Weiss Associates *Environmental and Geologic Services*

5500 Shellmound Street, Emeryville, CA 94608-2411 *FAX: 510-547-5043 Phone: 510-450-6000*

TRANSMITTAL

DATE: August 14, 1995 **PROJECT #:** 81-1055-36

TO: Juliet Shin **PHONE:** (510) 567-6763

COMPANY: Alameda County
Environmental Protection Division
1131 Harbor Bay Parkway, Room 250
Alameda, CA 94502-6577

FROM: Tim Utterback, (510) 450-6193

SUBJECT: **Soil Disposal Certification,**
Shell WIC #204-5508-2808, Golf Links Rd., Oakland

95 AUG 15 PM 12:31

VIA:	FAX:	AS:	FOR:
☐ Fax	# of pages: _____ (including this cover)	☐ Per our phone call	☐ Your information
☑ 1st Class Mail	☐ Hard Copy to follow	☑ You requested	☐ Return to you
☐ Overnight Delivery		☐ Is required	☐ Your action
☐ UPS (Surface)		☐ We believe you may be interested	☑ Your review
☐ Courier			

Please call (510) 450-6000 if there are any problems with transmission.

COMMENTS: Juliet,

Enclosed is a copy of the soil disposal confirmation for the above referenced site as requested in your letter to Mr. Dan Kirk, Shell Oil Company, dated August 8, 1995. No soil disposal manifests were generated because laboratory analysis determined the soil to be non hazardous (class-III). Please note that the total volume of soil was 60 yards as stated in the Tank Removal Closure Report, dated July 6, 1995.

Please call me if you have any additional questions.

cc. Dan Kirk, Shell Oil Company, P.O. Box 4023, Concord, CA 94524

8/23/95 Requested that Tim Utterback, Weiss, submit analysis results of stockpiled soil samples.

FAX CONFIDENTIALITY NOTICE

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R2941

Shell Oil Products US

December 5, 2002

Mr. Don Hwang
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Subject: **Shell-branded Service Station**
9750 Golf Links Road
Oakland, California

Dear Mr. Hwang:

Attached for your review and comment is a copy of the *Agency Response and Well Installation Work Plan Addendum* for the above referenced site. Upon information and belief, I declare, under penalty of perjury, that the information contained in the attached document is true and correct.

As always, please feel free to contact me directly at (559) 645-9306 with any questions or concerns.

Sincerely,

Shell Oil Products US

Karen Petryna

Karen Petryna
Sr. Environmental Engineer

P.O. Box 7869 Burbank, CA 91510-7869 Phone (559) 645-9306 Facsimile (559) 645-5643

CAMBRIA

December 4, 2002

Mr. Don Hwang
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Re: **Agency Response and Well Installation Work Plan Addendum**
Shell-branded Service Station
9750 Golf Links Road
Oakland, California
Incident # 98995744
Cambria Project # 244-0735

Dear Mr. Hwang:

On behalf of Equilon Enterprises LLC dba Shell Oil Products US, Cambria is submitting this *Agency Response and Well Installation Work Plan Addendum*. As requested in a March 29, 2002 Alameda County Health Care Services Agency (ACHCSA) letter, Cambria submitted a *Well Installation Work Plan* on May 17, 2002. The ACHCSA responded to the May 17, 2002 work plan with an October 9, 2002 letter requesting additional information and a work plan addendum. Presented below are the site summary, our response to the ACHCSA letter, and our proposed scope of work.

BACKGROUND

Site Location: This operating Shell-branded service station is located at the intersection of Golf Links Road and Mountain Boulevard in Oakland, California (Figures 1 and 2). Residential and commercial properties surround the site. Interstate Highway 580 runs near the northern boundary of the site.

Hydrogeologic Setting: According to the Regional Water Quality Control Board's June 1999 *East Bay Plain Groundwater Basin Beneficial Use Evaluation Report – Alameda and Contra Costa Counties, California*, the site is located within the East Bay Plain basin. The East Bay Plain consists of up to 1,000 feet of unconsolidated sediments of Pleistocene and Holocene age including a series of alluvial deposits underlain by bedrock of Jurassic, Cretaceous and Tertiary age including the Franciscan Complex. Beneficial uses of the East Bay Plain basin include municipal, industrial, industrial process and agricultural uses.

Oakland, CA
San Ramon, CA
Sonoma, CA

Cambria Environmental Technology, Inc.

1144 65th Street
Suite B
Oakland, CA 94608
Tel (510) 420-0700
Fax (510) 420-9170

The site is located in a valley created by the confluence of Arroyo Viejo Creek and the Country Club and Rifle Range branches of Arroyo Viejo Creek at the foot of the Oakland Hills. The Rifle Range branch is diverted into a storm drain culvert approximately 3,000 feet north of the site, and the Country Club branch is diverted into the same culvert approximately 1,650 feet northeast of the site. The Arroyo Viejo Creek is diverted into a storm drain culvert south of the site, which joins the Rifle Range and Country Club branch culvert just north of the site. The joined storm drain culvert then crosses Interstate Highway 580 and outlets to the surface northwest of the site as Arroyo Viejo Creek (Figure 3). Several storm drain inlets located along the Interstate Highway 580 on-ramp also connect to the Arroyo Viejo Creek storm drain culvert.

Site Lithology: The site is underlain primarily by interbedded clays, silts, silty sands and sands. Bedrock has been encountered in two soil borings. Siltstone was encountered in boring B-1 between 30 feet below grade (fbg) and the total depth explored of 47 fbg, and chert was encountered in boring SB-2 between 13.5 fbg and the total depth explored of 16 fbg. Due to the site location in a stream valley at the foot of the Oakland Hills, an aquifer or water-bearing zone, as typically encountered, may not be present at the site.

Groundwater Depth and Flow Direction: No groundwater monitoring wells are currently installed at the site. Assumed groundwater flow direction based on topography and the flow direction of natural stream channels in the site vicinity is west. Perched groundwater has been encountered between the depths of 12 fbg and 20 fbg in two of seven soil borings installed onsite as noted below. However, a contiguous groundwater table has not been encountered to the total depth explored at the site of 47 fbg.

A sensitive receptor survey conducted in 2000 (see below) identified the nearest well to be a cathodic protection well located northwest of the site. No depth-to-groundwater information was provided on the Department of Water Resources (DWR) well drillers report form for this well. The sensitive receptor survey also identified several monitoring well locations outside the survey radius (Figure 1). The nearest monitoring wells to the site are located approximately 3,425 feet south of the site near the corner of Foothill Boulevard and Talbot Avenue in Oakland. According to the DWR well drillers report forms for the monitoring wells installed at this location, the depth to first encountered groundwater was 18 fbg during installation in August 1987. The next closest monitoring wells are located approximately 4,000 feet southwest of the site near the corner of 98th Avenue and Bancroft Avenue in Oakland. The depth to first encountered groundwater at the site was approximately 25 fbg when the wells were installed in 1991.

1995 Waste Oil Underground Storage Tank (UST) Removal: On March 7, 1995, Weiss Associates of Emeryville, California (WA) observed the removal of a 550-gallon, single-walled, steel waste-oil UST and collected soil samples from the tank excavation floor and sidewalls. The highest

hydrocarbon concentrations were 12,000 parts per million (ppm) total oil and grease (TOG), 190 ppm total petroleum hydrocarbons as gasoline (TPHg) and 3,900 ppm total petroleum hydrocarbons as diesel (TPHd), detected at 7 fbg. After excavation, soil samples from a depth of 11 fbg at the site contained 62 ppm TOG, and no TPHg or TPHd. No benzene was detected in any of the excavation samples.

1995 Subsurface Investigation: On December 15, 1995, WA advanced one soil boring to 47 fbg in the vicinity of the former waste oil UST. Hydrocarbons detected were 2.8 ppm TPHd at 30.5 fbg and 56 ppm TOG at 40.5 fbg. No groundwater was encountered.

1998 Dispenser Upgrade: On February 4, 1998, Cambria observed station upgrade activities and collected soil samples from beneath one dispenser. The highest hydrocarbon concentrations were 7,800 ppm TPHg and 37 ppm benzene beneath dispenser D-4 at 4.0 fbg (Figure 2). No field indications of hydrocarbons were observed beneath the other dispensers.

1998 Subsurface Investigation: On July 6 and 31, 1998, Cambria installed one soil boring (SB-1) to a depth of 30 fbg in the vicinity of dispenser sample D-4. Hydrocarbons were detected at a maximum concentration of 14,000 ppm TPHg and 100 ppm benzene at 13 fbg. A maximum concentration of 91 ppm of methyl tertiary butyl ether (MTBE) was reported at 9 fbg by EPA Method 8020. This detection was confirmed by EPA Method 8260 at a concentration of 23 ppm. Low concentrations of TPHg, benzene, toluene, ethylbenzene and xylenes (BTEX) and MTBE by EPA Method 8020 were reported in the deepest sample collected at approximately 26 fbg. Cambria was unable to collect a groundwater sample, as the only water encountered was an apparent thin perched zone at approximately 12 fbg.

1999 Subsurface Investigation: On August 25, 1999, Cambria installed five soil borings (SB-1b and SB-2 though SB-5) to depths ranging from 16 to 30 fbg. A perched water zone was encountered at approximately 12 fbg in boring SB-2 and approximately 20 fbg in boring SB-3. Groundwater was not encountered in the remaining soil borings. The maximum TPHg concentration detected in soil was 243 ppm at approximately 10 fbg in boring SB-2. The maximum MTBE concentration detected in soil was 2.23 ppm (by EPA Method 8260) at approximately 10 fbg in boring SB-4. No benzene was reported in any of the analyzed soil samples collected. Grab water samples collected from the perched water encountered in borings SB-2 and SB-3 contained a maximum of 256 parts per billion (ppb) TPHg, 11,800 ppb MTBE (by EPA Method 8020) and 2.42 ppb benzene.

2000 Sensitive Receptor Survey: In 2000, Cambria conducted a sensitive receptor survey for a ¼-mile radius of the site. Results of the survey are shown on Figure 1. The only well identified within the ¼-mile survey radius was a cathodic protection well located approximately 1,150 feet north-northwest of the site. Arroyo Viejo Creek was the only identified surface water body within the survey radius.

Arroyo Viejo Creek is located aboveground southeast of the site and is diverted into an underground storm drain culvert which runs beneath the west portion of the site. The culvert outlet to Arroyo Viejo Creek is located approximately 575 feet northwest of the site.

2000 Conduit Study: In 2000, Cambria reviewed storm drain and sanitary sewer maps from the City of Oakland Public Works Department and the California Department of Transportation. Locations, flow directions, depths and pipe diameters for the sanitary sewer and storm drain lines in the site vicinity are shown on Figure 2.

RESPONSE TO OCTOBER 9, 2002 LETTER

The October 9, 2001 ACHCSA letter makes several recommendations associated with our May 17, 2002 *Well Installation Work Plan*. Our responses to each recommendation follow excerpts from the ACHCSA letter, as indicated below.

Monitoring Well Depths - The only groundwater samples yielded thus far were from soil borings SB-2 at 12 fbg and SB-3 at 20 fbg. Both were attributed to a perched water zone. The depths for onsite wells ranged from 16 to 48 fbg. In 2000, a sensitive receptor survey found only one well within a ¼-mile radius. This was a cathodic protection well located approximately 1,150 feet north-northwest of the site with a depth of 120 fbg. No depth to groundwater was available. Include your proposal for determining monitoring well depths in the revised work plan requested below.

No onsite wells have been installed at the site. Depths for onsite borings ranged from 16 to 47 fbg. Cathodic protection wells are not typically installed for groundwater monitoring purposes and are not typically installed with a screen in groundwater bearing zones. The DWR well drillers report form for the noted cathodic protection well does not indicate a screened interval nor depth to first encountered groundwater. As noted, only perched water has been encountered previously at the site to the total explored depth of 47 fbg. As described below, Cambria proposes to determine monitoring depths based on field conditions.

Monitoring Well Locations - We do not concur with one of the locations proposed, south of the former fuel tanks. We feel that this location may miss downgradient flow from the former fuel tanks although we do want a well within 10 feet of the former fuel tanks and another one within 10 feet of the former dispensers in the downgradient direction. Include your proposal to meet these requirements in the revised work plan.

Assumed groundwater flow direction based on topography in the site vicinity is west. The dispenser islands at the site are located immediately west of the USTs. Due to the dangers of drilling between the dispenser islands and the USTs, Cambria does not recommend completing a boring immediately west of the USTs. Cambria instead has amended the location of the proposed well near the USTs from south of the tank pit to northwest of the tank pit (Figure 2). Cambria feels that this location coupled with the additional proposed locations along the western property boundary will adequately assess groundwater conditions downgradient of the USTs at the site. In addition, Cambria has added a fourth proposed monitoring well location downgradient of the dispenser islands at the site (Figure 2).

Arroyo Viejo Creek Sampling - Include a map showing your proposed sample locations in the revised work plan requested below.

Please see Figure 3 attached showing the two proposed locations for Arroyo Viejo Creek sampling.

Soil and Groundwater Analysis – Please analyze all soil and groundwater samples for total petroleum hydrocarbons as gasoline (TPHg), benzene, toluene, ethylbenzene and xylenes (BTEX), and MTBE. Additional for groundwater samples, analysis for the fuel oxygenates MTBE, tertiary amyl methyl ether (TAME), ethyl tertiary butyl ether (ETBE) 8260 is required. After the initial round of sampling, sample for any of these contaminants found in subsequent quarters. Include these analyses in the revised work plan requested below.

As noted below, all soil samples collected will be analyzed for TPHg, BTEX and MTBE. The initial groundwater samples will be additionally analyzed for TAME and ETBE as requested during the first monitoring event as described below. In addition, Cambria recommends analysis for tertiary butyl alcohol (TBA) and diisopropyl ether (DIPE) during the initial groundwater monitoring event. A recommendation for future monitoring for the additional analytes will be included with the first quarterly groundwater monitoring results for the site. This recommendation will include, at a minimum, analysis for any compound detected during the initial monitoring event.

B1 Boring – Missing log. Submit.

The boring log for B-1 is included as Attachment A.

Legitimacy Statement

A legitimacy statement has been provided with this report and will be provided with future reports for the site.

Vicinity hydrogeologic setting – Include in the revised work plan requested below.

The vicinity hydrogeologic setting is included in the site background above.

PROPOSED SCOPE OF WORK

The March 29, 2002 ACHCSA letter requests characterization of groundwater contamination and sampling of Arroyo Viejo Creek in the site vicinity. As noted above, a contiguous groundwater table has not been encountered at the site to a total explored depth of approximately 47 fbg. Cambria proposes to advance four soil borings at the site and complete the borings as groundwater monitoring wells in the approximate locations shown on Figure 2. The proposed groundwater monitoring well locations have been determined based on the assumed westerly groundwater flow direction and on a review previous soil sampling results at the site. One monitoring well has been proposed immediately downgradient of the USTs at the site, one immediately downgradient of the dispensers at the site, and two additional monitoring wells along the downgradient/western property boundary. Cambria also recommends collecting grab water samples from Arroyo Viejo Creek in two locations as described below and noted on Figure 3. Our scope of work for this investigation will include the following tasks.

Monitoring Well Installation

Utility Location: Cambria will notify Underground Service Alert (USA) of our drilling activities. USA will identify utilities in the site vicinity.

Site Health and Safety Plan: Cambria will prepare a comprehensive site safety plan to protect site workers. The plan will be reviewed and signed by each site worker and kept onsite during field activities.

Permits: We will obtain the necessary monitoring well installation permits.

Soil Borings: Assuming the absence of subsurface and overhead obstructions, Cambria will advance four borings in the approximate locations shown on Figure 2 using a drill rig equipped with hollow-stem augers. Soil samples will be collected at 5-foot intervals. The borings will be advanced until soil samples indicate saturation or up to a total depth of 100 fbg or until auger refusal is reached. If soil samples indicate saturation, groundwater will be allowed to stabilize before determining static depth-to-water. The borings will then be advanced to approximately 10 feet below the groundwater table and converted to 4-inch diameter groundwater monitoring wells. Exact screen intervals will be determined based on field conditions. All collected soil samples will be transported under chain-of-custody to a State-approved analytical laboratory. Our standard field procedures for soil borings are included as Attachment B.

Groundwater Monitoring Well Installation: The four groundwater monitoring wells will be constructed of PVC and screened with 0.010-inch machined slot. Screen intervals will be determined

based upon field conditions. A filter pack consisting of No. 2/12 sand will be installed to 2 feet above the top of the well screen, which will be overlain by 2 feet of bentonite and bentonite-cement grout to the surface. Traffic-rated vault-boxes will be installed to protect the wells. The groundwater monitoring wells will be developed by surging and purging at least 10 casing volumes of water. Our standard field procedures for soil borings and monitoring well installation are included in Attachment B.

Chemical Analysis: Selected soil samples based on field photo-ionization detector readings will be analyzed by a State-certified analytical laboratory using EPA Method 8260 for TPHg, BTEX and MTBE.

Arroyo Viejo Creek Sampling

Water Sampling: Grab water samples will be collected from Arroyo Viejo Creek in two locations (Figure 3). The creek will be sampled south of the site across Golf Links Road prior to diversion into the storm drain culvert (G-1 on Figure 3) and northwest of the site where the culvert outlets to a surface stream (G-2 on Figure 3). Note that water sampled from location G-2 will also include water diverted from the Rifle Range and Country Club branches into the storm drain culvert, as well as water diverted into the culvert from storm drain inlets along Interstate Highway 580. Sample G-2 may be impacted by any of these sources, or by the former gasoline station located north of the site. Cambria's standard field procedures for creek sampling are presented as Attachment C.

The proposed sampling location south of the site (G-1 on Figure 3) is within Knowland Park, which is operated by the City of Oakland. The proposed sampling location northwest of the site (G-2 on Figure 3) is located within East Bay Municipal Utility District (East Bay MUD) jurisdiction. Cambria will contact the City of Oakland and East Bay MUD for access to the sampling locations prior to collecting grab samples.

Chemical Analysis: Initial grab water samples from the creek will be analyzed by a State-certified analytical laboratory using EPA Method 8260 for TPHg, BTEX, MTBE, TBA, TAME, ETBE and DIPE. A recommendation for future creek sampling and analysis will be provided with the initial sampling results.

Reporting

Upon receipt of analytical results, we will prepare a report that, at a minimum, will contain:

- A summary of the site background and history;
- Descriptions of the drilling and sampling methods;
- Boring logs;
- Tabulated soil analytical results;
- Descriptions of creek sampling;
- Tabulated grab water analytical results;
- Analytical reports and chain-of-custody forms;
- An updated site conceptual model for the site; and
- Cambria's conclusions and recommendations.

Quarterly Monitoring

Following installation of the proposed monitoring wells, a groundwater monitoring program will be initiated at the site. Groundwater samples will be collected from the site well on a quarterly basis for a minimum of one year. Initial groundwater samples will be analyzed for TPHg, BTEX, MTBE, TBA, TAME, ETBE and DIPE by EPA Method 8260. A recommendation for future oxygenate analysis will be provided with the initial groundwater monitoring report.

Schedule

Upon receiving written work plan approval, permits will be acquired and the fieldwork will be scheduled. An investigation report will be submitted approximately 60 days after completing the field activities. Quarterly monitoring reports will be submitted approximately 60 days after each sampling event.

CLOSING

We appreciate the opportunity to work with you on this project. Please call Jacquelyn Jones at (510) 420-3316 if you have any questions or comments.

Sincerely,
Cambria Environmental Technology, Inc.

Jacquelyn L. Jones
Project Geologist

Matthew W. Derby, P.E.
Senior Project Engineer

Figures:
1 - Site Vicinity Map with Area Well Survey
2 - Proposed Monitoring Well Location Map
3 - Arroyo Viejo Creek Sampling Locations

Attachments:
A - Boring Log for B-1
B - Standard Field Procedures for Monitoring Well Installation
C - Standard Field Procedures for Creek Sampling

cc: Karen Petryna, Shell Oil Products US, P.O. Box 7869, Burbank, CA 91510-7869

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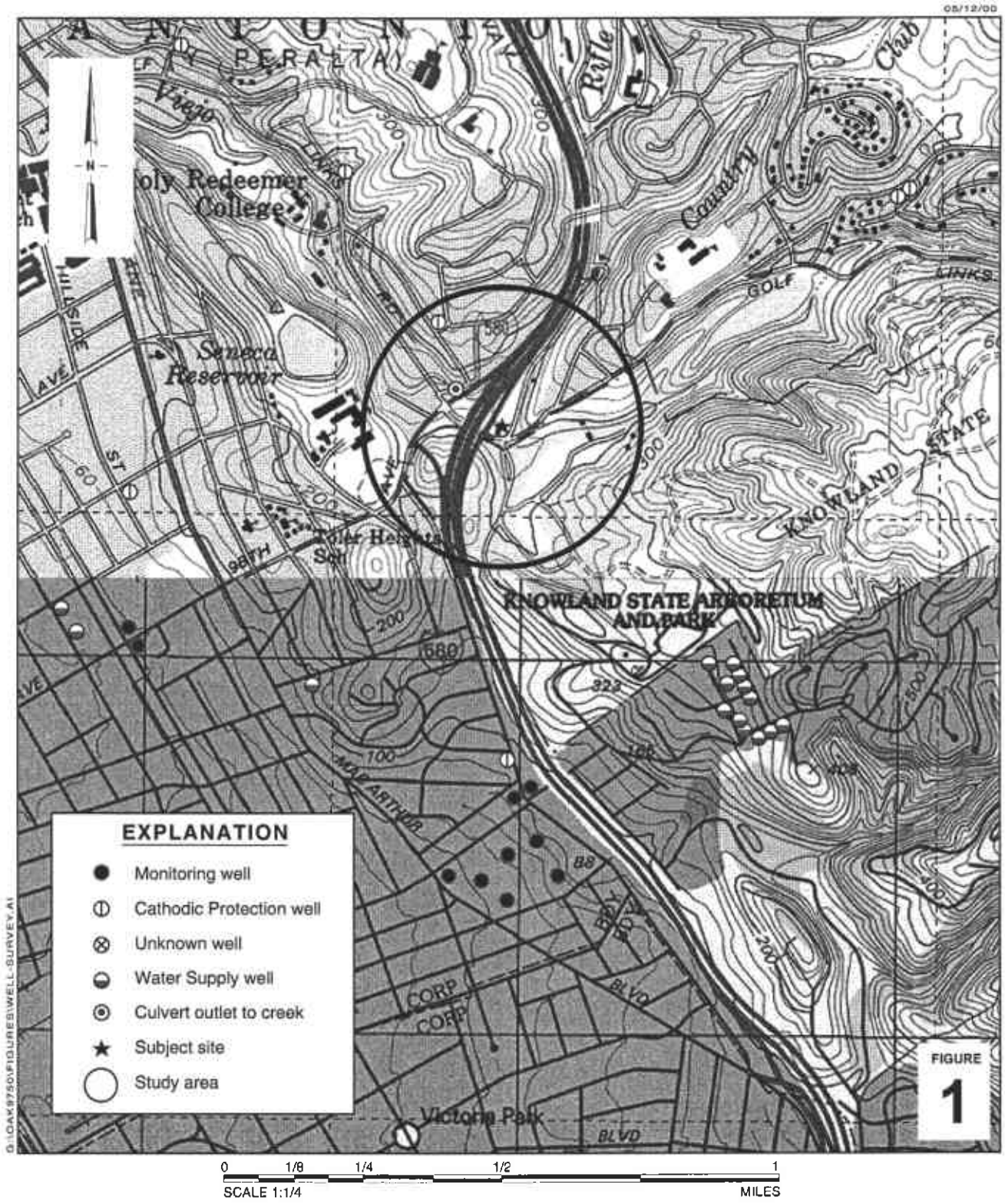
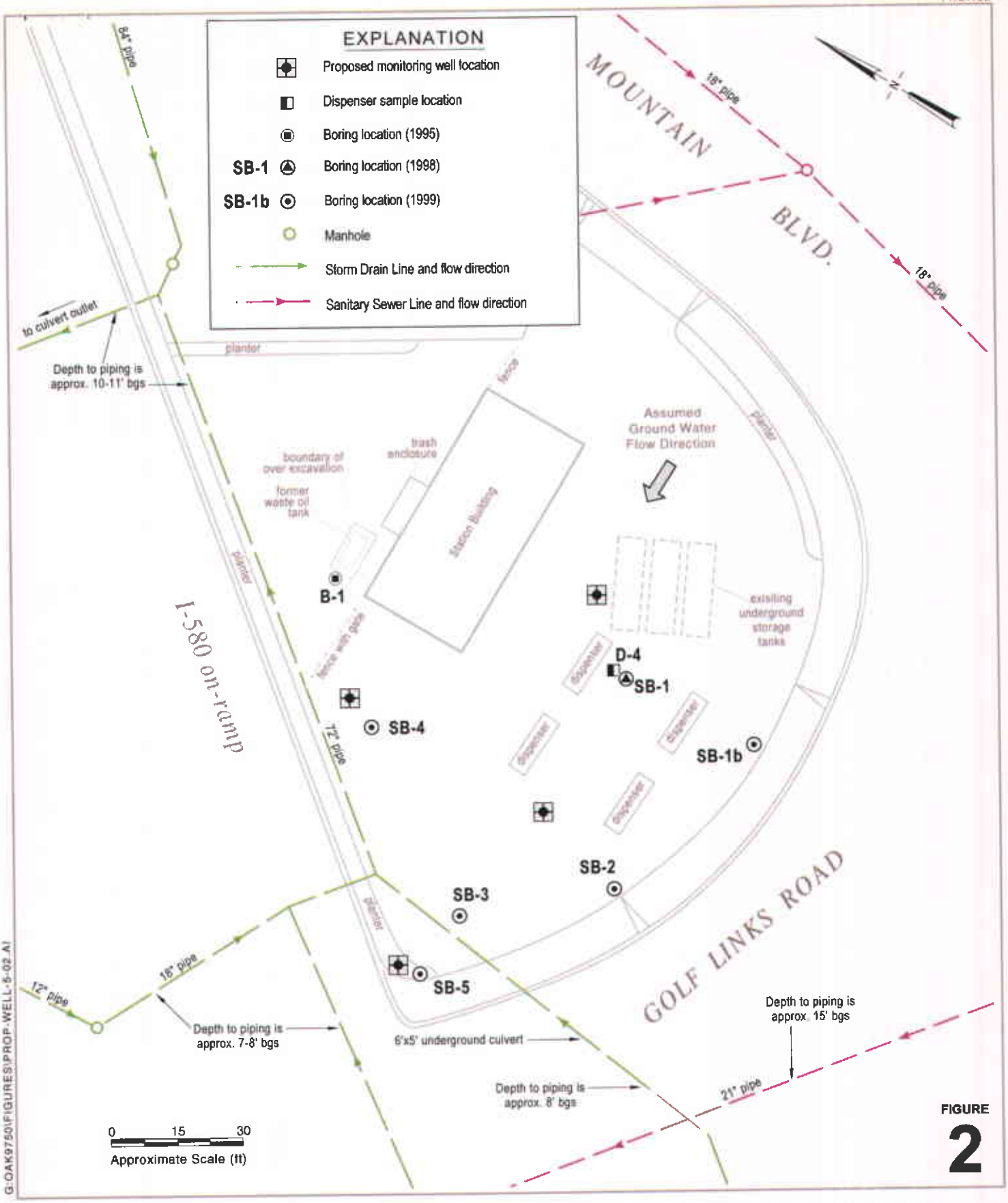


Shell-branded Service Station
9750 Golf Links Road
Oakland, California
Incident #98995744

CAMBRIA

Site Vicinity Map with Area Well Survey
(1/4-Mile Radius)

11/27/02



G:\OAK\9750\FIGURES\PROP-WELL-5-02.AI

FIGURE
2

Shell-branded Service Station
9750 Golf Links Road
Oakland, California
Incident #98995744

CAMBRIA

Proposed Monitoring Well Location Map

Arroyo Viejo Creek Sampling Locaitons

CAMBRIA

Shell-branded Service Station
9750 Golf Links Road
Oakland, California

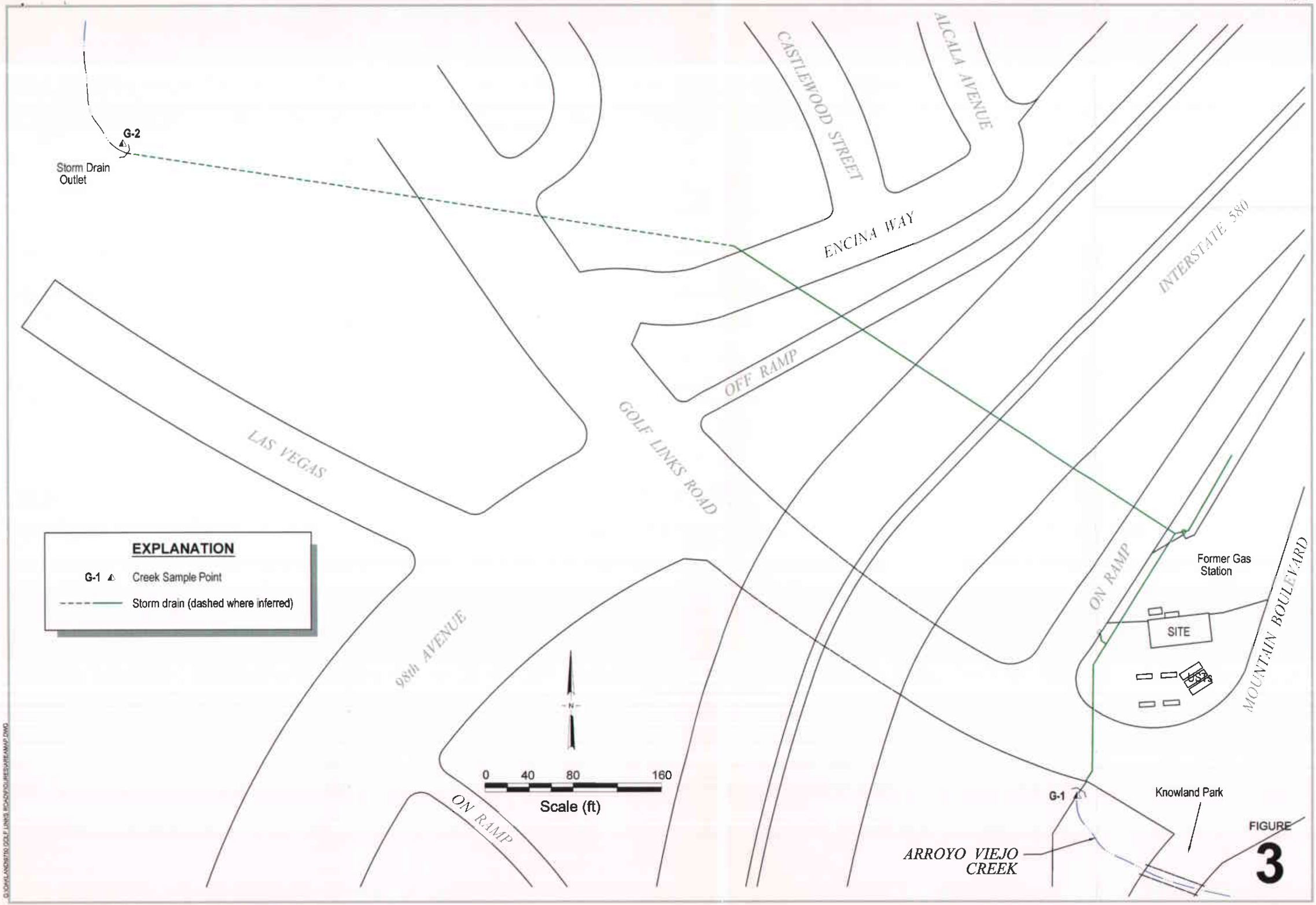


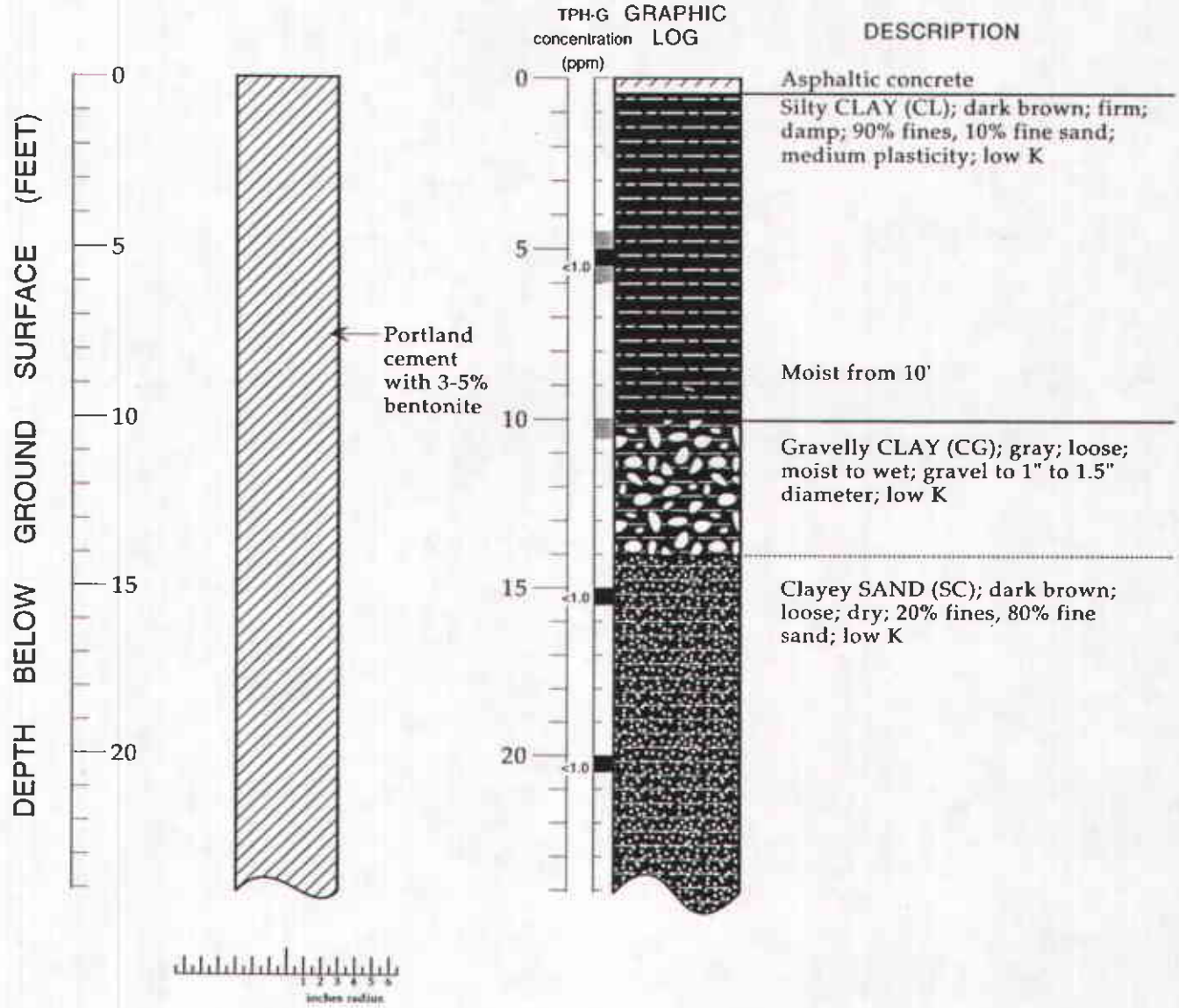
FIGURE
3

G:\OAKLAND\9750 GOLF LINKS ROAD\FIG\RESVAPE\MAP.DWG

ATTACHMENT A

Boring Log for B-1

BORING B-1



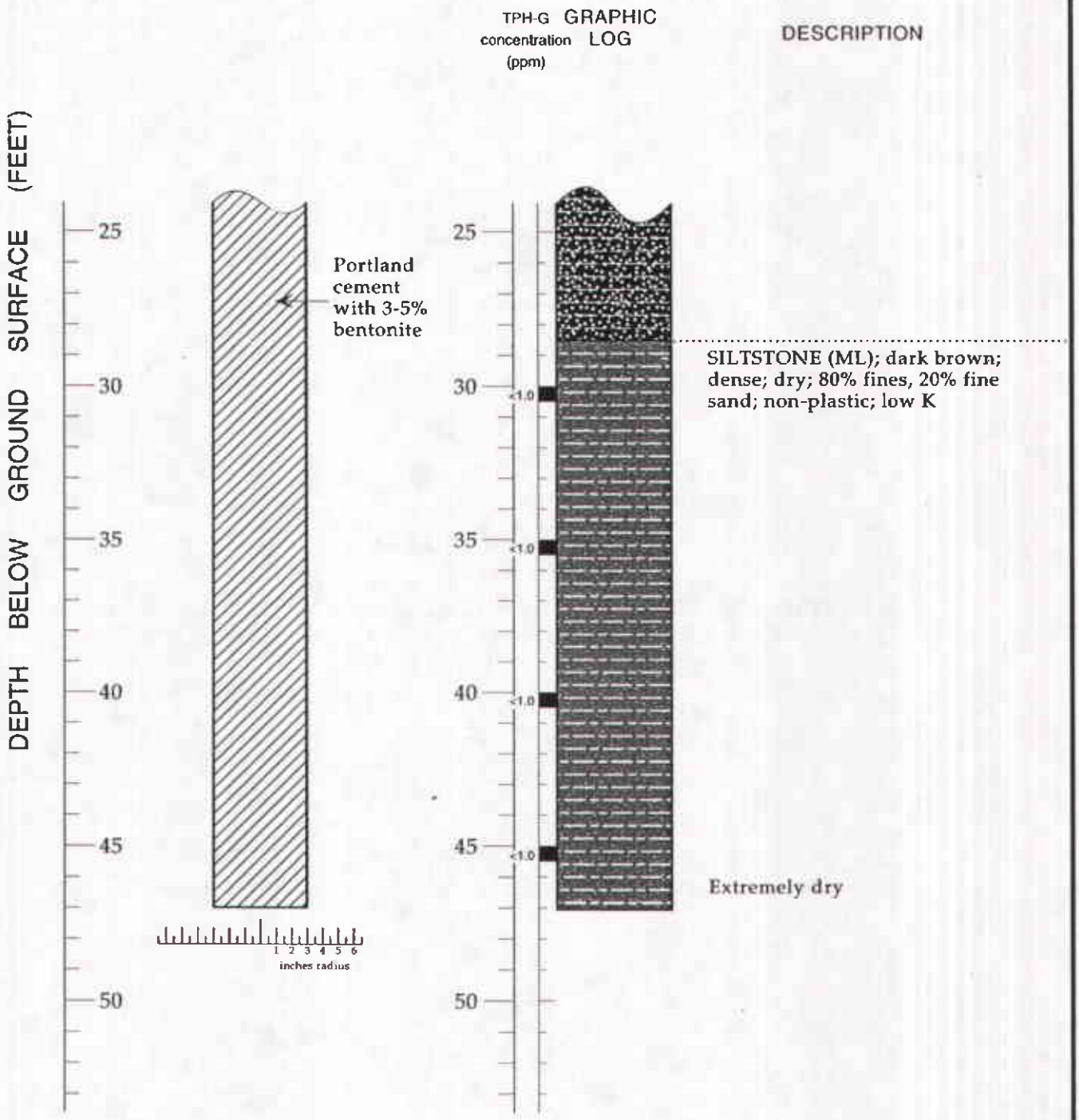
EXPLANATION

- ▼ Water level during drilling (date)
- ▽ Water level (date)
- ——..... Contact (dotted where approximate)
- —?—?— Uncertain contact
- ////////// Gradational contact
- Location of recovered drive sample
- Location of drive sample sealed for chemical analysis
- Cutting sample
- K = Estimated hydraulic conductivity

Logged By: Elizabeth Brogna
Supervisor: Peter F. McKereghan; CHG 64
Drilling Company: Gregg Drilling, Pacheco, CA
License Number: #C57-485165
Driller: Erik Christian
Drilling Method: Hollow-stem auger
Date Drilled: December 15, 1995
Type of Sampler: Split barrel (2" ID)
TPH-G: Total petroleum hydrocarbon as gasoline in soil by modified EPA Method 8015

Boring Log - Soil Boring B-1 - Shell Service Station, WIC#204-5508-2808, 9570 Golf Links Road, Oakland, California

BORING B-1 (cont.)



Boring Log - Soil Boring B-1 - Shell Service Station, WIC#204-5508-2808, 9570 Golf Links Road, Oakland, California

ATTACHMENT B

Standard Field Procedures for Monitoring Well Installation

CAMBRIA

STANDARD FIELD PROCEDURES FOR MONITORING WELL INSTALLATION

This document presents standard field methods for drilling and sampling soil borings and installing, developing and sampling groundwater monitoring wells. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

SOIL BORINGS

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor or staining, and to collect samples for analysis at a State-certified laboratory. All borings are logged using the Unified Soil Classification System by a trained geologist working under the supervision of a California Registered Geologist (RG).

Soil Boring and Sampling

Soil borings are typically drilled using hollow-stem augers or direct-push technologies such as the Geoprobe®. Soil samples are collected at least every five ft to characterize the subsurface sediments and for possible chemical analysis. Additional soil samples are collected near the water table and at lithologic changes. Samples are collected using lined split-barrel or equivalent samplers driven into undisturbed sediments at the bottom of the borehole.

Drilling and sampling equipment is steam-cleaned prior to drilling and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent.

Sample Analysis

Sampling tubes chosen for analysis are trimmed of excess soil and capped with Teflon tape and plastic end caps. Soil samples are labeled and stored at or below 4° C on either crushed or dry ice, depending upon local regulations. Samples are transported under chain-of-custody to a State-certified analytic laboratory.

Field Screening

One of the remaining tubes is partially emptied leaving about one-third of the soil in the tube. The tube is capped with plastic end caps and set aside to allow hydrocarbons to volatilize from the soil. After ten to fifteen minutes, a portable volatile vapor analyzer measures volatile hydrocarbon vapor concentrations in the tube headspace, extracting the vapor through a slit in the cap. Volatile vapor analyzer measurements are used along with the field observations, odors, stratigraphy and groundwater depth to select soil samples for analysis.

Water Sampling

Water samples, if they are collected from the boring, are either collected using a driven Hydropunch® type sampler or are collected from the open borehole using bailers. The groundwater samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4°C, and transported under chain-of-custody to the laboratory. Laboratory-supplied trip blanks accompany the samples and are analyzed to check for cross-contamination. An equipment blank may be analyzed if non-dedicated sampling equipment is used.

Grouting

If the borings are not completed as wells, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

MONITORING WELL INSTALLATION, DEVELOPMENT AND SAMPLING

Well Construction and Surveying

Groundwater monitoring wells are installed to monitor groundwater quality and determine the groundwater elevation, flow direction and gradient. Well depths and screen lengths are based on groundwater depth, occurrence of hydrocarbons or other compounds in the borehole, stratigraphy and State and local regulatory guidelines. Well screens typically extend 10 to 15 fee below and 5 feet above the static water level at the time of drilling. However, the well screen will generally not extend into or through a clay layer that is at least three feet thick.

Well casing and screen are flush-threaded, Schedule 40 PVC. Screen slot size varies according to the sediments screened, but slots are generally 0.010 or 0.020 inches wide. A rinsed and graded sand occupies the annular space between the boring and the well screen to about one to two feet above the well screen. A two feet thick hydrated bentonite seal separates the sand from the overlying sanitary surface seal composed of Portland type I,II cement.

Well-heads are secured by locking well-caps inside traffic-rated vaults finished flush with the ground surface. A stovepipe may be installed between the well-head and the vault cap for additional security.

The well top-of-casing elevation is surveyed with respect to mean sea level and the well is surveyed for horizontal location with respect to an onsite or nearby offsite landmark.

Well Development

Wells are generally developed using a combination of groundwater surging and extraction. Surging agitates the groundwater and dislodges fine sediments from the sand pack. After about ten minutes of surging, groundwater is extracted from the well using bailing, pumping and/or reverse air-lifting through an eductor pipe to remove the sediments from the well. Surging and extraction continue until at least ten well-casing volumes of groundwater are extracted and the sediment volume in the groundwater is negligible. This process usually occurs prior to installing the sanitary surface seal to ensure sand pack stabilization. If development occurs after surface seal installation, then development occurs 24 to 72 hours after seal installation to ensure that the Portland cement has set up correctly.

All equipment is steam-cleaned prior to use and air used for air-lifting is filtered to prevent oil entrained in the compressed air from entering the well. Wells that are developed using air-lift evacuation are not sampled until at least 24 hours after they are developed.

Groundwater Sampling

Depending on local regulatory guidelines, three to four well-casing volumes of groundwater are purged prior to sampling. Purging continues until groundwater pH, conductivity, and temperature have stabilized. Groundwater samples are collected using bailers or pumps and are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4°C, and transported under chain-of-custody to the laboratory. Laboratory-supplied trip blanks accompany the samples and are analyzed to check for cross-contamination. An equipment blank may be analyzed if non-dedicated sampling equipment is used.

Waste Handling and Disposal

Soil cuttings from drilling activities are usually stockpiled onsite and covered by plastic sheeting. At least three individual soil samples are collected from the stockpiles and composited at the analytic laboratory. The composite sample is analyzed for the same constituents analyzed in the borehole samples in addition to any analytes required by the receiving disposal facility. Soil cuttings are transported by licensed waste haulers and disposed in secure, licensed facilities based on the composite analytic results.

Groundwater removed during development and sampling is typically stored onsite in sealed 55-gallon drums. Each drum is labeled with the drum number, date of generation, suspected contents, generator identification and consultant contact. Upon receipt of analytic results, the water is either pumped out using a vacuum truck for transport to a licensed waste treatment/disposal facility or the individual drums are picked up and transported to the waste facility where the drum contents are removed and appropriately disposed.

ATTACHMENT C

Standard Field Procedures for Creek Sampling

CAMBRIA

STANDARD FIELD PROCEDURES FOR CREEK SAMPLING

This document describes Cambria Environmental Technology=s standard field methods for creek sampling. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

Objectives

Creek samples are collected and analyzed to characterize constituent distribution in water and to assess whether water contaminants pose a threat to human health or the environment.

Creek Sampling

A creek sample is collected by inserting a container under or down current of a discharge with the container opening facing upstream. Generally, simplified equipment and procedures can be used. In most cases, the sample container itself may be used to collect the sample. To ensure that the creek samples are representative of the flow in the channel, the following procedures are followed.

- X Label sample containers before sampling event,
- X Take a cooler with ice to the sampling point,
- X Take the sample from the horizontal center and two-thirds of the depth of the channel when possible,
- X Take the sample from a relatively straight section of the creek channel,
- X Avoid stirring up bottom sediments in the channel,
- X Hold the container so the opening faces downstream,
- X Avoid touching the inside of the container to prevent contamination,
- X Keep the sample free from uncharacteristic floating debris,
- X Wash sampling equipment before, during, and after sampling activities with an EPA-approved detergent,
- X If taking numerous samples, keep the samples separate and labeled clearly, and
- X Use safety precautions.

Sample Storage, Handling and Transport

Samples are stored out of direct sunlight in coolers at or below 4° C on either crushed or dry ice, and transported under chain-of-custody to a state-certified analytic laboratory.