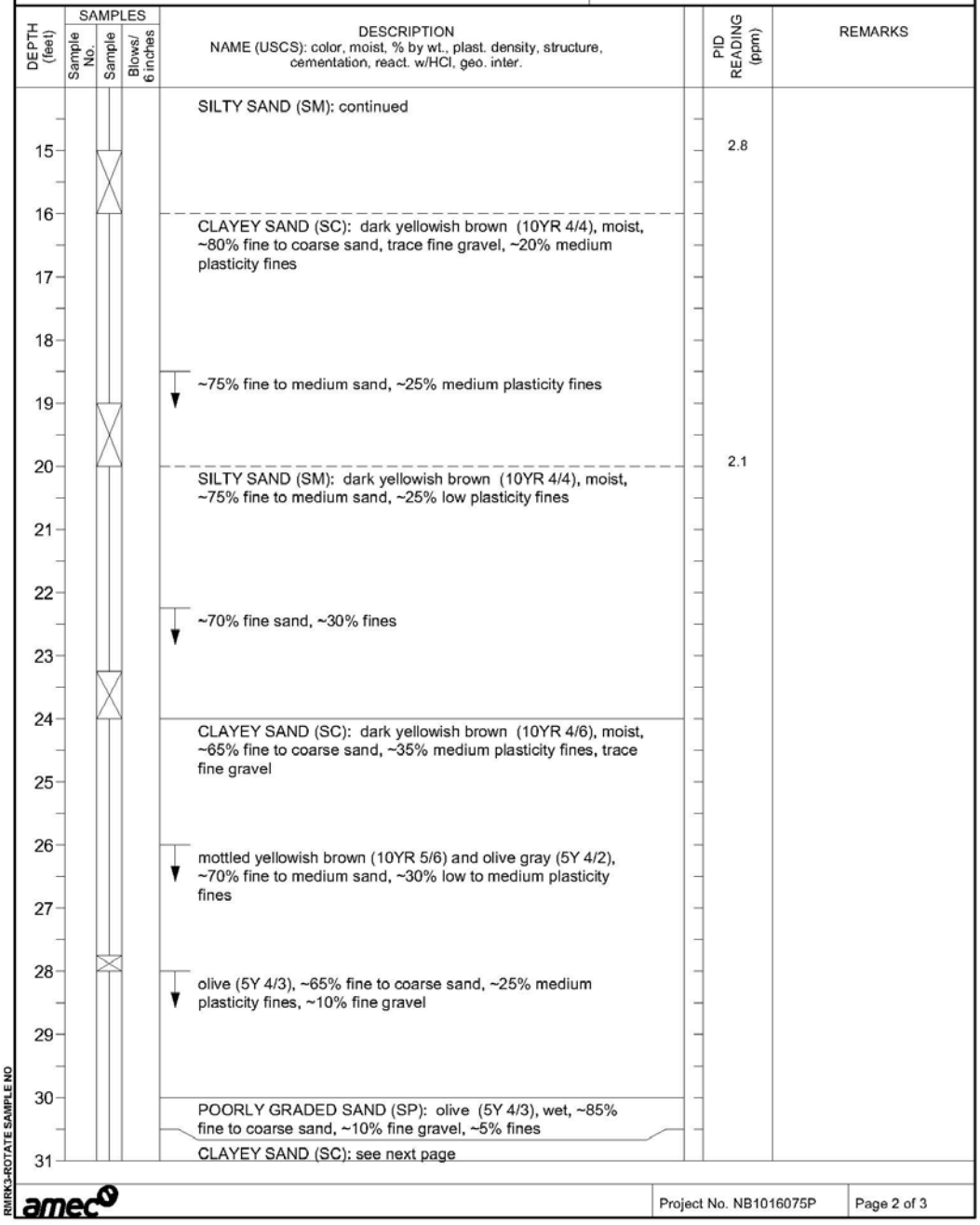
PROJECT: Autumnwood Development
Wildomar, California

Log of Boring No. 13 (cont'd)



RMRK3-ROTATE SAMPLE NO

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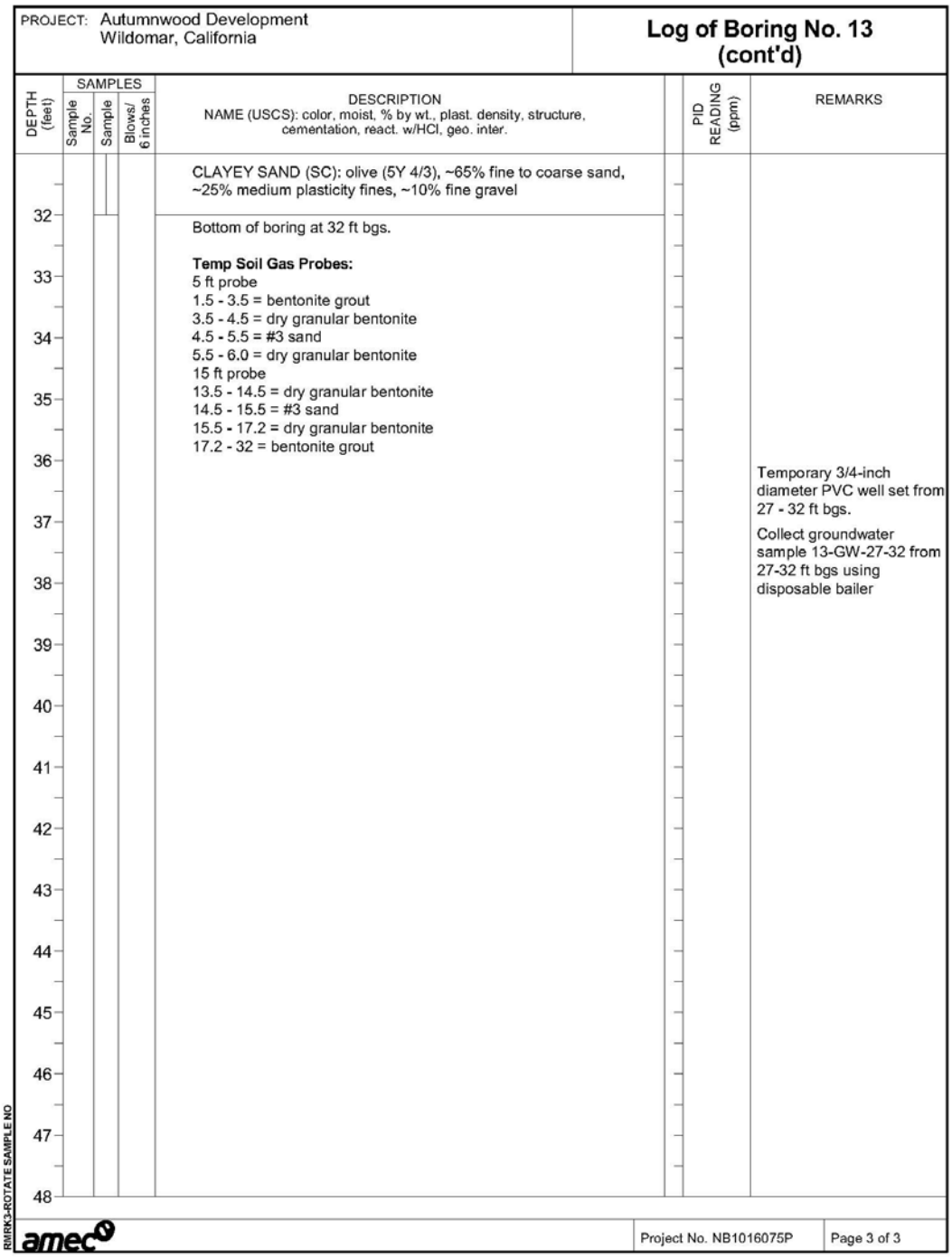
PROJECT: Autumnwood Development
Wildomar, California
Log of Boring No. 13
(cont'd)
DEPTH (feet)
SAMPLES
Sample No.
Sample
Blows/ 6 inches
DESCRIPTION
NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.
PID READING (ppm)
REMARKS
CLAYEY SAND (SC): olive (5Y 4/3), ~65% fine to coarse sand, ~25% medium plasticity fines, ~10% fine gravel
32
Bottom of boring at 32 ft bgs.
Temp Soil Gas Probes:
5 ft probe
1.5 - 3.5 = bentonite grout
3.5 - 4.5 = dry granular bentonite
4.5 - 5.5 = #3 sand
5.5 - 6.0 = dry granular bentonite
15 ft probe
13.5 - 14.5 = dry granular bentonite
14.5 - 15.5 = #3 sand
15.5 - 17.2 = dry granular bentonite
17.2 - 32 = bentonite grout
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48
Temporary 3/4-inch diameter PVC well set from 27 - 32 ft bgs.
Collect groundwater sample 13-GW-27-32 from 27-32 ft bgs using disposable bailer
RMRK3-ROTATE SAMPLE NO
amec
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Attachment D Soil and Groundwater Sample Analytical Data Sheets

Attachment E Soil Gas Sample Analytical Data Sheets

Attachment F Formaldehyde Soil Gas Sample Analytical Data Sheets

Attachment G Sub-Slab Soil Gas Sample Analytical Data Sheets

Attachment H Screening-Level Johnson and Ettinger Model Outputs