February 18, 2015

495791.A1.03

Mr. Paul Cho
Regional Water Quality Control Board,
Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, California 90013

Subject: Horizontal Biosparge Well and Soil Vapor Monitoring Probe Completion Report
SFPP Norwalk Pump Station, 15306 Norwalk Boulevard, Norwalk, California

Dear Mr. Cho:

On behalf of SFPP, L.P. (SFPP), an operating partner of Kinder Morgan Energy Partners, L.P. (KMEP), CH2M HILL Engineers, Inc. (CH2M HILL) has prepared this report detailing the drilling and installation of horizontal biosparge well BS-01 and soil vapor monitoring probes SVM-11 through SVM-16, at the SFPP Norwalk Pump Station. Figure 1 shows the location of the Norwalk site. Figure 2 displays the location of the biosparge well and new soil vapor monitoring probes.

This work was performed by CH2M HILL in accordance with the following work plan and response to Regional Water Quality Control Board, Los Angeles Region (RWQCB) comments:

- **Horizontal Biosparge System Construction and Pilot Test Work Plan, SFPP Norwalk Pump Station, 15306 Norwalk Boulevard, Norwalk, California,** prepared by CH2M HILL, dated November 18, 2013.

In the work plan, KMEP proposed to install two biosparge wells in 2014: one well in the southeastern area and one well in the south-central area. KMEP has since changed their approach and installed one well in the south-central area to be used for pilot testing in 2015. Expansion of the biosparge system to the southeastern area will be evaluated after sufficient pilot test data are collected over a 1-year period for the initial biosparge well. Pilot test data will be provided to the RWQCB and Restoration Advisory Board (RAB) members under separate cover on a monthly basis once pilot testing activities commence.

**Background**

This section presents background information including a summary of the site description, hydrogeologic conditions, and an overview of biosparge technology. This summary was extracted from the Light Nonaqueous Phase Liquids (LNAPL) Conceptual Site Model (CSM)\(^1\). Please refer to the LNAPL CSM for additional details and rationale for implementation of the biosparge technology at the Norwalk site.

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Site Description
The SFPP Norwalk Pump Station is located within the Defense Fuel Support Point (DFSP) Norwalk facility at 15306 Norwalk Boulevard in Norwalk, California. The DFSP is owned by Defense Logistics Agency (DLA) Energy (formerly Defense Energy Support Center) and was formerly occupied by 12 inactive aboveground fuel storage tanks and associated piping and facilities. The tanks had a maximum capacity of 35 million gallons and were used to store and distribute refined petroleum products including jet propellant numbers 5 and 8 (JP-5 and JP-8), and reportedly also stored aviation gasoline and jet propellant number 4 (JP-4). DLA Energy also previously operated truck fill stands and various fuel transfer systems. The facility was decommissioned in 2001 and is no longer used to handle fuel. The aboveground tanks and the main infrastructure were demolished in 2011; demolition of the subsurface piping was completed in 2012.

SFPP has equipment within 2 acres at the DFSP facility and easements for its pipelines along the southern and eastern boundaries of the facility. Previously, SFPP operated a pump station near the south-central area of the site. The pump station was used to transfer fuel to and from the DFSP facility, and as an in-line pumping station for portions of the SFPP pipeline network. The pump station was decommissioned in 2001, but three pipelines heading eastward along the southern boundary of the DFSP facility (one of which bends at the southeastern corner of the facility and continues northward within the eastern easement) remain in service and continue to convey refined petroleum fuels including gasoline, diesel, and jet fuel. The pipelines are fitted with block valves, two of which are located along a 24-inch-diameter pipeline and within areas currently undergoing remediation. One block valve is located in the south-central portion of the site and is referred to as the “intermediate 24-inch block valve.” The other block valve is located offsite near the southeastern area of the site and is referred to as the “southeastern 24-inch block valve” or “offsite 24-inch block valve.”

Subsurface assessments have been performed at the DFSP facility since 1986. Groundwater monitoring and remediation wells have been installed at the site for monitoring and as components of groundwater remediation systems. The investigations have evaluated and defined subsurface soil and groundwater within the uppermost groundwater zone that has been impacted by fuel-related hydrocarbons from historical releases from SFPP’s pipelines at the DFSP facility. The primary impacts are to groundwater associated with fuel product that historically leaked from block valves and migrated vertically downward to the water table. Separate-phase floating product, or LNAPL, as well as sorbed-phase and dissolved-phase fuel hydrocarbons have been delineated in areas beneath the DFSP facility and at offsite properties to the south, west, and east. Site assessments indicated that the chemicals of potential concern are total petroleum hydrocarbons (TPH), including TPH quantified as gasoline (TPH-g), diesel fuel (TPH-d), JP-4, JP-5, and JP-8; benzene, toluene, ethylbenzene, and total xylenes (BTEX); 1,2-dichloroethane (1,2-DCA); methyl tertiary butyl ether (MTBE); and tertiary butyl alcohol (TBA). A groundwater Monitoring and Reporting Program (MRP) has been in effect at the site since 1995.

Hydrogeologic Conditions
The DFSP facility is underlain by the following hydrogeologic units (listed in order of shallowest to deepest):

• **Semiperched groundwater zone between depths of approximately 25 and 50 feet below ground surface (bgs).** Groundwater flow within this uppermost zone is generally north to northwestward with a horizontal gradient of approximately 0.001 foot per foot (ft/ft).

• **Bellflower aquitard of the Lakewood Formation between depths of approximately 50 and 80 feet bgs beneath the site.** The Bellflower aquitard consists of predominantly clay, silty clay, and sandy clay with some interbedded sand with silt.

• **Exposition aquifer between depths of approximately 80 and 220 feet bgs.** The potentiometric surface in the Exposition aquifer is approximately 20 feet lower than that in the semiperched uppermost
groundwater zone. This relatively consistent difference in hydraulic heads between the semiperched upper groundwater zone and the Exposition aquifer indicates that the Bellflower aquitard inhibits the vertical movement of groundwater in the site area. The horizontal hydraulic gradient in the Exposition aquifer beneath the site area has had a magnitude of approximately 0.001 ft/ft and a generally southeastward direction.

**Biosparge Technology Overview**

Several remediation technologies were evaluated in the LNAPL CSM; however, biosparge technology (a form of air sparging) coupled with soil vapor extraction (SVE) was selected as the alternate interim remedy for achieving project objectives based on evaluation of the cost, effectiveness (including timeframe required for treatment), implementability, and third-party impacts. The horizontal biosparge system at buildout will supplement and ultimately replace the current dual-phase extraction remediation system. The evaluation of remedial alternatives and selection of biosparge technology was performed in accordance with the guidance document, *Evaluating LNAPL Remedial Technologies for Achieving Project Goals*.

Air sparging (that is, biosparging) technology involves the injection of ambient air or other gases (for example, oxygen) into groundwater, typically beneath the smear zone, to increase dissolved oxygen (DO) levels that enhance aerobic biodegradation. Some volatilization of low-molecular-weight hydrocarbons may also occur during the initial period of operation. Volatilized hydrocarbons are captured using SVE wells and treated using thermal or catalytic oxidation or carbon adsorption.

Biosparging generally utilizes the same principles as traditional air sparging, although at a lower and/or “pulsed” air injection rate. In addition, the primary mechanism for reducing residual LNAPL is through solubilization, followed by enhanced biodegradation of hydrocarbons. The relatively low delivery rate of air reduces the potential for volatilization and migration of volatile hydrocarbons through the vadose zone.

Biosparging is a proven and effective technology for enhanced mass removal at sites impacted by hydrocarbon constituents. Previous investigations at the site indicate that the lithology present in the target treatment zone (uppermost groundwater zone) consists of poorly graded sand, silty sand, clayey sand, and sandy silt. In general, the lower 20 feet (from 30 to 50 feet bgs) consist of sands, while the upper 30 feet (from ground surface to 30 feet bgs) predominantly consist of interbedded sand, silty sand, clayey sand, and sandy silt.

**Project Objectives and Approach**

The work performed includes the installation of a pilot-scale horizontal biosparge well in the south-central area of the site. Once the well is operational, pilot testing data will be collected to evaluate the feasibility of biosparge technology to enhance mass removal of free-phase and dissolved-phase hydrocarbon constituents beneath the south-central and southeastern areas of the site.

Six nested soil vapor probes also were installed as part of this investigation to supplement the existing soil vapor probes and provide a more robust soil vapor network in the south-central area. The data from this network will be used to:

- Evaluate biosparge system performance and assist with natural source zone depletion (NSZD) testing and monitoring. NSZD testing and monitoring will be performed to evaluate the potential future use of this technology as a stand-alone remedy.

- Evaluate potential for vapor migration beneath the offsite residential areas located immediately south of the site. This objective will be accomplished by conducting routine sampling of the new and previously installed soil vapor monitoring probes (Figure 2).

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Field Activities

Field activities included the drilling and installation a biosparge well and soil vapor monitoring probes as follows:

- One 4-inch-diameter horizontal biosparge well (BS-01) was drilled and installed in the south-central area of the site.
- Six nested soil vapor monitoring probes (SVM-11 to SVM-16) were installed in the south-central area to provide a more robust monitoring network during future pilot testing activities.

The following sections provide additional details regarding the field activities. The work was performed between August 11 and September 26, 2014.

Pre-field Activities

CH2M HILL performed the following permitting and field preparation tasks prior to commencement of field construction activities:

- Updated the existing site-specific health and safety plan to incorporate the planned fieldwork.
- Notified the RWQCB a minimum of 1 week in advance of the planned field activities.
- Marked the proposed biosparge well and soil vapor monitoring probe locations.
- Notified Underground Service Alert (USA). As required by USA, the borings were called-in and marked-out in white paint at least 2 business days prior to drilling. Dig Alert Number A42051301 was assigned for this project.
- Obtained the required biosparge well permit from the Los Angeles County Department of Public Health (Attachment A). County permits were not required for the soil vapor monitoring probes.
- Performed an underground utility check using a private utility-locating subcontractor. CH2M HILL and the subcontractor met with KMEP operations staff, marked-out the boring locations, and cleared the boring locations of potential underground utilities and other infrastructure.
- Coordinated with KMEP personnel to arrange for a KMEP field inspector to be present during field activities.

Horizontal Biosparge Well Completion

CH2M HILL and the directional drilling subcontractor, Directed Technologies Drilling, Inc. (DTD), used blind-end horizontal drilling technology to drill and install a 4-inch-diameter horizontal biosparge well to a vertical depth of approximately 45 feet bgs. A conceptual well construction diagram is presented in Figure 3. The purpose of installing the well to this depth is to place the horizontal well screens as close as practicable to the bottom of the uppermost groundwater zone to maximize its radius of influence (ROI). The ROI will be greater with maximum submergence below the water table, which will allow the sparged air to spread laterally as it rises after injection. Well construction activities were conducted between August 12 and August 27, 2014.

Borehole Navigation

DTD used a Gyroscopic Steering Tool (GST), supplied and operated by SlimDril International of Houston, Texas, to determine the precise location of the drilling bit during borehole advancement. The GST is an advanced navigation and locating tool that does not rely on electromagnetic signals, which can be distorted or attenuated, for positional locating. Instead, the GST uses a series of networked optical gyroscopes that provide inertial navigation. The GST is considered to have an accuracy within 2 percent of the intended bore path. The use of the GST was required for this project due to potential electromagnetic interferences from
nearby KMEP pipelines and the Southern California Edison (SCE) power substation, which lies directly above the biosparge well bore path.

Prior to drilling, the proposed bore path of the well (at surface) was surveyed by Calvada Surveying, Inc. (Calvada) and the results were submitted to DTD. SlimDril used the survey data to navigate the advancement of the drill bit along the proposed bore path with minimal lateral deviation. A copy of the surveyor report is provided in Attachment B.

**Drilling and Construction**

The drill bit diameter of the BS-01 borehole for biosparge well installation was approximately 12.5 inches. The borehole diameter ranged from 100 to 150 percent of the drill bit size, due to asymmetrical enlargement of the horizontal borehole by gravitational effects during drilling. Biodegradable guar-based drilling fluid (Baroid BioBore biodegradable biopolymer with small additions of Zanflow viscosifier, xanthan gum, and soda ash) was used to facilitate advancement of the drill bit and circulation of the drill cuttings from the borehole. Prior to drilling, another subcontractor (BC2 Environmental) air knifed to 6 feet bgs at the entry point and 30 lateral feet west of the entry point to check for the presence of underground utilities.

The well entry point was positioned just south of the southeastern corner of the former truck fill stand (Figure 2). The well bore was drilled 861.7 lateral feet from the entry point. Soil cutting returns at the drilling rig mud system were logged by a CH2M HILL geologist for color, moisture content, grain size, and other pertinent soil characteristics. Soil also was screened in the field using a photoionization detector (PID) for the potential presence of volatile organic compounds (VOCs). A copy of the boring log is provided in Attachment C.

Two hundred fifty-feet of riser pipe (blank casing) were installed from the entry point to the beginning of the screened interval. The well was screened between 250 feet and 850 feet from the entry point. The screened interval was placed so that it is beneath the LNAPL smear zone in the south-central area. Ten feet of blank casing and a 0.75-foot-long end cap was installed at the distal end of the well. The well was constructed of 4-inch-diameter, flush threaded PVC Schedule 80 casing and slotted pipe. The screen has a maximum slot width of 0.011 inches, a slot length of 1.2 inches, and 3 rows at 11 slots per foot (total of 33 slots per foot; 0.28 to 0.30 percent open area). The pipe was slotted longitudinally to create a single slot zone, with slots uniformly distributed around the circumference of the pipe. No filter pack was required for the screen interval.

After the casing and screen were installed, a 4-inch-diameter shale trap packer was installed at 39 feet from the entry point (equates to approximately 12 vertical feet bgs) to facilitate grouting the surface completion. Approximately 40 cubic feet of 5 percent bentonite cement was used to grout the well to land surface via a 2-inch PVC tremie pipe; 1.5 bags of hydrated bentonite pellets were used to complete the surface seal. A biosparge well construction diagram is presented in Attachment D. A subcontractor well completion report, provided by DTD, is included in Attachment E.

**Well Development**

Well development was conducted to ensure effective communication between the well and the surrounding geologic formation. A combination of jetting and flushing clean water and a drilling-fluid-breaking enzyme through the well screen was employed for development. The total development water flushed and jetted into the well was approximately 8,900 gallons, with a total of 23 jetting passes through the well screen section. Field water quality parameters (pH, temperature, conductivity, turbidity, and sand content) were collected during development activities and are included in the well development log (Attachment F).
Well Vault Completion

A 2-foot by 4-foot steel-walled, bottomless vault was installed. The vault assembly includes a diamond plate, H-20 traffic-rated lid with spring assist and bolted down locking device. The vault has sidewalls approximately 24 inches in height.

The vault was set and leveled to prevent ponding or entrapment of rainwater on the wellhead. Openings were drilled through the vault walls to provide entry for the well riser and access for the air supply stub out. The wellhead assembly of a “Y”, with a 4-inch ball valve, 3-inch reducer, and 3-inch stub out was made on the angled portion of the “Y”. The stub out terminates approximately 2 to 3 feet beyond the concrete apron surrounding the vault, and is closed with a flush-threaded 3-inch cap. The straight part of the “Y” was completed with a flush-threaded, 4-inch cap with O-ring and pipe dope to form an airtight seal and provide access for future downhole activities.

A concrete slab was constructed that exceeds 18 inches in all directions from the rim of the vault, to a slab depth of nominal 6 inches.

Soil Vapor Probe Completion

CH2M HILL and a drilling subcontractor, Environmental Support Technologies, Inc. (EST) drilled and installed six triple nested soil vapor monitoring probes (SVM-11 to SVM-16) to supplement the existing monitoring probes in the south-central area. The objective is to have a sufficient coverage of probes spatially to evaluate the ROI of the biospharge well, potential migration of vapor hydrocarbons, and the changes in vapor chemistry with distance above the smear zone and increasing distance from the biospharge well.

The work was completed in general accordance with the Advisory - Active Soil Gas Investigations (Advisory) (California Department of Toxic Substances Control [DTSC], 2012 and updates). Each monitoring point consists of a soil vapor probe nest with probes completed at approximately 7, 15, and 22 feet bgs in a single borehole. Figure 2 shows the locations of the soil vapor monitoring points. In general, new soil vapor monitoring points were positioned at locations with increasing lateral distance from the biospharge well screen.

Prior to drilling, the boring locations were cleared to a depth of approximately 12 feet bgs using hand-auger methods to check for the presence of underground utilities. Borings were then advanced using direct-push methods to approximately 23 feet bgs. Continuous soil cores were collected using a macro-core sampler during borehole advancement; the cores were described by a CH2M HILL geologist for color, moisture content, grain size, and other pertinent soil characteristics. Soil also was screened in the field using a PID for the potential presence of VOCs. Boring logs and soil vapor probe completion diagrams are included in Attachment G.

Each vapor probe was constructed with new ¼-inch-outside-diameter Teflon tubing with a nominal 6-inch-long stainless steel screen. A 1-foot-thick filter pack consisting of No. 3 sand was placed around each screen. A 1-foot-thick dry granular bentonite was placed on top of each filter sand pack. Granular bentonite was then installed and hydrated in place (at 6-inch lifts) between the top of the dry granular bentonite and the bottom of each screen interval. A sampling valve was fitted to the end of each tubing. The valve will be kept closed until purging and sampling activities commence. Each soil vapor monitoring point was completed at the surface with a flush-mounted, traffic-rated well box. Construction details of the soil vapor monitoring probes are provided in Table 1 and Attachment G.

Surveying

Following completion of the field investigation, the location (northing and easting coordinates) and ground surface elevation of the soil vapor probes were surveyed in accordance with the RWQCB GeoTracker requirements by Calvada, a California-licensed land surveyor. The surveyor’s report is provided in Attachment B.
Investigative-Derived Waste

Investigation-derived waste (IDW) generated during field activities included soil cuttings/drilling fluids, decontamination water, purged groundwater, and disposable sampling supplies and personal protective equipment (for example, nitrile gloves). Soil cuttings and drilling fluids were containerized in 20-cubic-yard roll-off bins. Rinse water and purged groundwater were containerized in 8,000-gallon polyethylene holding tanks with secondary containment. Drilling fluids were eventually transferred from the roll-off bins to the holding tanks prior to offsite transport. The containers were labeled and temporarily stored at the drilling site pending analytical results for waste classification and eventual disposal by KMEP’s waste hauling contractor (Patriot Environmental Services [Patriot]).

Provided below is a summary of liquid and solid waste removed from the site during the investigation.

Liquids

- Approximately 9,000 gallons of nonhazardous waste liquids (biosparge well drilling fluids and development water) were removed from the site on September 10, 2014, by Patriot and transported to Demenno/Kerdoon at 2000 North Alameda Street, Compton, California 90222.
- Approximately 8,000 gallons of nonhazardous waste liquids (biosparge well drilling fluids and development water) were removed from the site on September 11, 2014, by Patriot and transported to Demenno/Kerdoon.
- Approximately 750 gallons of nonhazardous biosparge well drilling fluids and development water were removed from the site by Patriot on September 23, 2014, and transported to Demenno/Kerdoon.

Solids

- Approximately 5 cubic yards of nonhazardous waste solids (biosparge well drill cuttings) were removed from the site on September 23, 2014, by Patriot and transported to Filter Recycling Services, Inc., at 180 West Monte Avenue, Bloomington, California 92316.
- Approximately 15 cubic yards of nonhazardous waste solids (biosparge well drill cuttings) were removed from the site on September 30, 2014, by Patriot and transported to Filter Recycling Services, Inc.
- General refuse (such as disposable sampling supplies and used gloves) was disposed of onsite as municipal trash.

Copies of the waste manifests are provided in Attachment H.

Pilot Test Schedule

It is anticipated that pilot testing of the horizontal biosparge well will commence in the first or second quarter of 2015. As mentioned above, pilot test status reports will be provided to the RWQCB and RAB on a monthly basis during pilot test activities. The reports will include analytical and operational data, and a brief discussion of the results.
If you have any additional questions regarding this investigation, please contact Dan Jablonski at (213) 228-8271, or Mr. Stephen Defibaugh, KMEP’s Remediation Project Manager, at (714) 560-4802.

Sincerely,

CH2M HILL Engineers, Inc.

Dan Jablonski
Project Manager

Mark Wuttig, P.G.
Senior Geologist

Attachments:

- Table 1 – Soil Vapor Monitoring Probe Completion Details
- Figure 1 – Site Location Map
- Figure 2 – Biosparge Well and Soil Vapor Monitoring Probe Locations
- Figure 3 – Conceptual Horizontal Biosparge Well Construction Diagram
- Attachment A – Los Angeles County Department of Public Health Well Permit
- Attachment B – Surveyor Reports
- Attachment C – Biosparge Well Boring Log
- Attachment D – Biosparge Well Construction Diagram
- Attachment E – DTD Well Completion Report
- Attachment F – Biosparge Well Development Log
- Attachment G – Soil Vapor Probe Boring Logs and Construction Diagrams
- Attachment H – Waste Manifests

Distribution:

- Steve Defibaugh, Kinder Morgan Energy Partners, L.P.
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- Angelina Mancillas, Office of Congresswoman Linda T. Sanchez (electronic only)
- Luis Gonzalez, Office of State Senator Ron Calderon (electronic only)
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<td>23</td>
<td>22.5</td>
<td>23</td>
<td>22</td>
<td>22.5</td>
<td>21.5</td>
<td>22.5</td>
<td>20.5</td>
<td>21.5</td>
<td>15.5</td>
</tr>
<tr>
<td>SVM-16</td>
<td>Shallow</td>
<td>Hand auger</td>
<td>3</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>7</td>
<td>7.5</td>
<td>6.5</td>
<td>7.5</td>
<td>5.5</td>
<td>6.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>Geoprobe</td>
<td>2.25</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>15.5</td>
<td>16</td>
<td>15</td>
<td>16</td>
<td>14</td>
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<td>7.5</td>
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<td>Deep</td>
<td>Geoprobe</td>
<td>2.25</td>
<td>23</td>
<td>22.5</td>
<td>23</td>
<td>22</td>
<td>22.5</td>
<td>21.5</td>
<td>22.5</td>
<td>20.5</td>
<td>21.5</td>
<td>16</td>
</tr>
</tbody>
</table>

Notes:
--- = does not apply

bgs = below ground surface

Filter pack consists of No. 3 Monterey fine sand.

Bentonite is granular bentonite.
LEGEND

- Monitoring or TFE/SVE Well Screen
- Horizontal Biosparge Well Screen
- Approximate Groundwater Elevation in Uppermost Groundwater Zone (April 2013)

Note: Top of the Bellflower Aquitard was interpreted based on (1) review of the lithological descriptions provided on the select well and boring logs (Preliminary Conceptual Site Model, AMEC Geomatics, Inc., February 13, 2009) and (2) Conceptual Site Model and Proposed Alternate Interim Remedy for Soil, Groundwater, and LNAPL (CH2M HILL, September 3, 2013).

FIGURE 3
Conceptual Horizontal Biosparge Well Completion Diagram
SFPP Norwalk Pump Station
Norwalk, California
Attachment A
Los Angeles County
Department of Public Health Well Permit
890917-67
15306 Norwalk Blvd Norwalk 90650 Work Plan Approval

TO BE COMPLETED BY APPLICANT:

<table>
<thead>
<tr>
<th>WORK SITE ADDRESS</th>
<th>CITY</th>
<th>ZIP</th>
<th>EMAIL ADDRESS FOR WELL PERMIT APPROVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>15306 Norwalk Blvd</td>
<td>Norwalk</td>
<td>90650</td>
<td><a href="mailto:Djablon1@ch2m.com">Djablon1@ch2m.com</a></td>
</tr>
</tbody>
</table>

NOTICE:

- WORK PLAN APPROVALS ARE VALID FOR 180 DAYS. 30 DAY EXTENSIONS OF WORK PLAN APPROVALS ARE CONSIDERED ON AN INDIVIDUAL (CASE-BY-CASE) BASIS AND MAY BE SUBJECT TO ADDITIONAL PLAN REVIEW FEES (HOURLY RATE AS APPLICABLE).
- WORK PLAN MODIFICATIONS MAY BE REQUIRED IF WELL AND GEOLOGIC CONDITIONS ENCOUNTERED AT THE SITE INSPECTION ARE FOUND TO DIFFER FROM THE SCOPE OF WORK PRESENTED TO THE DEPARTMENT OF PUBLIC HEALTH—DRINKING WATER PROGRAM.
- WORK PLAN APPROVALS ARE LIMITED TO COMPLIANCE WITH THE CALIFORNIA WELL STANDARDS AND THE LOS ANGELES COUNTY CODE AND DOES NOT GRANT ANY RIGHTS TO CONSTRUCT, RENOVATE, OR DECOMMISSION ANY WELL. THE APPLICANT IS RESPONSIBLE FOR SECURING ALL OTHER NECESSARY PERMITS SUCH AS WATER RIGHTS, PROPERTY RIGHTS, COASTAL COMMISSION APPROVALS, USE COVENANTS, ENCROACHMENT PERMISIONS, UTILITY LINE SETBACKS, CITY/COUNTY PUBLIC WORKS RIGHTS OF WAY, ETC.
- ALL FIELD WORK MUST BE CONDUCTED UNDER THE DIRECT SUPERVISION OF A PROFESSIONAL GEOLOGIST LICENSED IN THE STATE OF CALIFORNIA.
- THIS PERMIT IS NOT COMPLETE UNTIL ALL OF THE FOLLOWING REQUIREMENTS ARE SIGNED BY THE DEPUTY HEALTH OFFICER. WORK SHALL NOT BE INITIATED WITHOUT A WORK PLAN APPROVAL STAMPED BY THE DEPARTMENT OF PUBLIC HEALTH—DRINKING WATER PROGRAM.
- ONCE APPROVED NOTIFY VINCENT GALLEGOS AT vgallegos@ph.lacounty.gov PREFERABLY 4 BUSINESS DAYS BEFORE WORK IS SCHEDULED TO BEGIN.

TO BE COMPLETED BY DEPARTMENT OF PUBLIC HEALTH—DRINKING WATER PROGRAM:

X WORK PLAN APPROVED

DATE: June 30, 2014

ADDITIONAL APPROVAL CONDITIONS:

- Please provide project dates and time via my email listed above this comment box
- Submit Copy of DWR Well Completion Report for final signoff.

Vincent Gallegos R.E.H.S.
Drinking Water Program

□ ANNULAR SEAL FINAL INSPECTION REQUIRED

X WELL COMPLETION REPORT REQUIRED

DATE ACCEPTED: REHS signature

DATE ACCEPTED: REHS signature
Attachment C
Biosparge Well Boring Log
### Environmental Data (PID = ppm)

<table>
<thead>
<tr>
<th>Soil Name, USCS Group Symbol, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silty Sand (SM)</td>
<td>geophysical utility survey performed for subsurface clearance. Air knifed to 6 ft bgs at borehole entry and to 8 ft bgs at 30 ft west of entry point along borehole alignment. No conflicts encountered. Samples for logging were collected from drill cuttings from the borehole drilling fluid returns. Drilling fluid viscosity averaged 50 sec/qt. Drilling fluid pressure averaged 150-175 psi. Drilling fluid borehole return averaged 160 gpm.</td>
</tr>
<tr>
<td>Poorly Graded Sand (SP)</td>
<td>strong hydrocarbon odor</td>
</tr>
</tbody>
</table>

### Well Details

- **Project Number:** BS-01
- **Start:** 8/13/2014
- **End:** 8/21/2014
- **Logger:** M. Mayry

#### Borehole Log

<table>
<thead>
<tr>
<th>Borehole Number</th>
<th>Soil Name, USCS Group Symbol, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Silty Sand (SM) grayish brown (2.5Y 5/2), 85% fine to medium sand, subangular, 15% fines, trace mica</td>
<td>as above</td>
</tr>
<tr>
<td>2</td>
<td>Poorly Graded Sand (SP) dark grayish brown (2.5Y 4/2), 95% fine sand, micaceous, 5% fines, trace medium sand</td>
<td>greenish gray (10Y 5/1), as above, 95% fine to medium sand, 5% fines, trace coarse sand, subangular</td>
</tr>
<tr>
<td>3</td>
<td>Silty Sand (SM) greenish gray (10Y 5/1), 70% fine to medium sand, micaceous, 30% fines, trace medium sand, subangular</td>
<td>strong hydrocarbon odor</td>
</tr>
</tbody>
</table>

#### Soil Description

- **Silty Sand (SM):**
  - Color: Grayish brown (2.5Y 5/2)
  - Moisture Content: 85% fine to medium sand
  - Relative Density or Consistency: Subangular
  - Soil Structure: 15% fines, trace mica

- **Poorly Graded Sand (SP):**
  - Color: Dark grayish brown (2.5Y 4/2)
  - Moisture Content: 95% fine sand
  - Relative Density or Consistency: Micaceous
  - Soil Structure: 5% fines, trace medium sand

- **Silty Sand (SM):**
  - Color: Greenish gray (10Y 5/1)
  - Moisture Content: 70% fine to medium sand
  - Relative Density or Consistency: Subangular
  - Soil Structure: Micaceous, 30% fines, trace medium sand
**SOIL DESCRIPTION**

**DEPTH OF CASING, DRILLING RATE, DETAILS, AND INSTRUMENTATION**

**WELL DETAILS**

<table>
<thead>
<tr>
<th>Depth Below Ground (ft)</th>
<th>Depth of Casing</th>
<th>Well Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.06</td>
<td>-10.53</td>
<td>hydrocarbon odor</td>
</tr>
<tr>
<td>130</td>
<td></td>
<td></td>
</tr>
<tr>
<td>140</td>
<td></td>
<td></td>
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<tr>
<td>150</td>
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<tr>
<td>160</td>
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<td>230</td>
<td></td>
<td></td>
</tr>
<tr>
<td>240</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SOIL**

- **POORLY GRADED SAND (SP) WITH INTERBEDDED SANDY SILT (ML)**
  - light brownish gray (2.5Y 6/2), fine to medium sand, subangular, silt is 60% fines, 40% fine sand

- **POORLY GRADED SAND (SP)**
  - light brownish gray (2.5Y 6/2), fine to medium sand, subangular

- **as above**
  - as above

- **as above**
  - as above

- **strong hydrocarbon odor**

**HYDROCARBON ODOR**

**ELEVATION:** 75.06 (top of casing) ft msl NGVD29

**DRILLING CONTRACTOR AND RIG:** Directed Technologies Drilling, Directional Drill CMS9030MSC

**COORDINATES:** N 1782935.84, E 6540665, CA State Plane NAD83

**DRILLING METHOD AND EQUIPMENT:** Directional Drilling, Chisel-tooth tri-cone bit with 2” bend

**STEERING CONTRACTOR:** SlimDril International

**STEERING METHOD AND EQUIPMENT:** GST, Brownline Drill Guide 135.034
### Directional Borehole Log

**Project Number:** BS-01  
**Site:** 15306 Norwalk Blvd, Norwalk, CA  
**Elevation:** 75.06 ft NGVD29  
**Steering Contractor:** SlimDril International

**Environmental Data (PID = ppm):**

<table>
<thead>
<tr>
<th>Depth Below Ground (ft)</th>
<th>Soil Name, USCS Group Symbol, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>44.67</td>
<td>Gray (5Y 5/1), as above, fine to medium sand, subangular, trace fines</td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>POORLY GRADED SAND (SP) WITH INTERBEDDED SILTY SAND (SM)</td>
<td></td>
</tr>
<tr>
<td>45.11</td>
<td>Gray (5Y 5/1), fine to medium sand, subangular, micaceous, fines as silt, some interbeds of laminated SILT (ML), very dark gray (2.5Y 3/1)</td>
<td></td>
</tr>
<tr>
<td>25.2</td>
<td>Beginning of Screen at 250 feet</td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>POORLY GRADED SAND (SP)</td>
<td></td>
</tr>
<tr>
<td>45.2</td>
<td>Gray (5Y 5/1), fine to medium sand</td>
<td></td>
</tr>
</tbody>
</table>

**Well Details:**

- 4-inch SCH 80 PVC 0.01-inch transverse-slotted screen with 1.2-inch slot lengths and 11 slots per foot along 3 tri-symmetric rows for a total of 33 slots per foot along the screen.

**Logging:**

- **495791.A1.02**  
- **End:** 8/21/2014  
- **Logger:** M. Mayry

**Additional Information:**

- **Boring Number:** BS-01  
- **Start:** 8/13/2014  
- **Logging Method and Equipment:** Directional Drilling, Brownline Drill Guide 135.034

**Utilities:**

- **Water Level:** NA

**Coordinates:**

- **N 1782935.84, E 6540665, CA State Plane NAD83**

**Additional Details:**

- **Drilling Method and Equipment:** Directional Drilling, Chisel-tooth tri-cone bit with 2° bend

---

**Note:** All borehole logs and details provided are for informational purposes only and do not constitute professional geotechnical or drilling reports. Always consult with a qualified professional for site-specific data and analysis.
### Directional Borehole Log

**Project Number:** 495791.A1.02  
**Boring Number:** BS-01  
**Sheet:** 4 of 8

**Location:** KMEP Norwalk Biosparge Well Installation, Norwalk, CA  
**Location:** 15306 Norwalk Blvd, Norwalk, CA

**Elevation:** 75.06 (top of casing) ft NGVD29  
**Drilling Contractor and Rig:** Directed Technologies Drilling, Directional Drill CMS9030MSC

**Coordinates:** N 1782935.84, E 6540665, CA State Plane NAD83  
**Drilling Method and Equipment:** Directional Drilling, Chisel-tooth tri-cone bit with 2° bend

**Steering Contractor:** SlimDril International  
**Steering Method and Equipment:** GST, Brownline Drill Guide 135.034

**Water Level:** NA

**Start:** 8/13/2014  
**End:** 8/21/2014  
**Logger:** M. Mayry

<table>
<thead>
<tr>
<th>Depth Below Ground (ft)</th>
<th>Borehole Inclination (Degrees)</th>
<th>Soil Name, USCS Group Symbol, Color, Moisture Content, Relative Density or Consistency, Soil Structure, Mineralogy</th>
<th>Comments</th>
<th>Well Details</th>
</tr>
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<tbody>
<tr>
<td>370</td>
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<td></td>
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<tr>
<td>400</td>
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<td>410</td>
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<td>450</td>
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<tr>
<td>460</td>
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</tr>
<tr>
<td>470</td>
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<td></td>
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</tr>
<tr>
<td>480</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Soil Description:**
- **As above**
- **As above with interbeds of laminated SILT (ML) very dark gray (2.5Y 3/1)**
- **POORLY GRADED SAND (SP)** olive gray (5Y 4/2), fine to medium sand, subangular, trace fines, micaceous

**Environmental Data (PID = ppm):**
- **Hydrocarbon odor**

**Well Details:**
- **Hydrocarbon odor**
- **Hydrocarbon odor**
- **Hydrocarbon odor**

**Steering Data:**
- **Hydrocarbon odor**

**Graphic Log:**
- Directional Borehole Log

**Directions:**
- **Directional Boring Log:** DRAFT CH2M GEOTECH_12REV070213.GLB; BIOSPARGE WELL INSTALL.GPJ; CH2M GEOTECH_12.GDT; 2/18/15

**Logs:**
- **BOREHOLE LENGTH**
- **DEPTHT Below GROUND (ft)**
- **BOREHOLE INCLINATION (DEGREES)**
- **DRILLING PIPE**
- **HYDROCARBON ODOR**
- **SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY**
- **COMMENTS**
- **DEPTH OF CASING, DRILLING RATE, DETAILS, AND INSTRUMENTATION**
- **WELL DETAILS**

**Notes:**
- **40.7**
- **45.49**
- **37.0**
- **45.4**
## Directional Borehole Log

**PROJECT NUMBER:** 495791.A1.02  
**BORING NUMBER:** BS-01  
**ELEVATION:** 75.06 (top of casing) ft msl NGVD29  
**PROJECT:** KMEP Norwalk Biosparge Well Installation, Norwalk, CA  
**COORDINATES:** N 1782935.84, E 6540665, CA State Plane NAD83  
**DRILLING CONTRACTOR AND RIG:** Directed Technologies Drilling, Directional Drill CMS9030TMSC  
**STEERING CONTRACTOR:** SlimDril International  
**DRILLING METHOD AND EQUIPMENT:** GST, Brownline Drill Guide 135.034  
**PROJECT LOCATION:** 15306 Norwalk Blvd, Norwalk, CA  
**START:** 8/13/2014  
**END:** 8/21/2014  
**LOGGER:** M. Mayry  

<table>
<thead>
<tr>
<th>DEPTH BELOWGROUND (ft)</th>
<th>SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY</th>
<th>COMMENTS</th>
<th>WELL DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>490</td>
<td>as above, fine to medium sand, subangular</td>
<td></td>
<td></td>
</tr>
<tr>
<td>495</td>
<td>Hydrocarbon odor</td>
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<td></td>
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<tr>
<td>500</td>
<td></td>
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<td>510</td>
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<tr>
<td>600</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SOIL DESCRIPTION**

- **Silty Sand (SM)**
  - Dark greenish gray (10Y 4/1), 85% fine sand, micaceous, 15% fines, trace medium sand, subangular
  - Depth of casing, drilling rate, details, and instrumentation
  - No odor

- **Poorly Graded Sand (SP)**
  - Dark greenish gray (10Y 4/1), 90% fine sand, micaceous, 5% medium sand, subangular, 5% fines
  - Interbeds of Silt (ML), laminated, very dark gray
  - No odor
<table>
<thead>
<tr>
<th>DEPTH BELOW GROUND (ft)</th>
<th>SOIL DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>610</td>
<td>(10YR 3/1), some plastic fines</td>
<td>slight chemical odor</td>
</tr>
<tr>
<td>620</td>
<td>as above, increase in medium sand to 65% fine sand, 30% medium sand, 5% fines with interbeds of laminated SILT (ML)</td>
<td>slight chemical odor</td>
</tr>
<tr>
<td>630</td>
<td>as above, 95% fine sand, micaceous, subangular, trace medium sand, 5% fines</td>
<td></td>
</tr>
<tr>
<td>640</td>
<td>as above with interbeds of laminated SILT (ML)</td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>as above, increase in medium sand, subangular, interbeds of laminated SILT (ML)</td>
<td></td>
</tr>
</tbody>
</table>
### Directional Borehole Log

**PROJECT NUMBER:** 495791.A1.02  
**BORING NUMBER:** BS-01  
**LOCATION:** 15306 Norwalk Blvd, Norwalk, CA  
**ELEVATION:** 75.06 (top of casing) ft msl NGVD29  
**COORDINATES:** N 1782935.84, E 6540665, CA State Plane NAD83

**DRILLING CONTRACTOR AND RIG:** Directed Technologies Drilling, Directional Drill CMS9030TMSC  
**DRILLING METHOD AND EQUIPMENT:** Directional Drilling, Chisel-tooth tri-cone bit with 2” bend

**STEERING CONTRACTOR:** SlimDril International  
**STEERING METHOD AND EQUIPMENT:** GST, Brownline Drill Guide 135.034

**WATER LEVEL:** NA  
**START:** 8/13/2014  
**END:** 8/21/2014  
**LOGGER:** M. Mayry

<table>
<thead>
<tr>
<th>DEPTH BELOW GROUND (ft)</th>
<th>BOREHOLE INCLINATION (DEGREES)</th>
<th>DRILLING PIPE</th>
<th>ENVIRONMENTAL DATA</th>
<th>GRAPHIC LOG</th>
<th>SOIL DESCRIPTION</th>
<th>COMMENTS</th>
<th>WELL DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>45.18</td>
<td>-0.09</td>
<td></td>
<td></td>
<td></td>
<td>as above</td>
<td>slight chemical odor</td>
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<tr>
<td>45.07</td>
<td>0.34</td>
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<td></td>
<td></td>
<td>as above</td>
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<td></td>
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<td>0.43</td>
<td></td>
<td></td>
<td></td>
<td>as above</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY**

- as above, 60% fine sand, 40% medium sand
- as above
- as above

**COMMENTS**

- slight chemical odor
- hydrocarbon odor

**END OF 8/21/2014**

**LOGGER:** M. Mayry
**Directional Borehole Log**

**PROJECT NUMBER:** 495791.A1.02  
**BORING NUMBER:** BS-01  
**START:** 8/13/2014  
**END:** 8/21/2014  
**LOGGER:** M. Mayry

**PROJECT:** KMEP Norwalk Biosparge Well Installation, Norwalk, CA  
**LOCATION:** 15306 Norwalk Blvd, Norwalk, CA

**ELEVATION:** 75.06 (top of casing) ft msl NGVD29  
**DRILLING CONTRACTOR AND RIG:** Directed Technologies Drilling, Directional Drill CMS9030TMSC

**COORDINATES:** N 1782935.84, E 6540665, CA State Plane NAD83  
**DRILLING METHOD AND EQUIPMENT:** Directional Drilling, Chisel-tooth tri-cone bit with 2" bend

**STEERING CONTRACTOR:** SlimDril International  
**STEERING METHOD AND EQUIPMENT:** GST, Brownline Drill Guide 135.034

**WATER LEVEL:** NA  
**START:** 8/13/2014  
**END:** 8/21/2014  
**LOGGER:** M. Mayry

<table>
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<tr>
<th>BOREHOLE LENGTH</th>
<th>DEPTH BELOW GROUND (ft)</th>
<th>DEPTH OF CASING</th>
<th>DRILLING RATE</th>
<th>SOIL DESCRIPTION</th>
<th>COMMENTS</th>
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<td>End of Screen at 850 feet</td>
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<td>4-inch SCH 80 blank well casing</td>
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Subsurface Boring Length: 861.70 ft.  
End Depth: 44.66 ft bgs.  
Maximum Depth: 45.49 ft bgs.
Attachment D
Biosparge Well Construction Diagram
1- Ground elevation at well: 75.59 ft msl
2- Top of casing elevation: 75.06 ft msl
3- Wellhead protection cover type: H2O spring-assist vault box 24"x48"a) concrete pad dimensions: 48" x 72" x 6" concrete pad
4- Dia./type of well casing: 4-inch SCH 80 PVC with O-rings
5- Type/slot/aperture of screen: 4-inch SCH 80 slotted PVC 0.010" to 0.011" transverse slots, cut in 3 rows tri-symmetrically
Slot Length/Spacing: 1.2 to 1.3 inch slots, 33 slots/ft
Field Measured: Yes / No
6- Type screen filter: Natural Filter Pack from Boreholea) Quantity used: N/A
7- Type of seal: Portland-Cement Bentonite Grouta) Quantity used: 80 bags of Portland with 5% Bentonite
8- Grout stop seal: 14" shale trap packer in annulus at 40 feet
9- Angle at Point of Entry: -17°a) Boring angle at screen: -0.55° to 0.43°
Drilling Fluid employed: Bio-Bore and Zan-Flo biodegradable drilling fluid.

Fluid degrader: CETCO LEB-CD Liquid Enzyme Breaker

Development method: Water Flushing and Jetting
Development time: 11.55 hours

Final Development Parameters:
Temp: 32.30° C
pH: 7.34
Conductivity: 2.93 µmhos/cm
Turbidity: 1236 NTU
Sand Content: 1.0 ml/L
Mud Content: 2.0 ml/L
Total Water Volume Discharged: ~8900 gallons

Comments:
Drill bit has a 12.5" diameter; however, horizontal borehole diameters vary slightly (likely 100% to 150% of drill bit size) due to gravitational effects.
Dear Dan:

Thank you again for selecting DTD to install a biosparge well (BS-01) for pilot testing at the Norwalk DFSP site in Norwalk, CA. We are pleased that the installation was concluded successfully. This letter is to document various aspects of the well completion for your project records.

I have documented construction details in the table below. The as-built information, including bore profile, 3D coordinates of the locating plots of the Gyroscopic Steering Tool, and X-Y coordinates of the as-built well location in reference to your staked survey points are all provided as attachments. These were generated by our navigation subcontractor, SlimDril, and reviewed by DTD.

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<th>Well Construction Details – Biosparge Well BS-01</th>
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<td><strong>Well Length:</strong> 860 feet</td>
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<td><strong>Screened Length:</strong> 600 feet</td>
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<td><strong>Distal Blank Length:</strong> 10 feet</td>
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<td><strong>End Cap:</strong> Flush Threaded, with O-ring. Installed length ~ 0.75 feet</td>
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<td><strong>Riser Length:</strong> 250 feet to ground vault entry</td>
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<td><strong>Screen Depth (Average – center of borehole):</strong> 45 feet</td>
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<td><strong>Screen and Riser Material:</strong> 4-inch Schedule 80 PVC [white], flush threaded with 4 TPI threads</td>
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<td><strong>Slot Specifications (as installed)</strong> (0.010x1.2” [nominal] slots, 33 slots per foot 0.28%-0.30% Open Area)</td>
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<td><strong>Wellhead Components:</strong> 4” “Y” connection. 4” flush threaded with cap for cleanout. 4” PVC ball valve to 4”x3” bushing reducer, to 3” PVC stub out (3” flush threaded cap) outside vault.</td>
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<td><strong>Drilling Fluid:</strong> Baroid BioBore biodegradable biopolymer; small additions of Zanflow viscosifier and xanthan gum, and soda ash.</td>
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<td><strong>Well Development additives:</strong> CETCO LEB-CD enzyme breaker</td>
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After an initial delay due to schedule conflicts with the gyroscopic steering subcontractor, the pilot bore was drilled on August 19-21, 2014. Drilling proceeded continuously during day shifts through this period, with short breaks for waste transfer, mixing of drilling fluid, and other routine tasks. Constant contact was
maintained between driller and GST technician to maintain the borepath typically within < 0.5 feet from designed path.

The pilot bore was completed on August 21, to a total length of 861.7 feet. The as-built data and drawings for the completed bore were completed by SlimDril and submitted to DTD. These were reviewed and are attached with this submittal, as listed in the table:

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<td>PDF file of CAD plot, showing as-built coordinates of pilot bore</td>
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<td>PLOT – 0.dwg</td>
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<td>DrillingReport8-21-14 Final.xls</td>
<td>Excel Spreadsheet of final as-built coordinates</td>
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<td>4</td>
<td>Coordinate bore locations14413-ACAD_05-16-14.xls</td>
<td>Combined spreadsheet showing supplied coordinates of bore path stakes and as-built offsets from those locations</td>
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During drilling, the tooling advanced through alternating beds of sandy silt, and, silt, and clay. Drilling mud color varied from medium to dark gray in color, apparently depending on fines content. Matt Mayry (CH2M – HILL) collected soil cuttings at intervals during the drilling process.

Upon attempting to remove the drill rods and GST tooling from the bore on August 21, the hydraulic controller for the drill rig’s rotary motor failed. After on-site trouble shooting, a new controller was ordered. While waiting for delivery of the controller, site activities included waste management and conditioning the drilling fluid in the bore to prevent bore collapse.

The new controller was installed the morning of August 23 and the removal of the drill tooling was immediately resumed. Once all tooling was removed, the drill rods were then tripped back in (with no bottom hole drill bit assembly) to near the end of the bore. The drill operator observed the bore was stable, with no indications of collapse.

All well materials were installed through the middle of the open drill rod on August 24th. The drill rods were then withdrawn from the bore, leaving the well materials in place in the open borehole.

The well assembly included:

1pc. – Pointed, Flush-threaded Sch. 80 PVC end cap. Approximate length 0.75 feet.

30 pcs. – Flush-threaded, White, Schedule 80 PVC well screen. Slotting as described in table above. Total 600 feet in 20 foot (make-up length) sticks. Threaded joints made up with factory O-Rings and PTFE pipe threading compound.

13 pcs. – Flush-threaded, White, Schedule 80 PVC blank riser. Total 260 feet in 20 foot (make up length) sticks. Approximately 10 feet of stick up remaining when well materials seated in hole. Stick up subsequently shortened and removed to facilitate well development, later cut to length for vault installation.
Well materials were supplied through PQ Products of Spokane, Washington. However, problems with the order quantities, and also the product quality resulted in the rejection of the delivered well materials. New materials were secured by PQ Products through a local supplier, Drillers Pipe Manufacturing. The new well materials were inspected and met the project specifications.

Well Development:

Upon installation of the well casing and screen, DTD undertakes a well development process to ensure effective communication between the well and the surrounding geologic formation. DTD began the well development process on August 25th. A Vactor combination jetting/vacuum truck was used for the development. We began the process by jetting inside the screen section with clear water from the site hydrant, after filling the Vactor truck tanks (1300 gallons). Water started flowing up the bore annulus upon the first flushing pass. We continued this flushing for approximately two hours, then attached fittings to the end of wellhead to allow direct connection of the hydrant hose to the well head. This forces water down the well riser and out through the screen, pushing the drilling fluid and cuttings out of the bore annulus. Flushing continued for approximately 15 minutes at an estimated flow rate of 55 gpm.

On August 26, we continued well development with an additional flush of water down the inside of the well materials and back to the ground surface through the bore annulus. After noting that the water level in the well would drop immediately upon halting the flush, we set up to continue jetting. Three pints of LEB-CD enzyme was added to 1300 gallons of water in the jetting tanks. The enzyme accelerates breakdown of the biopolymer drilling fluid. Multiple passes of the jetting tool were made through the well screen until 1500 hr. in the afternoon. At this point, the total development water pumped or jetted into the well was approximately 4600 gallons, with a total of 12 jetting passes through the well screen section. DTD demobilized the jetting truck.

Though the well was deemed adequately developed, CH2M-HILL requested additional development on the morning of August 27.

DTD reacquired the Vactor truck and made eleven (11) additional jetting passes, for a total of 23 jetting passes. The first 1300 gallons of water included enzyme breaker to assure any residual mud was broken. We used approximately 4300 gallons of water on August 27, for a total of approximately 8900 gallons.

Water was collected using the vacuum truck, and conveyed directly to the Baker tanks on site. Matt Mayry (CH2M-HILL) collected water samples at intervals during the process and confirmed that the water parameters of sand and silt content, pH, and turbidity were remaining stable throughout the day. CH2M directed DTD to cease well development efforts at 1340. DTD removed the jetting assembly from the well and removed the truck from site shortly after.

Well Surface Completion:

Concurrent with well development efforts, staged appropriately to prevent interference in the operations and the setting of grout, DTD commenced efforts to construct the surface completion of the well on August 26. Gregg Drilling provided a grouting truck and two operators/laborers to assist in grouting the well annulus. The Statement of Work specified to grout the well from a depth of 12 feet of vertical depth below ground surface. This equated to a borehole length of 39 feet, measured from the wellhead/ground level, resulting in a required volume of approximately 32 cubic feet of cement. DTD procured 80, forty-seven (47) pound bags of Type II Portland Cement. This yields approximately 40 cubic feet of grout. The grout was mixed in 5-6 bag batches, to each batch 5% bentonite (by weight) was mixed in.

A packer was set at a depth of 39 feet. The packer consisted of a 4” x 9.5” shale trap packer that fit closely to the well casing, attached by self-tapping screw to an 8” x 14” shale trap packer to form a close interference fit to the bore annulus.

A tremie tube (2” PVC) was placed at a depth of 35 feet with no obstructions noted. Grout was mixed and emplaced in batches, as the tremie was slowly withdrawn. Color changes and visual evidence of grout was noted at surface as the last of the grout was emplaced. During excavation for the vault the following day, partly-cured grout was noted around the bore annulus. Prior to setting the vault, DTD placed 1.5 bags of hydrated bentonite pellets to complete a surface seal.
Well Vault:

A 2 foot by 4 foot, steel walled, bottomless vault was installed. The vault assembly includes a diamond plate, H-20 traffic rated lid with spring assist and bolted down locking device. The vault has sidewalls of approximately 24 inches height.

The vault was set and leveled to prevent ponding or entrapment of rainwater on the wellhead. Openings were drilled through the vault walls to provide entry for the well riser and access for the air supply stub out. The well head assembly of a “Y”, with a 4-inch ball valve, 3-inch reducer, and 3-inch stubout was made on the angled portion of the “Y”. The stub out terminates approximately 2-3 feet beyond the concrete apron surrounding the vault, and is closed with a flush-threaded 3-inch cap. The straight part of the “Y” was completed with a flush-threaded, 4-inch cap with O-ring and pipe dope to form an air-tight seal and provide access for future downhole activities.

A concrete slab was constructed, using 18 bags of pre-mixed Sakcrete, 40 lb. bags, plus 11, ninety (90) lb. bags. This was calculated to build a slab that exceeds 18 inches in all directions from the rim of the vault, to a slab depth of nominal 6 inches, per specifications. No slump test or other testing of the concrete was made. The slab was troweled and brushed with a broom to finish the surface. The completed wellhead was delineated with cones and flagging to prevent intrusion, and a steel T-post was set to indicate the position of the stub out.

At the conclusion of the wellhead completion, DTD rough-graded the surrounding area, picked up remaining debris and/or trash, then completed demobilization of equipment from the well site.

Sincerely,

Directed Technologies Drilling, Inc.

Michael D. Lubrecht
Senior Geologist

Cc: Matthew Mayry – CH2M-HILL
    Dan Ombalski – Directed Technologies Drilling, Inc.
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Project Number: 34104 DTD - Norwalk, California - 140815
First Date: 19-August-14
Place: Norwalk, California

Client Name: 34104 DTD
Surveyor: NORB

DRILLING REPORT

D: www.drillguide.com
### Proposed versus As-built Survey Coordinates

**Horizontal Biosparge Well BS-01**  
**SFPP Norwalk Pump Station**  
**Norwalk, CA**

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<td>6540108.27</td>
<td>1782911.36</td>
<td>6540108.26</td>
<td>-45.37</td>
<td>-0.50</td>
<td>0.006</td>
</tr>
<tr>
<td>104</td>
<td></td>
<td>1782910.10</td>
<td>6540035.28</td>
<td>1782910.18</td>
<td>6540035.28</td>
<td>-45.35</td>
<td>-0.08</td>
<td>0.001</td>
</tr>
<tr>
<td>103</td>
<td></td>
<td>1782909.11</td>
<td>6539969.38</td>
<td>1782909.32</td>
<td>6539969.38</td>
<td>-45.22</td>
<td>-0.21</td>
<td>0.005</td>
</tr>
<tr>
<td>101</td>
<td></td>
<td>1782907.95</td>
<td>6539878.97</td>
<td>1782907.45</td>
<td>6539878.98</td>
<td>-45.01</td>
<td>0.50</td>
<td>-0.007</td>
</tr>
<tr>
<td>100</td>
<td></td>
<td>1782907.25</td>
<td>6539822.23</td>
<td>1782907.04</td>
<td>6539822.23</td>
<td>-44.76</td>
<td>0.21</td>
<td>0</td>
</tr>
</tbody>
</table>

--- Termination Point --- --- --- 1782907.04 6539808.22 -44.66 --- ---

**Notes:**

Northing and Easting coordinates in units of feet  
Depth is feet below ground surface  
Coordinates shown are based upon the State Plane Coordinate System (NAD 83)  
California Zone 5 based on static GPS observation
Attachment F
Biosparg Well Development Log
**WELL DEVELOPMENT LOG**

**PROJECT NUMBER:** BS-01  
**WELL ID:** BS-01  
**LOCATION:** 15306 Norwalk Blvd, Norwalk, CA

**DEVELOPMENT CONTRACTOR:** Directed Technologies Drilling

**DEVELOPMENT METHOD AND EQUIPMENT USED:** Flush and Jet, Vactor 1200 Jet/Vacuum Unit

**START WATER LEVELS:** Not monitored  
**START:** 8/27/2014  
**END:** 8/27/2014  
**LOGGER:** M. Mayry

**MAXIMUM DRAWDOWN DURING PUMPING:** Not determined (ND)

**RANGE AND AVERAGE DISCHARGE RATE:** 20 to 58 gpm

**TOTAL QUANTITY OF WATER DISCHARGED:** 8900 gallons

**DISPOSITION OF DISCHARGE WATER:** Discharge water held in rolloff bins and poly tanks for profiling and disposal.

**MONITORING EQUIPMENT USED:** Horiba U-52 cal’d to 4.0 pH, cond. 4.49 mS/cm, and LaMotte Turbidimeter to 10 NTU. 1000 mL Imhoff Cone

### Water Volume Discharged

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Water Volume Discharged (gal)</th>
<th>Water Level (ft BTOC)</th>
<th>Temp. (°C)</th>
<th>pH</th>
<th>Conductivity (µmhos/cm)</th>
<th>Turbidity (NTU)</th>
<th>Sand (mL/L)</th>
<th>Mud (mL/L)</th>
<th>Remarks (color, odor, sheen, sediment, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/25/14 15:00</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>Flush casing/borehole with hydrant water.</td>
</tr>
<tr>
<td>16:00</td>
<td>1300</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>3.0</td>
<td>35</td>
<td>Flushed inside casing. 5 passes in screen.</td>
</tr>
<tr>
<td>17:45</td>
<td>2800</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>Flush annulus outside of casing.</td>
</tr>
<tr>
<td>8/26/14 07:45</td>
<td>3000</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>ND</td>
<td>ND</td>
<td>Flush annulus outside of casing.</td>
</tr>
<tr>
<td>9:15</td>
<td>3600</td>
<td>--</td>
<td>26.45</td>
<td>6.89</td>
<td>0.757</td>
<td>1627</td>
<td>0.5</td>
<td>3.0</td>
<td>Add 3 pints of enzyme to water flush.</td>
</tr>
<tr>
<td>9:20</td>
<td>3800</td>
<td>--</td>
<td>24.44</td>
<td>6.28</td>
<td>0.560</td>
<td>2502</td>
<td>1.0</td>
<td>5.0</td>
<td>Stop to pump water into Baker.</td>
</tr>
<tr>
<td>9:35</td>
<td>4000</td>
<td>--</td>
<td>27.00</td>
<td>6.51</td>
<td>0.841</td>
<td>2338</td>
<td>1.0</td>
<td>5.0</td>
<td>12 jetting passes through screen.</td>
</tr>
<tr>
<td>10:00</td>
<td>4300</td>
<td>--</td>
<td>27.66</td>
<td>6.41</td>
<td>0.800</td>
<td>2292</td>
<td>1.0</td>
<td>5.0</td>
<td>Resume jetting. Add 3 pints of enzyme.</td>
</tr>
<tr>
<td>10:08</td>
<td>4600</td>
<td>--</td>
<td>27.50</td>
<td>6.30</td>
<td>0.816</td>
<td>1920</td>
<td>0.5</td>
<td>4.0</td>
<td>Shutdown to refill water.</td>
</tr>
<tr>
<td>8/27/14 09:30</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>Resume jetting.</td>
</tr>
<tr>
<td>9:45</td>
<td>4800</td>
<td>--</td>
<td>30.44</td>
<td>6.73</td>
<td>0.83</td>
<td>1092</td>
<td>0.7</td>
<td>3.0</td>
<td>6 jetting passes through screen.</td>
</tr>
<tr>
<td>10:45</td>
<td>5800</td>
<td>--</td>
<td>25.83</td>
<td>4.18</td>
<td>1.27</td>
<td>1346</td>
<td>1.0</td>
<td>2.0</td>
<td>Stop jetting to refill.</td>
</tr>
<tr>
<td>11:10</td>
<td>5900</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>2 jetting passes through screen.</td>
</tr>
<tr>
<td>11:30</td>
<td>6700</td>
<td>--</td>
<td>30.54</td>
<td>6.50</td>
<td>3.09</td>
<td>1634</td>
<td>1.0</td>
<td>3.0</td>
<td>Stop jetting to refill.</td>
</tr>
<tr>
<td>11:45</td>
<td>7200</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>Resume jetting.</td>
</tr>
<tr>
<td>13:00</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>2 jetting pass through screen.</td>
</tr>
<tr>
<td>13:35</td>
<td>--</td>
<td>--</td>
<td>32.40</td>
<td>7.32</td>
<td>3.08</td>
<td>1571</td>
<td>1.0</td>
<td>2.0</td>
<td>Terminate jetting/flushing.</td>
</tr>
<tr>
<td>14:10</td>
<td>--</td>
<td>--</td>
<td>32.30</td>
<td>7.34</td>
<td>2.93</td>
<td>1236</td>
<td>1.0</td>
<td>2.0</td>
<td>1 jetting pass through screen.</td>
</tr>
<tr>
<td>15:40</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>11.55 total hours of development.</td>
</tr>
<tr>
<td>16:00</td>
<td>8900</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>Terminate jetting/flushing.</td>
</tr>
</tbody>
</table>
Attachment G
Soil Vapor Probe Boring Logs and Construction Diagrams
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Recovery</th>
<th>Sample Type</th>
<th>Environmental Data (PSI psi)</th>
<th>Soil Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>HA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.0</td>
<td>DPT</td>
<td></td>
<td></td>
<td>POORLY GRADED SAND WITH SILT (SP-SM)</td>
<td>Hand auger to 12 ft bgsto clear for subsurface utilities.</td>
</tr>
<tr>
<td>15.0</td>
<td>DPT</td>
<td></td>
<td></td>
<td>POORLY GRADED SAND (SP)</td>
<td></td>
</tr>
<tr>
<td>20.0</td>
<td>DPT</td>
<td></td>
<td></td>
<td>CLAYEY SAND (SC)</td>
<td></td>
</tr>
</tbody>
</table>

- POORLY GRADED SAND WITH SILT (SP-SM)
  - Pale yellow (2.5Y 7/3), dry, 90% fine sand, 10% fines
- POORLY GRADED SAND (SP)
  - Light olive brown (2.5Y 5/3), dry, 100% fine sand
- CLAYEY SAND (SC)
  - Light olive brown (2.5Y 5/3), moist, 85% fine sand, micaceous, 15% fines

Boring terminated at 23.0 ft bg.

- Hand auger rated well box
- Filter Sand
- Vapor Probe 7 to 7.5 ft
- Hydrated Bentonite

- Dry Granulated Bentonite
- Filter Sand
- Vapor Probe 15 to 15.5 ft
- Hydrated Bentonite

- Dry Granulated Bentonite
- Filter Sand
- Vapor Probe 21 to 21.5 ft

- Flush Mount Traffic
- Hydrated Bentonite

- Water Level: NA
Hand auger to 12 ft bgs to clear for subsurface utilities.

<table>
<thead>
<tr>
<th>DEPTH BELOW GROUND (ft)</th>
<th>SOIL DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>PORELLY GRADED SAND (SP) olive brown (2.5Y 4/3), moist, 95% fine sand, 5% fines</td>
<td>Hand auger to 12 ft bgs to clear for subsurface utilities.</td>
</tr>
<tr>
<td>4.0</td>
<td>SANDY SILTY CLAY (ML/CL) dark grayish brown (2.5Y 4/2), moist, 75% fines, some clay, 25% fine sand, low plasticity, low toughness</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>POORELLY GRADED SAND (SP) grayish brown (2.5Y 5/2), as above, dry, 100% fine sand</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>SANDY SILTY CLAY (ML/CL) dark grayish brown (2.5Y 4/2), moist, 75% fines, some clay, 25% fine sand, low plasticity, low toughness</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>SANDY SILTY CLAY (ML/CL) dark grayish brown (2.5Y 4/2), moist, 75% fines, some clay, 25% fine sand, low plasticity, low toughness</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>SANDY SILTY CLAY (ML/CL) dark grayish brown (2.5Y 4/2), moist, 75% fines, some clay, 25% fine sand, low plasticity, low toughness</td>
<td></td>
</tr>
</tbody>
</table>

Boring terminated at 24.0 ft bgs.
<table>
<thead>
<tr>
<th>DEPTH BELOW GROUND (ft)</th>
<th>RECOVERY</th>
<th>SOIL DESCRIPTION</th>
<th>INSTRUMENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>HA</td>
<td>Gravel 4 inches</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>DPT</td>
<td>POORLY GRADED SAND WITH SILT (SP-SM)</td>
<td>Hand auger to 12 ft bgs to clear for subsurface utilities.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dark grayish brown (2.5Y 4/2), dry, 90% fine sand, 10% fines</td>
<td></td>
</tr>
<tr>
<td>15.0</td>
<td></td>
<td>SILTY SAND (SM)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>dark gray (2.5Y 4/1), moist, 80% fine sand, micaceous, 20% fines</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>POORLY GRADED SAND (SP)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>light olive gray (5Y 6/2), moist, 100% fine sand</td>
<td></td>
</tr>
<tr>
<td>20.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>DPT</td>
<td>POORLY GRADED SAND WITH SILT (SP-SM)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>dark grayish brown (2.5Y 4/2), dry, 90% fine sand, 10% fines</td>
<td></td>
</tr>
<tr>
<td>30.0</td>
<td></td>
<td>SANDY SILT (ML)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>olive (5Y 4/3), 70% fines, 30% fine sand, micaceous</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>POORLY GRADED SAND (SP)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>olive (5Y 4/3), moist, 100% fine sand</td>
<td>Boring terminated at 23.0 ft bgs.</td>
</tr>
</tbody>
</table>
**Soil Boring Log**

**PROJECT:** KMEP Norwalk Biosparge Well Installation, Norwalk, CA  
**LOCATION:** 15306 Norwalk Blvd, Norwalk, CA  
**ELEVATION:** 75.03 ft msl NGVD29  
**COORDINATES:** E 6540286.95, N 1782903.6, CA State Plane NAD83  
**DRILLING CONTRACTOR AND DRILL RIG:** EST, Geoprobe 5400  
**DRILLING METHOD AND EQUIPMENT:** Direct Push Technology with Macrocore

<table>
<thead>
<tr>
<th>DEPTH BELOW GROUND (ft)</th>
<th>RECOVERY (ft)</th>
<th>SAMPLE TYPE</th>
<th>ENVIRONMENTAL DATA (PSI-25)</th>
<th>SOIL DESCRIPTION</th>
<th>SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY</th>
<th>CPM</th>
<th>END OF CASING</th>
<th>DRILLING DETAILS</th>
<th>INSTRUMENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>HA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 5.0                     |               |             |                             |                  | Gravel 4 inches  
**Silty Sand (SM)**  
dark gray (2.5Y 4/1), dry, 75% fine sand, micaceous,  
25% fines  
Brick and glass debris at 5 ft  
POORLY GRADED SAND (SP)  
dark gray (2.5Y 4/1), dry, 100% fine sand, micaceous, trace fines |
| 10.0                    |               |             |                             |                  | 3 inches of interbedded SANDY SILT (ML), 55% fines,  
45% fine sand  
SILTY SAND (SM)  
dark grayish brown (2.5Y 4/2), moist, 80% fine sand,  
15% fines, 5% medium sand, subangular |
| 15.0                    | 3.0 DPT       |             |                             |                  |  
SANDY SILT (ML)  
olive (5Y 4/3), moist, 60% fines, 40% fine sand,  
micaceous, hydrocarbon odor  
Boring terminated at 23.0 ft bg |
**Soil Boring Log**

**PROJECT:** KMEP Norwalk Biosparge Well Installation, Norwalk, CA  
**LOCATION:** 12247 Cheshire St, Norwalk, CA

**ELEVATION:** 74.96 ft msl NGVD29  
**DRILLING CONTRACTOR AND DRILL RIG:** EST, Geoprobe 5400

**COORDINATES:** E 6540064.44, N 1782840.8, CA State Plane NAD83  
**DRILLING METHOD AND EQUIPMENT:** Direct Push Technology with Macrocore

**WATER LEVEL:** NA  
**START:** 9/25/2014  
**END:** 9/25/2014  
**LOGGER:** M. Mayry

---

<table>
<thead>
<tr>
<th>DEPTH BELOW GROUND (ft)</th>
<th>SOIL DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>Concrete 4 inches</td>
<td>Hand auger to 12 ft bgs to clear for subsurface utilities.</td>
</tr>
<tr>
<td>0.2</td>
<td>light brownish gray (2.5Y 6/2), as above, dry</td>
<td></td>
</tr>
<tr>
<td>4.0</td>
<td>POORLY GRADED SAND (SP) olive brown (2.5Y 4/3), 95% fine sand, micaceous, 5% fines</td>
<td></td>
</tr>
<tr>
<td>15.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>SILTY SAND (SM) gray (2.5Y 5/1), moist, 85% fine sand, 15% fines</td>
<td>Boring terminated at 23.0 ft bgs.</td>
</tr>
<tr>
<td>25.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BORING NUMBER:** SVM-15  
**PROJECT NUMBER:** SVM-15

---

**ENVIRONMENTAL DATA (PID = ppm):**

**SOIL DESCRIPTION**
- **SOIL NAME, USCS GROUP SYMBOL:**
- **COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY**

**GRAPHIC LOG:**
- **SAMPLE TYPE:**
- **RECOVERY (ft):**
- **DEPTH OF CASING, DRILLING DETAILS, INSTRUMENTATION:**

---

**WELL DETAILS:**
- **Flush Mount Traffic Rated Well Box**
- **Dry Granulated Bentonite**
- **Filter Sand**
- **Vapor Probe 7 to 7.5 ft**
- **Hydrated Bentonite**
- **Dry Granulated Bentonite**
- **Filter Sand**
- **Vapor Probe 15 to 15.5 ft**
- **Hydrated Bentonite**
- **Dry Granulated Bentonite**
- **Filter Sand**
- **Vapor Probe 22 to 22.5 ft**
## Soil Boring Log

**PROJECT:** K MEP Norwalk Biosparge Well Installation, Norwalk, CA  
**LOCATION:** 12313 Cheshire St, Norwalk, CA  
**ELEVATION:** 73.21 ft msl NGVD29  
**COORDINATES:** E 6540270.96, N 1782635.09, CA State Plane NAD83  
**DRILLING CONTRACTOR AND DRILL RIG:** EST, Geoprobe 5400  
**DRILLING METHOD AND EQUIPMENT:** Direct Push Technology with Macrocore

**WATER LEVEL:** NA  
**START:** 9/25/2014  
**END:** 9/25/2014  
**LOGGER:** M. Mayry

<table>
<thead>
<tr>
<th>DEPTH BELOW SURFACE (ft)</th>
<th>RECOVERY (%)</th>
<th>ENVIRONMENTAL DATA (PSI gpm)</th>
<th>GRAPHIC LOG</th>
<th>SOIL DESCRIPTION</th>
<th>COMMENTS</th>
<th>WELL DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>HA</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SOIL DESCRIPTION**
- **Concrete 4 inches**
  - **POORLY GRADED SAND (SP)**
    - grayish brown (2.5Y 5/2), moist, 100% fine sand

**COMMENTS**
- Hand auger to 12 ft bgs to clear for subsurface utilities.

**WELL DETAILS**
- **Flush Mount Traffic Rated Well Box**
  - Hydrated Bentonite
- **Dry Granulated Bentonite**
- **Filter Sand**
  - Vapor Probe 7 to 7.5 ft
  - Hydrated Bentonite
- **Dry Granulated Bentonite**
- **Filter Sand**
  - Vapor Probe 15.5 to 16 ft
  - Hydrated Bentonite
- **Dry Granulated Bentonite**
- **Filter Sand**
  - Vapor Probe 22 to 22.5 ft

**Boring terminated at 23.0 ft bgs.**
Attachment H
Waste Manifests
NON-HAZARDOUS WASTE MANIFEST

6. Generator's Name and Mailing Address
   SFPN-LP
   1100 Town and Country Rd.
   Orange, CA 92869
   Attn: Ms. Karina Hankins

7. Transporter 1 Company Name
   PATRIOT ENVIRONMENTAL SERVICES
   U.S. EPA ID Number
   CAD053866794

8. Transporter 2 Company Name
   U.S. EPA ID Number
   CAT090013352

9. Waste Shipping Name and Description
   1. Non-Hazardous Waste, Liquid (drilling mud with trace hydrocarbons)

10. Containers
    No. Type Quantity Wt./Vtd.
    1. TT 4500 G

11. Signature
    Generator/Shipper's Printed/Typed Name
    x Patrick Boyd

12. Signature
    Transporter 1 Printed/Typed Name
    x Jesus Espinoza

13. Signature
    Transporter 2 Printed/Typed Name

14. GENERATOR/SHIPPER'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/labelled, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

15. Signature
    Designated Facility's Printed/Typed Name
    Marcus W. Burns

16. Signature
    Designated Facility's Employee's Printed/Typed Name
    Marcus W. Burns

17. Signature
    Designated Facility's Owner or Operator's Printed/Typed Name
    Marcus W. Burns

18. Signature
    Designated Facility's Owner or Operator's Employee's Printed/Typed Name
    Marcus W. Burns

19. Signature
    Designated Facility's Owner or Operator's Certification of receipt of materials covered by the manifest except as noted in item 17s.

20. Signature
    Designated Facility's Owner or Operator's Employee's Certification of receipt of materials covered by the manifest except as noted in item 17s.
<table>
<thead>
<tr>
<th>Container</th>
<th>Type</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TT</td>
<td>8500</td>
<td>g</td>
</tr>
</tbody>
</table>
**NON-HAZARDOUS WASTE MANIFEST**

1. Generator ID Number: Not Required
2. File #: 00451-5136
3. Emergency Response Phone: 714-450-4400
4. Waste Tracking Number: NH 0102675

5. Generator's Name and Mailing Address:
   - SFP-LP
   - Attn: Ms. Karina Hanks
   - 1100 Town and Country Rd.
   - Orange
   - CA 92868
   - Generator's SBA Address (if different than mailing address): Norwalk: Tank Farm
   - 15306 Norwalk Blvd
   - Norwalk, CA 90650

6. Transporter 1 Company Name:
   - PATRIOT ENVIRONMENTAL SERVICES
   - U.S. EPA ID Number: CAD005886794
   - Generator's Phone: 714-450-4400

7. Transporter 2 Company Name:
   - U.S. EPA ID Number: CAT080013392
   - Facility's Phone: 310-557-7100

8. Designated Facility Name and Site Address:
   - DEMINGO HERDON
   - 2000 N. ALAMEDA ST.
   - COMPTON
   - CA 90222
   - Facility's Phone: 310-557-7100

9. Waste Shipping Name and Description:

<table>
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<tr>
<th>No.</th>
<th>Type</th>
<th>Quantity</th>
<th>Unit Wt./Vol.</th>
</tr>
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<tr>
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<td>TT</td>
<td>4500</td>
<td>G</td>
</tr>
<tr>
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<td>3</td>
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</tbody>
</table>

10. Special Handling Instructions and Additional Information:
    Wear Appropriate PPE when handling:

11. PATRIOT Job Number:
    BILL: SFPP-LP

12. GENERATOR/SOFTNER'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/certified, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

   Generator/Shipper's Printed/Typed Name: MATT MANG / CHM III
   Signature: [Signature]
   Month Day Year: 9/10/14

   Transporter's Printed/Typed Name: JESUS L ESPINOZA
   Signature: [Signature]
   Month Day Year: 9/10/14

13. DESIGNATED FACILITY'S COPY
   Printed/Typed Name: MARCUS WORMLEY
   Signature: [Signature]
   Month Day Year: 9/10/14
**Non-Hazardous Waste Manifest**

5. Generator's Name and Mailing Address:
   - Site: Norwalk Tank Farm
   - Address: 13306 Norwalk Blvd
   - Norwalk, CA 90650
   - Generator's Phone: 714-550-4400

7. Transportation Company Name:
   - PATRIOT ENVIRONMENTAL SERVICES

8. Facility's Name and Mailing Address:
   - DEMENTO KERDOON
   - 2000 N. ALAMEDA ST.
   - COMPTON
   - CA 80222
   - Facility's Phone: 310-537-7100

   - Quantity: 4500 G

13. Special Handling Instructions and Additional Information:
   - Sufficiently mixed so that no separation occurs.

14. Generator's Officer's Certification:
   - I hereby certify that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/collected, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

   Signature: [Signature]

15. Transportation Company Name:
   - PATRIOT JOB NUMBER:
     - Bill: SFPP-3P

16. Transportation Company's Name:
   - JESUS ESPINO

17. Discrepancy:
   - None

18. Alternate Facility or Generator:
   - Facility's Phone:

19. Designated Facility's Information:
   - Printed Type/Name:
     - [Signature]

20. Designated Facility's Copy:
   - Printed Type/Name:
     - [Signature]

**Manifest Reference Number:**
- U.S. EPA ID Number: CA0653566794
- Facility's Phone: 714-550-4400

**Printed Date:**
- 09/10/10

**Designated Facility's Copy:**
- 169-BLC-0 5-11977 (Rev. 9/09)
<table>
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<tr>
<td></td>
<td></td>
<td>600-621-1434</td>
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</table>

5. Generator's Name and Mailing Address: SHEPP
1600 TOWNS COUNTRY RD.
CORNELIA, GA 30526
Generator's Phone: 770-240-8000

6. Transporter 1 Company Name: LATENT ENVIRONMENTAL SERVICE

7. Transporter 2 Company Name: U.S. EPA ID Number: CANDCS266794

8. Designated Facility Name and Site Address: U.S. EPA ID Number: 007-5501-37252

9. Waste Shipping Name and Description:

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Quantity</th>
<th>Unit</th>
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<tbody>
<tr>
<td>1</td>
<td>TT</td>
<td>750</td>
<td>Gal</td>
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</table>

10. Containers

11. Total Quantity

12. Unit

13. Special Handling Instructions and Additional Information

14. GENERATOR'S/SHIPPER'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Shipper's Printed/Typed Name: James Dyer
Signature: [Signature]
Month Day Year: 9/25/14

15. International Shipment

16. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: [Typed/Printed]
Signature: [Signature]
Month Day Year: 1/29/114

Transporter 2 Printed/Typed Name: [Typed/Printed]
Signature: [Signature]
Month Day Year: 1/29/114

17. Discrepancy

17a. Discrepancy Description Space: Quantity 

17b. Alternate Facility (or Generator) U.S. EPA ID Number: 007-5501-37252

Facility's Phone: [Phone Number]

17c. Signature of Alternate Facility (or Generator) Month Day Year: 

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a

Printed/Typed Name: [Typed/Printed]
Signature: [Signature]
Month Day Year: 

169-BLS-C 5 11979 (Rev. 9/09)
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</table>

13. Special Handling Instructions and Additional Information

WEAR appropriate PPE when handling.

14. GENERATOR’S/SHIPPER’S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator’s/Shipper’s Printed/Typed Name: [Signature]

15. International Shipments
   - Import to U.S.
   - Export from U.S.
   - Port of entry/exit:
   - Date leaving U.S.: [Month Day Year]

16. Transporter Acknowledgment of Receipt of Materials
   - Transporter 1 Printed/Typed Name: [Signature]
   - Transporter 2 Printed/Typed Name: [Signature]
   - Month Day Year: [Month Day Year]

17. Discrepancy
   - Discrepancy Indicator Space: [Quantity] [Type] [Residue] [Partial Rejection] [Full Rejection]
   - Manifest Reference Number: [Number]
   - Alternate Facility (or Generator): [Name]
   - Facility’s Phone: [Number]
   - Signature of Alternate Facility (or Generator): [Signature]
   - Month Day Year: [Month Day Year]

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a.
   - Printed/Typed Name: [Name]
   - Signature: [Signature]
   - Month Day Year: [Month Day Year]
<table>
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<tr>
<td></td>
<td>2</td>
<td>CMISY</td>
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</table>

13. Special Handling Instructions and Additional Information

"And profile #12031521"

Always wear proper PPE when handling.

14. GENERATOR'S/OFFERER'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator/Offerer's Printed/Typed Name: [Signature]

Month Day Year: 9/28/14

15. International Shipments
- [ ] Import to U.S.
- [ ] Export from U.S.

Port of entry/exit: [Signature]

Date leaving U.S.: [Signature]

16. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: [Signature]

Month Day Year: 9/30/14

Transporter 2 Printed/Typed Name: [Signature]

17. Discrepancy

- [ ] Quantity
- [ ] Type
- [ ] Residue
- [ ] Partial Rejection
- [ ] Full Rejection

Manifest Reference Number: [Insert]

U.S. EPA ID Number: [Insert]

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a.

Printed/Typed Name: [Signature]

Month Day Year: [Insert]