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ENVIRONMENTAL PROTECTION

Los Angeles Regional Water Quality Control Board

February 25, 2019

Steve Christie
Signal Hill XC, LLC
3010 Old Ranch Parkway, Suite 470
Seal Beach, CA 90740

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
CLAIM NO. 7017 0190 0000 4169 6102

SUBJECT: REVIEW OF AIR SPARGE PILOT TEST REPORT AND WORK PLAN FOR FOLLOW-ON DUAL ZONE TEST

SITE: FORMER CHEMOIL REFINERY, 2020 WALNUT AVENUE, SIGNAL HILL, CALIFORNIA 90755 (SCP NO. 1391, SITE ID NO. 2040510)

Dear Mr. Christie:

The California Regional Water Quality Control Board, Los Angeles Region (Regional Board) received a technical document titled *Air Sparge Pilot Test Report and Work Plan for Follow-on Dual-Zone Test* ("Pilot Test Report" and "Workplan") dated October 25, 2018, submitted on your behalf by Apex Companies, LLC, (Apex).

The Pilot Test Report and Workplan are summarized below.

SUMMARY OF PILOT TEST REPORT

Historically, a dual-nested nutrient injection and air injection (NI/AI) system was installed as a groundwater barrier at the subject site (Site). Three of the NI/AI wells (NI/AI-35, NI/AI-41, and NI/AI-47) were abandoned by over-drilling and replaced with the installation of air sparge wells ASW-1 through ASW-3 that were screened between 55 to 65 ft bgs[1]. A clay layer was encountered at 30 to 45 ft bgs during the installation of the ASW-1 and ASW-2. In ASW-3, clay was encountered at the terminal well depth of 60 ft bgs.

The air sparge pilot test was conducted at the Site on July 10 and 11, 2018 in ASW-1 through ASW-3. The test was conducted in one air sparge well at a time, while existing monitoring wells MW-1, BMW-5, and the remaining two air sparge wells were used as observation wells.

During the pilot test conducted in ASW-1 and ASW-2, observation well BMW-5 (screened from 8 to 23 ft bgs), had no pressure increases. However, observation wells that were screened below the clay layer from 55 to 65 ft bgs and located further from the test wells detect a pressure response. With the presence of the clay layer between 30 to 45 feet, Apex believes the clay layer is impeding air migration vertically through the saturated zone and into shallower groundwater above the clay.

[1] ft bgs = feet below ground surface

(footnote continued on next page)

Soil vapor samples were collected from observation wells MW-1 and BMW-5 before and after the pilot test. Results show the post-test vapor concentrations of TPHg[2], TPHd[3], and BTEX[4] were higher than pre-test vapor concentrations (see table below), indicating the air sparging activities were successfully stripping VOCs[5] from groundwater into the vapor phase.

	MW-1 Pre-Test ($\mu g/m^3$)	MW-1 Post-Test ($\mu g/m^3$)		BMW-5 Pre-Test ($\mu g/m^3$)	BMW-5 Post-Test ($\mu g/m^3$)
TPHg	<100,000	190,000		<100,000	380,000
TPHd	<100,000	300,000		<100,000	100,000
Benzene	<500	540		<500	670
Toluene	<500	1,000		<500	1,600
Ethylbenzene	<500	<500		<500	<500
Xylene (total)	<1,500	5,100		<1,500	2,600

SUMMARY OF WORKPLAN FOR FOLLOW-ON DUAL-ZONE TEST

Due to the lithologic heterogeneity encountered, additional air sparge wells with shallower screen intervals located above the clay layer is recommended to determine if dual zone air sparge points are necessary to treat the full saturated zone.

The Workplan proposes to install one air sparge well (ASW-4) and four observation wells (OBS-1 through OBS-4) at depths between 20 to 35 ft bgs (see Figure 1). Similar to the first pilot test, these five wells will replace three existing NI/AI wells (NI/AI-43 through NI/AI-45) and two biogenic gas extraction wells (BGE-23 and BGE-24). The pilot test conducted in the shallow groundwater above the clay layer will measure and record the injection flow rates, breakthrough pressure, pressure response, groundwater level changes, dissolved oxygen, and oxidation reduction potential readings. Pre-test and post-test vapor and groundwater samples will be collected and analyzed for TPHg, TPHd, and VOC concentrations to confirm air sparging is effectively stripping VOCs from groundwater to vapor.

Following the shallow air sparge test in ASW-4, another pilot test incorporating the deeper air sparge wells (ASW-1 through ASW-3) will be operated for 30 days to evaluate long-term effectiveness of the air sparge system. Vapor samples will be collected from observation wells to determine the effectiveness of air stripping VOCs from groundwater.

REGIONAL BOARD COMMENTS

The Regional Board has reviewed and considers the Pilot Test Report and Workplan complete. A report documenting the air sparge activities is due to the Regional Board for review by **July 15, 2019**. The report shall include:

1. Pilot test results for shallow air sparge wells.
2. Pilot test for both shallow and deeper air sparge wells.
3. Details of a full-scale barrier treatment system to be implemented at the Site.

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[2] TPHg = Total Petroleum Hydrocarbon as gasoline

[3] TPHd = Total Petroleum Hydrocarbon as diesel

[4] BTEX = benzene, toluene, ethylbenzene, and xylene

[5] VOCs = volatile organic compounds

If you have any questions, please contact Ms. Jessica Pao, Case Manager, at (213) 576-6729 or Jessica.Pao@waterboards.ca.gov, or Ms. Jillian Ly, Site Cleanup Unit IV, Chief, at (213) 576-6664 or Jillian.Ly@waterboards.ca.gov.

Sincerely,

Deborah J. Smith
Executive Officer

Attachments:
Figure 1 – Proposed Shallow Air Sparge Test and Observation Well Locations

cc:

Mary Hashem, RE Solutions (Mary@resolutionsdev.com)
Richard Lesser, RE Solutions (Richard@resolutionsdev.com)
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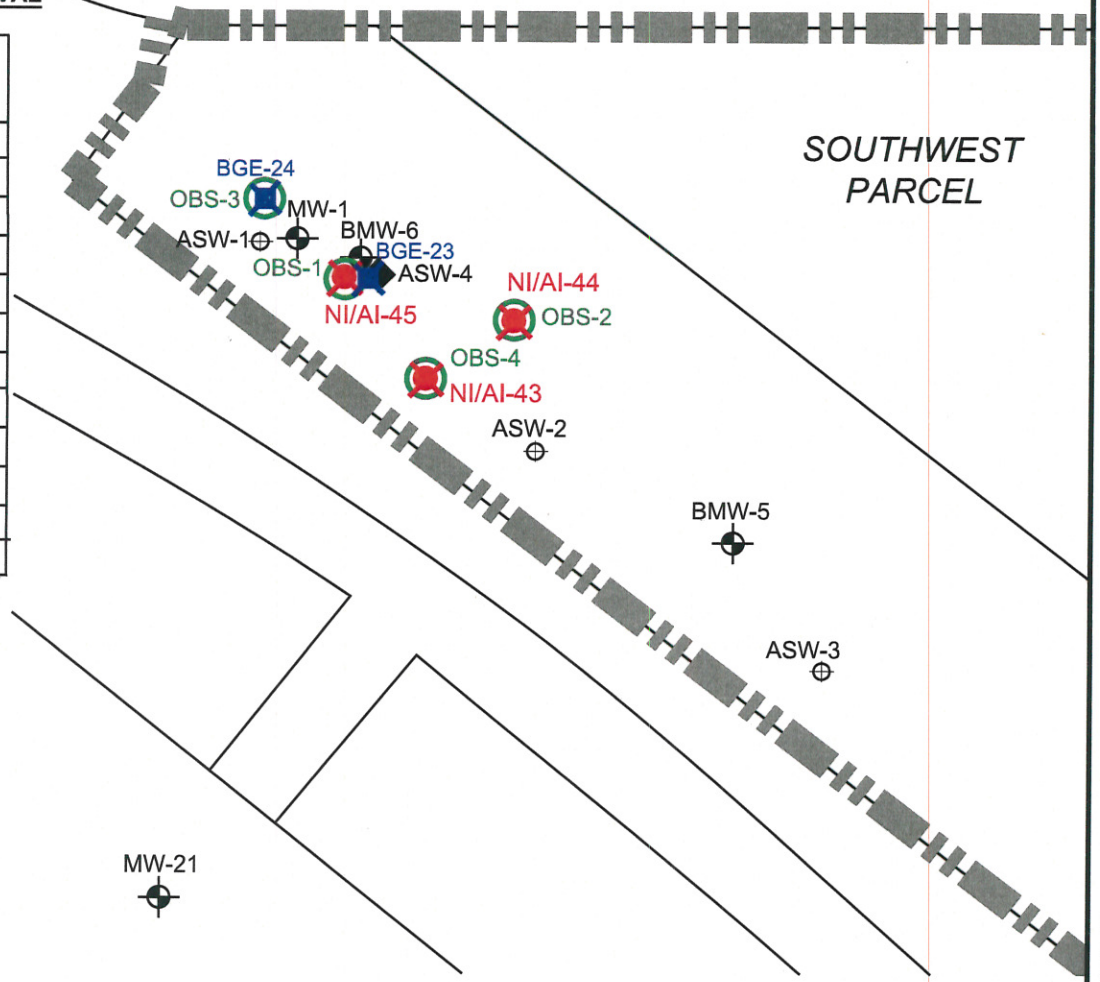
Colleen Doan, City of Signal Hill (CDoan@cityofsignalhill.org)
Susan Mearns, Mearns Consulting, LLC (Mearns.consulting@verizon.net)

SUMMARY OF MONITORING OF SPARGE WELL SCREEN INTERVAL

Well ID	Screen Intervals (feet below ground surface)
Existing Wells	
MW-1	30-60
BMW-5	11-23
ASW-1	55-60
ASW-2	60-65
ASW-3	55-60
Proposed Wells	
OBS-1	20-35*
OBS-2	20-35*
OBS-3	20-35*
OBS-4	20-35*
ASW-4	32-35*



LEGEND

- Site Boundary
- BMW-2 — Monitoring Well Location
- ASW-3 — Deep Air Sparge Well Location
- OBS-3 — Proposed New Observation Groundwater Monitoring Well Location
- ASW-4 — Proposed New Shallow Air Sparge Well Location
- * — Screen Interval For Proposed Wells are Approximate. Actual Depth May Be Adjusted Based on Field Condition Encounter.
- NI/AI-43 — Proposed Gas Extraction Well Abandonment Location
- BGE-24 — Proposed Dual-Nested Nutrient Injection/Air Injection Well Abandonment Location

Note:
Only select existing dual-nested nutrient injection/air injection and gas extraction well locations are shown.

S:\Clients A - F\ChemOil Refinery\Air Sparge Phase 1\Fig.5-2-Proposed Shallow AS Test & Observation Wells.dwg

APEX
3478 BUSKIRK AVENUE, SUITE 100
PLEASANT HILL, CA 94523

FORMER CHEMOIL REFINERY
2020 WALNUT AVENUE
SIGNAL HILL, CA

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PROPOSED SHALLOW AIR SPARGE TEST AND OBSERVATION WELL LOCATIONS

0 30 60
HORIZONTAL SCALE IN FEET

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FIGURE 1