



Los Angeles Regional Water Quality Control Board

October 18, 2022

Mr. Christian Darville
Lisi Aerospace/Hi-Shear Corporation
2600 Skypark Drive
Torrance, California 90509-2975

Certified Mail
Return Receipt Requested
Claim No. 7020 2450 0000 3231 8355

Mr. Richard Doyle
Magellan Aerospace, Middletown, Inc.
2320 Wedekind Drive
Middletown, Ohio 45042-2390

Certified Mail
Return Receipt Requested
Claim No. 7020 2450 0000 3231 8348

Mr. Bailey Su
Excellon Technologies, LLC
20001 S. Rancho Way
Rancho Dominguez, California 90220

Certified Mail
Return Receipt Requested
Claim No. 7020 2450 0000 3231 8331

Corporate Secretary
Esterline Technologies Corporation
1301 East 9th Street, Suite 3000
Cleveland, Ohio 44114

Certified Mail
Return Receipt Requested
Claim No. 7020 2450 0000 3231 8324

Mr. Tim A. Goetz
Robinson Helicopter Company
2901 Airport Drive
Torrance, California 90505

Certified Mail
Return Receipt Requested
Claim No. 7020 2450 0000 3231 8317

Mr. Ward Olson
Dasco Engineering Corporation
24747 Crenshaw Boulevard
Torrance, California 90505

Certified Mail
Return Receipt Requested
Claim No. 7020 2450 0000 3231 8300

Mr. Aram Chaparyan
City Manager
City of Torrance
3031 Torrance Boulevard
Torrance, California 90503

Certified Mail
Return Receipt Requested
Claim No. 7020 2450 0000 3231 8294

JAMES STAHL, ACTING CHAIR | RENEE PURDY, EXECUTIVE OFFICER

SUBJECT: REVIEW OF INTERIM REMEDIAL ACTION PLAN FOR SITE GROUNDWATER, PURSUANT TO CALIFORNIA WATER CODE SECTION 13304 CLEANUP AND ABATEMENT ORDER NO. R4-2021-0079

SITE: SKYPARK COMMERCIAL PROPERTIES (ASSESSOR PARCEL NO. 7377-006-906), 24701 – 24777 CRENSHAW BOULEVARD AND 2530, 2540, AND 2600 SKYPARK DRIVE, TORRANCE, CALIFORNIA (SCP NO. 1499)

Dear Mr. Darville, et al.:

The California Regional Water Quality Control Board, Los Angeles Region (Los Angeles Water Board) is the state agency with primary responsibility for the protection of groundwater and surface water quality within major portions of Los Angeles and Ventura counties, including the above referenced site (Site). To accomplish this, the Los Angeles Water Board oversees the investigation and cleanup of discharges of waste that may affect the quality of waters of the state as authorized by the Porter-Cologne Water Quality Control Act (California Water Code [CWC], Division 7).

On January 31, 2022, the Los Angeles Water Board staff received the *Groundwater Removal Action Workplan* (Groundwater IRAP), submitted on behalf of the City of Torrance by Terraphase Engineering Inc. (Terraphase) for review.

A summary of the Groundwater IRAP followed by Los Angeles Water Board comments are included below.

SUMMARY OF GROUNDWATER IRAP

According to the Groundwater IRAP, the objectives of the proposed remedial actions are to:

1. Reduce the potential for vapor intrusion risk into the City of Lomita, east of Crenshaw Boulevard, by addressing the regional groundwater impacted by volatile organic compounds (VOCs).
2. Reduce contaminant mass and migration at and/or beneath the Hi-Shear Corporation portion (Hi-Shear Property) of the Site.
3. Achieve water quality objectives (i.e., maximum contaminant levels [MCLs]) in the regional groundwater within a reasonable time frame.

The Groundwater IRAP evaluated the following remedy alternatives to achieve the objectives:

1. No Action
2. Monitored Natural Attenuation (MNA)

3. Enhanced In-Situ Bioremediation (EISB)
4. Zero-Valent Iron (ZVI) Barrier
5. Groundwater Pump and Treat
6. Thermal Technologies with Soil Vapor Extraction
7. In-Situ Chemical Oxidation

Terraphase proposed to retain the following two remedy alternatives to achieve the objectives:

1. ZVI Barrier
 - a. Intends to minimize the migration of the VOC plume into the City of Lomita and to reduce groundwater contaminant concentrations.
 - b. Is located roughly along the eastern boundary of the Site (i.e., along Crenshaw Boulevard) and measuring approximately 500 feet (see attached Figure 6 – Plume Margin ZVI Barrier) to treat groundwater total VOC concentrations greater than 200 micrograms per liter (µg/L).
 - c. Is installed by injecting ZVI, KB-1 Plus (a commercial bioaugmentation culture), and plant-based substrate (guar) at 28 injection points into a 25-foot zone approximately 90 to 115 feet below ground surface (ft-bgs). The injection points are organized in an array of two rows approximately in the center 250 feet of the groundwater VOC plume with single rows of injection points extending 125 to the north and south. The north and south extent and placement of the ZVI barrier will be better understood with confirmation groundwater samples collected during installation of the outmost injection wells.
 - i. Injections through 4-inch-diameter polyvinyl chloride casings installed to 115 ft-bgs by sonic drilling technology
 - ii. Terraphase estimates the barrier will be composed of 134 metric tons of ZVI injected under high pressure with 43 metric tons of sand in a water- and food-grade guar carrier fluid with 90 liters of KB-1 Plus. Limited EISB substrate will also be applied during ZVI placement to increase reductive conditions.
 - iii. The radius of influence of each injection point is expected to be 15 feet and will be confirmed with continuous pressure logging. The 15 feet radii allow for a minimum of 30 percent and 10 percent overlap along the single injection rows and double injection rows, respectively.

- iv. The exact locations of the 28 injection points are subject to change as confirmation groundwater samples will be collected during injection well installations that may better inform placement of injection points.

2. EISB, followed by MNA

- a. Intended to treat “the primary VOC source at the Hi-Shear Property” (as described by Terraphase) and to prevent continued migration of VOCs in the regional groundwater from the Hi-Shear Property.
 - b. EISB pilot studies were conducted in 2013 and 2015 followed by one injection event in 2017 at the Hi-Shear Property. The results suggest that EISB is effective in the remediation of VOC impacts to groundwater. Terraphase cites short duration and incomplete and limited application of EISB within the Hi-Shear Property as key shortcomings of past efforts.
 - c. Utilizes the existing 77 dual-nested injection wells, screened from 88 to 98 ft-bgs and 103 to 113 ft-bgs, at the Hi-Shear Property to reestablish and maintain a biologically active zone conducive for dechlorination (see attached Figure 5 – High-Shear Injection Well Locations).
 - i. Terraphase estimates a total injection volume of 724,500 gallons. The EISB amendment concoction includes soybean oil, emulsifiers, nutrients, and other soluble organic carbon substrates (i.e., Electron Donor Solution-extended release [EDS-ER; soybean-oil based], Electron Donor Solution-Activator [EDS-Activator; alkaline and donor], substrate shuttle [alcohol based], and TersOx Nutrients-QR).
 - d. Terraphase estimates 4 quarterly sampling events, 4 bi-annual sampling events, and 10 years of annual sampling post-injection.
3. Terraphase anticipates quarterly Waste Discharge Requirement (WDR) groundwater compliance monitoring for one year, bi-annually for two years, and annually thereafter for up to 15 groundwater monitoring wells.

FACT SHEET AND NOTICE OF OPPORTUNITY TO COMMENT

Pursuant to sections 13307.1 and 13307.5 of the California Water Code (CWC), Los Angeles Water Board staff issued a *Project Update and Notice of Opportunity to Comment* (Update) on May 11, 2022 to all businesses, residents, and property owners within a 500-foot radius of the aerial extent of the Site and to interested parties. The Update invited all recipients of the Update to participate in the cleanup process by reviewing and providing comments on the Groundwater IRAP to the Los Angeles Water Board by June 20, 2022.

LOS ANGELES WATER BOARD COMMENTS AND REQUIREMENTS

The Los Angeles Water Board conditionally approves the Groundwater IRAP with the following comments and requirements:

1. In addition to the groundwater monitoring wells highlighted in the Groundwater IRAP (MW-20, MW-21, and MW-23), groundwater monitoring wells MW-8, MW-12, and the five wells conditionally approved to be installed in the regional groundwater zone (three on Property 1, one on Property 2, and one on the former Nike Missile Base), as part of the investigative component of the revised *Removal Action Workplan for the East Adjacent Properties* (EAP IRAP), shall be included in the network of wells that monitors the effectiveness of the ZVI barrier.
2. Based on recent groundwater monitoring data reported in the *First Tri-Annual 2022 Groundwater Monitoring Report*, submitted on behalf of Hamrick & Evans, LLP (attorney representative for Hi-Shear Corporation) by Genesis Engineering & Redevelopment, Inc. on May 13, 2022, additional EISB injection wells shall be installed in the immediate vicinity of groundwater monitoring wells MW-4, MW-13, and MW-14. Recent tetrachloroethene, trichloroethene, and 1,1-dichloroethene groundwater concentrations at these wells were up to two orders of magnitude greater than their respective State Water Resources Control Board Division of Drinking Water's MCLs of 5 µg/L, 5 µg/L, and 6 µg/L, respectively, and have historically been elevated.

These injection wells shall be installed in a similar construction and configuration as the existing injection points and incorporated in the implementation of the Groundwater IRAP.

3. The existing dual-nested injection wells that are deemed to be in poor working or nonworking conditions during inspection shall be rehabilitated or replaced with a new injection well of the same construction and configuration.
4. Consistent with the EISB activities implemented in 2017 by Hi-Shear Corporation at the Hi-Shear property, the network of wells that monitors the effectiveness of the EISB injections shall include groundwater monitoring wells MW-7R (serves as an upgradient well); MW-6, MW-15, MW-18, MW-5, MW-10, MW-16, MW-19, CMW-11C (serve as treatment zone wells); and MW-8 and MW-12 (serve as downgradient wells). Based on Los Angeles Water Board Comment No. 2, groundwater monitoring wells MW-4, MW-13, and MW-14 shall also be included in the network to serve as treatment zone monitoring wells.
5. Ensure that performance monitoring parameters for the selected remedy alternatives, at a minimum, include oxidation-reduction potential, terminal electron-accepting processes (i.e., ferrous iron, manganese), electrical conductivity, major cations (e.g., Al, Ba, Fe, Mn, Ca, Mg, Na, K), major anions (e.g., HS⁻, Cl⁻, NO₂⁻, NO₃⁻, SO₄⁻², PO₄⁻³, CO₃⁻²), alkalinity, total dissolved solids, total sulfide, dissolved

organic carbon or total organic carbon, dissolved gases (methane, ethane, ethene, carbon dioxide, hydrogen, oxygen), pH, temperature, and Dehalococcoides.

Note the primary performance measures for the remedy alternatives will be reduction in contaminant concentrations in groundwater. The geochemical and microbial data, where applicable, may be evaluated to identify any changes in environmental conditions that may impact the remedy alternatives' efficiencies.

6. In addition to the proposed criteria of treating groundwater total VOC concentrations greater than 200 µg/L, the north and south ends of the ZVI barrier shall also be extended along the eastern boundary of the Site, as necessary, to address groundwater VOC concentrations that exceed one order of magnitude of their respective MCLs. The extension of the north and south ends of the ZVI barrier shall be based on the proposed confirmation groundwater sampling during the ZVI barrier installation and data from the investigative component of the EAP IRAP (i.e., grab groundwater sample data from the transects).
7. The Los Angeles Water Board does not concur at this time with the MNA aspect of the EISB remedy alternative retained. It is premature at this time to conclude that MNA following EISB injections can achieve the necessary cleanup levels in a reasonable timeframe. MNA may be considered as an alternative in the future based on the positive results of interim and comprehensive remedial activities implemented at the Site.
8. Notify the Los Angeles Water Board case manager at least ten working days in advance of field work.
9. Submit the Groundwater IRAP implementation report by **May 15, 2023**. The report should include field observations, a detailed map of the injection points, conclusions, and recommendations for the Site.
10. Prepare and submit tri-annual performance monitoring reports for the Site on the same schedule as the tri-annual groundwater monitoring reports with the first performance monitoring report due **May 15, 2023**. Continue to submit tri-annual performance monitoring reports and tri-annual groundwater monitoring reports until otherwise instructed to do so by the Executive Officer of the Los Angeles Water Board.
11. The Los Angeles Water Board does not consider the Groundwater IRAP as the final Site cleanup plan. The Groundwater IRAP provides source reduction and containment, but it does not actively address the VOC concentrations downgradient and off-Site. Subsequent interim remedial action plan(s) and/or comprehensive remedial action plan(s) are warranted to address impacts that have migrated off-Site.
12. Regarding necessary cleanup levels, note that State Water Resources Control Board Resolution No. 92-49 establishes that the Los Angeles Water Board shall

require dischargers to clean up and abate the effects of discharges in a manner that promotes attainment of either background water quality or, if background levels of water quality are not achievable, the best water quality which is reasonable. If background levels of water quality are not achievable, alternative cleanup levels must be established that are protective of human health and the environment and which take into account technical and economic feasibility. (See Cal. Code Regs., tit. 23, § 2550.4.)

As noted in Comment No. 11 above, the Los Angeles Water Board does not consider the Groundwater IRAP as the final Site cleanup plan. The final Site cleanup plan and the cleanup levels proposed therein must address the requirements of State Water Resources Control Board Resolution No. 92-49. Therefore, any discussion in the Groundwater IRAP regarding cleanup levels is premature without first demonstrating that cleanup to achieve background levels of water quality is not achievable.

13. On May 11, 2022, the Groundwater IRAP was presented to you and posted for public comment with the issuance of a *Project Update and Notice of Opportunity to Comment*. The public comment period ended on June 20, 2022. The Los Angeles Water Board has reviewed the comments received and prepared the attached document, entitled *Response to Public Comments to Groundwater Removal Action Plan* (Response to Comments), summarizing the pertinent comments received and the responses to those comments.

The revisions to Attachment B Third Revised Time Schedule (attached) constitute an amendment to the requirements of the Cleanup and Abatement Order No. R4-2021-0079 (Order) originally dated June 18, 2021. All other aspects of the Order No. R4-2021-0079 originally dated June 18, 2021, and the amendments thereto, remain in full force and effect. Pursuant to section 13350 of the California Water Code, failure to comply with the requirements of the Order No. R4-2021-0079 by the specified due date, including date(s) in this amendment, may result in civil liability administratively imposed by the Los Angeles Water Board in an amount up to five thousand dollars (\$5,000) for each day of failure to comply.

If you have any questions regarding this letter, please contact Mr. Kevin Lin at (213) 576-6781 or via email at kevin.lin@waterboards.ca.gov, or contact Ms. Jillian Ly, Remediation Section II Manager, at (213) 576-6664 or via email at jillian.ly@waterboards.ca.gov.

Sincerely,

 Digitally signed by R Purdy
Date: 2022.10.18 15:21:44 -07'00'

Renee Purdy
Executive Officer

Attachments:

1. Figure 6 – Plume Margin ZVI Barrier
2. Figure 5 – High-Shear Injection Well Locations
3. Attachment B Third Revised Time Schedule of Order
4. Attachment B Third Revised Time Schedule of Order (underline/strikeout version)
5. Response to Comments to Groundwater Removal Action Plan
6. Comments Received to Groundwater Removal Action Plan

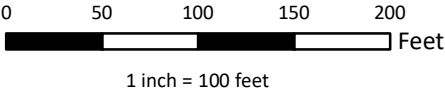
cc:

Dmitriy Ginzburg, State Water Board Division of Drinking Water
Joseph Liles, Water Replenishment District
Carla Dillon, City of Lomita
Ryan Smoot, City of Lomita
Trevor Rusin, City of Lomita
Alan B. Fenstermacher, Rutan & Tucker, LLP
Travis Van Ligten, Rutan & Tucker, LLP
Richard Montevideo, Rutan & Tucker, LLP
Darren Croteau, Terraphase Engineering Inc.
Sonja A. Inglin, Cermak & Inglin, LLC
Patrick L. Rendon, Lamb and Kawakami, LLP
William J. Beverly, Law Offices of William J. Beverly
Brian M. Ledger, Gordon Rees Scully Mansukhani, LLP
Thomas Schmidt, Hamrick & Evans, LLP
David L. Evans, Hamrick & Evans, LLP
Jeff W. Poole, Hamrick & Evans, LLP
Steve Van der Hoven, Genesis Engineering & Redevelopment
Solomon Seyum, Genesis Engineering & Redevelopment

Attachment 1 - Figure 6 – Plume Margin ZVI Barrier



Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



SAFETY FIRST



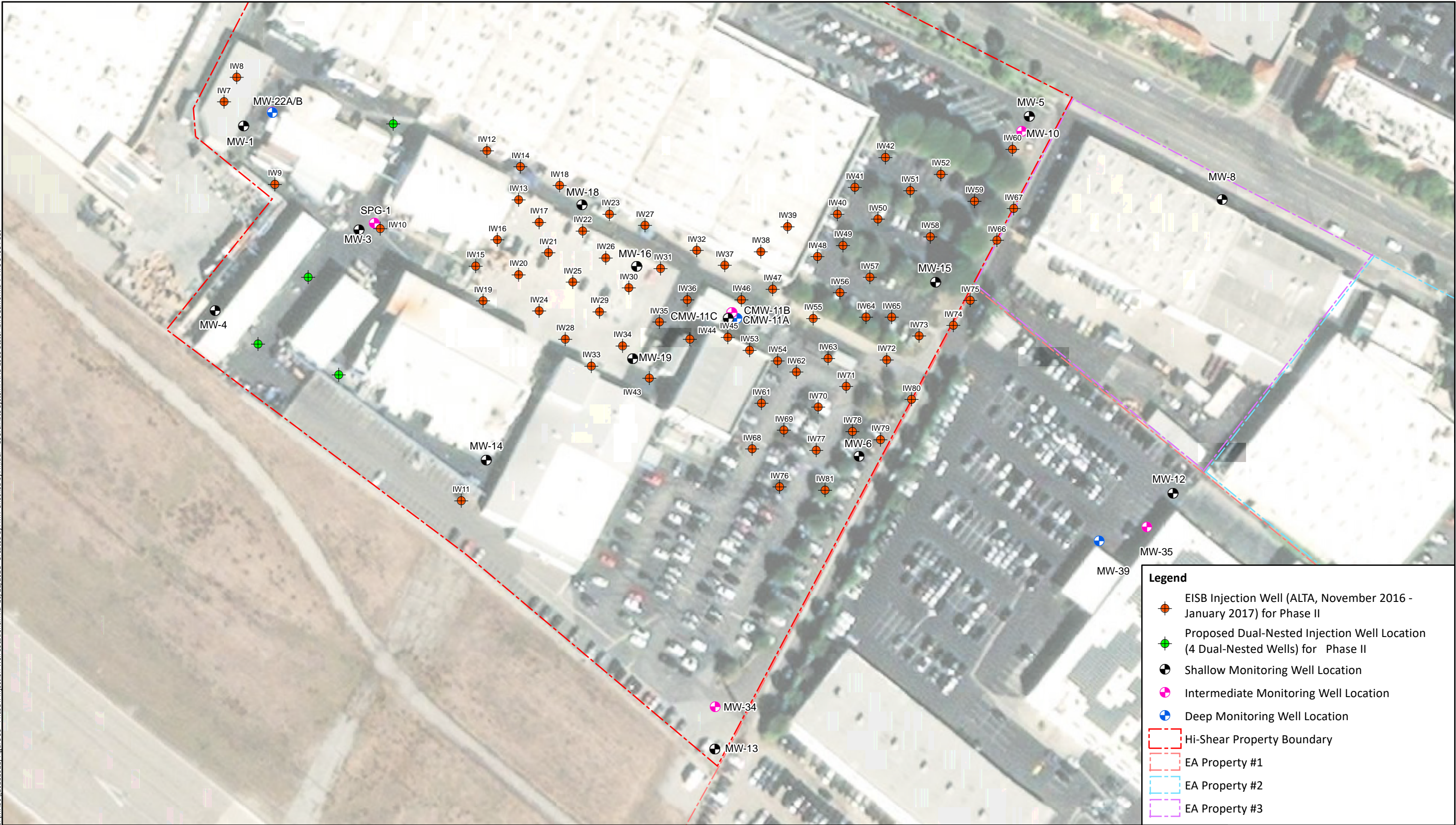
CLIENT:	Rutan & Tucker
PROJECT:	Hi-Shear
PROJECT NUMBER:	S042.002.002

Plume Margin ZVI Barrier

FIGURE 6

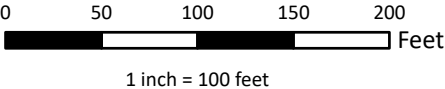
File: N:\GIS\Prj\S042.002_HiShear\MXDs\20220111\Figure 6 - Plume Margin ZVI Barrier.mxd 1/11/2022 Created by: MR Checked by: Initial Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet

Attachment 2 - Figure 5 – High-Shear Injection Well Locations




File: N:\GIS\PA\S042.002_HiShear\MXD\20211021\Figure 3b - Phase II Injection Well Locations.mxd 10/21/2021 Created by: MR Checked by: Initial Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



- Legend**
- EISB Injection Well (ALTA, November 2016 - January 2017) for Phase II
 - Proposed Dual-Nested Injection Well Location (4 Dual-Nested Wells) for Phase II
 - Shallow Monitoring Well Location
 - Intermediate Monitoring Well Location
 - Deep Monitoring Well Location
 - Hi-Shear Property Boundary
 - EA Property #1
 - EA Property #2
 - EA Property #3

<div><div>SAFETY FIRST</div><div> terraphase engineering</div></div>	CLIENT:	Rutan & Tucker	<div>High-Shear Injection Well Locations</div> <div>FIGURE 5</div>
	PROJECT:	Hi-Shear	
	PROJECT NUMBER:	S042.002.002	

ATTACHMENT B: THIRD REVISED TIME SCHEDULE OF ORDER

DIRECTIVE	DUE DATE
<p>1. Site Conceptual Model:</p> <p>The Dischargers shall prepare and submit to the Regional Board a Site Conceptual Model which provides details on and illustrates waste discharge scenario(s), geology and hydrogeology, waste constituent fate and transport in soil, soil vapor, and groundwater, distribution of waste constituents, exposure pathways, sensitive receptors and other relevant information.</p> <p>[Note that the Regional Board may require revisions to the Site Conceptual Model as necessary to complete the Model.]</p>	<p>Site Conceptual Model due September 10, 2021.</p> <p>Revisions due within 60 days of receiving directive from the Regional Board.</p>
<p>2. Risk Assessment:</p> <p>The Dischargers shall:</p> <ul style="list-style-type: none"> a. Prepare and submit a comprehensive HHRA b. Prepare and submit implementation reports for the response zones designated in the Vapor Intrusion Response Plan. <ul style="list-style-type: none"> i. Completion report for the Accelerated Response Zone ii. Interim completion report for the Evaluate Need for Action Zone. iii. Completion report for the Evaluate need for Action Zone c. Submit a revised Evaluate Need for Action Zone Plan and its Figure 7 – Proposed VI Assessment Sectors d. Prepare and submit semi-annual soil vapor probe monitoring reports for the network of soil vapor probes east of Crenshaw Boulevard according to the following schedule: 	<p>September 10, 2021</p> <p>August 15, 2022</p> <p>August 15, 2022</p> <p>March 17, 2023</p> <p>August 13, 2021</p> <p>Semi-annually beginning January 31, 2022</p>

DIRECTIVE	DUE DATE
<p>Monitoring Period June December</p>	<p>Report Due Date July 31st January 31st</p>
<p>3. Site Assessment:</p> <p>a. The Dischargers shall prepare and submit Site Assessment Work Plan(s) for each Property</p> <p>The Dischargers shall implement the Site Assessment Work Plan(s) according to the approved schedule</p> <p>The Dischargers shall submit the Site Assessment Completion Report(s)</p> <p>b. Hi-Shear Corporation shall submit the Additional Scope Report</p> <p>c. Hi-Shear Corporation shall submit the Module IV Report</p> <p>d. Hi-Shear Corporation shall submit the Onsite Vertical Groundwater Investigation Report</p> <p>e. The Dischargers shall submit the Groundwater Modeling Work Plan</p>	<p>September 10, 2021</p> <p>According to the schedule approved by the Executive Officer. Vertical and lateral delineation must be completed no later than September 12, 2022</p> <p>According to the schedule approved by the Executive Officer</p> <p>October 15, 2021</p> <p>October 15, 2021</p> <p>August 27, 2021</p> <p>January 7, 2022</p>
<p>4. Conduct Remedial Action:</p> <p>The Dischargers shall:</p> <p>a. Develop and submit the IRAP(s)</p> <p>i. Submit the Groundwater IRAP implementation report</p>	<p>August 31, 2021</p> <p>May 15, 2023</p>

DIRECTIVE	DUE DATE
<p>ii. Prepare and submit Remediation Progress Reports for the implementation of the Groundwater IRAP</p> <p>b. Develop and submit the RAP(s)</p> <p>Implement the RAP(s)</p> <p>Prepare and submit Remediation Progress Reports for the implementation of the RAP(s)</p> <p>Upon completion of implementation of the RAP, submit a Remedial Action Completion Report</p>	<p>Tri-annually beginning May 15 of the year implementation of the Groundwater IRAP begins.</p> <p>March 31, 2022</p> <p>According to the schedule in the RAP approved by the Executive Officer. RAP Implementation must be complete and cleanup achieved by March 31, 2027.</p> <p>Quarterly beginning January 15 of the year implementation of the RAP begins</p> <p>60 days after completion of implementation of the RAP</p>
<p>5. Groundwater Monitoring:</p> <p>The Dischargers shall conduct tri-annual groundwater monitoring according to Attachment C (Monitoring and Reporting Program) and the following schedule.</p> <p>Monitoring Period January – April May – August September – December</p>	<p>The next groundwater monitoring report is due on September 15, 2021.</p> <p>Report Due Date May 15th September 15th January 15th</p>
<p>6. Public Participation: The Dischargers shall submit information and take actions addressing public participation requirements of CWC sections 13307.5 and 13307.6, including, but not limited to:</p> <p>a. Submit a baseline community assessment</p> <p>b. Submit an interested persons contact list</p> <p>c. Submit a draft fact sheet</p>	<p>According to the schedule approved by Executive Officer.</p> <p>According to the schedule approved by Executive Officer.</p> <p>According to the schedule approved by Executive Officer.</p>

ATTACHMENT B: ~~SECOND-THIRD~~ REVISED TIME SCHEDULE OF ORDER

DIRECTIVE	DUE DATE
<p>1. Site Conceptual Model:</p> <p>The Dischargers shall prepare and submit to the Regional Board a Site Conceptual Model which provides details on and illustrates waste discharge scenario(s), geology and hydrogeology, waste constituent fate and transport in soil, soil vapor, and groundwater, distribution of waste constituents, exposure pathways, sensitive receptors and other relevant information.</p> <p>[Note that the Regional Board may require revisions to the Site Conceptual Model as necessary to complete the Model.]</p>	<p>Site Conceptual Model due September 10, 2021.</p> <p>Revisions due within 60 days of receiving directive from the Regional Board.</p>
<p>2. Risk Assessment:</p> <p>The Dischargers shall:</p> <ul style="list-style-type: none"> a. Prepare and submit a comprehensive HHRA b. Prepare and submit implementation reports for the response zones designated in the Vapor Intrusion Response Plan. <ul style="list-style-type: none"> i. Completion report for the Accelerated Response Zone ii. Interim completion report for the Evaluate Need for Action Zone. iii. Completion report for the Evaluate need for Action Zone c. Submit a revised Evaluate Need for Action Zone Plan and its Figure 7 – Proposed VI Assessment Sectors d. Prepare and submit semi-annual soil vapor probe monitoring reports for the network of soil vapor probes east of Crenshaw Boulevard according to the following schedule: 	<p>September 10, 2021</p> <p>August 15, 2022</p> <p>August 15, 2022</p> <p>March 17, 2023</p> <p>August 13, 2021</p> <p>Semi-annually beginning January 31, 2022</p>

DIRECTIVE	DUE DATE
<p>Monitoring Period June December</p>	<p>Report Due Date July 31st January 31st</p>
<p>3. Site Assessment:</p> <p>a. The Dischargers shall prepare and submit Site Assessment Work Plan(s) for each Property</p> <p>The Dischargers shall implement the Site Assessment Work Plan(s) according to the approved schedule</p> <p>The Dischargers shall submit the Site Assessment Completion Report(s)</p> <p>b. Hi-Shear Corporation shall submit the Additional Scope Report</p> <p>c. Hi-Shear Corporation shall submit the Module IV Report</p> <p>d. Hi-Shear Corporation shall submit the Onsite Vertical Groundwater Investigation Report</p> <p>e. The Dischargers shall submit the Groundwater Modeling Work Plan</p>	<p>September 10, 2021</p> <p>According to the schedule approved by the Executive Officer. Vertical and lateral delineation must be completed no later than September 12, 2022</p> <p>According to the schedule approved by the Executive Officer</p> <p>October 15, 2021</p> <p>October 15, 2021</p> <p>August 27, 2021</p> <p>January 7, 2022</p>
<p>4. Conduct Remedial Action:</p> <p>The Dischargers shall:</p> <p><u>a.</u> Develop and submit the IRAP(s)</p> <p><u>i. Submit the Groundwater IRAP implementation report</u></p>	<p>August 31, 2021</p> <p>According to the schedule approved by the Executive Officer <u>May 15, 2023</u></p>

DIRECTIVE	DUE DATE
<p>Implement the IRAP(s)</p> <p>i.ii. Prepare and submit Remediation Progress Reports for the implementation of the IRAP(s)<u>Groundwater IRAP</u></p> <p>b. Develop and submit the RAP(s)</p> <p>Implement the RAP(s)</p> <p>Prepare and submit Remediation Progress Reports for the implementation of the RAP(s)</p> <p>Upon completion of implementation of the RAP, submit a Remedial Action Completion Report</p>	<p>Quarterly—Tri-annually beginning January—May 15 of the year implementation of the <u>Groundwater</u> IRAP begins.</p> <p>March 31, 2022</p> <p>According to the schedule in the RAP approved by the Executive Officer. RAP Implementation must be complete and cleanup achieved by March 31, 2027.</p> <p>Quarterly beginning January 15 of the year implementation of the RAP begins</p> <p>60 days after completion of implementation of the RAP</p>
<p>5. Groundwater Monitoring:</p> <p>The Dischargers shall conduct tri-annual groundwater monitoring according to Attachment C (Monitoring and Reporting Program) and the following schedule.</p> <p>Monitoring Period January – April May – August September – December</p>	<p>The next groundwater monitoring report is due on September 15, 2021.</p> <p>Report Due Date May 15th September 15th January 15th</p>
<p>6. Public Participation: The Dischargers shall submit information and take actions addressing public participation requirements of CWC sections 13307.5 and 13307.6, including, but not limited to:</p> <p>a. Submit a baseline community assessment</p>	<p>According to the schedule approved by Executive Officer.</p>

DIRECTIVE	DUE DATE
b. Submit an interested persons contact list	According to the schedule approved by Executive Officer.
c. Submit a draft fact sheet	According to the schedule approved by Executive Officer.



Los Angeles Regional Water Quality Control Board

Response to Public Comments: Groundwater Removal Action Plan

(Comment Period: May 18, 2022 – June 20, 2022)

Comments received

Bates Page

A. Magellan Aerospace, Middleton, Inc., 3/21/2022	1 – 75
B. City of Torrance (in response to Middletown), 4/5/2022	76 – 88
C. Hi-Shear Corporation, 4/25/2022	89 – 98
D. City of Lomita, 6/17/2022	99 – 101
E. Magellan Aerospace, Middletown, Inc., 6/17/2022	102 – 112
F. Hi-Shear (Supplemental Comments), 6/17/2022	113 – 118
G. Esterline Technologies Corporation, 6/20/2022.....	119 – 148

Groundwater Removal Action Plan (Groundwater IRAP) Response to Comments

Acronyms

ARZ	Accelerated Response Zone
ASVR	Air Sparing and Vapor Recovery
City	City of Torrance
CAO	Cleanup and Abatement Order
Dischargers	City of Torrance; Magellan Aerospace, Middletown, Inc. (formerly known as Aeronca, Inc. formerly known as Aeronca Manufacturing Corporation); Excellon Industries, an Esterline Company (also known as Excellon Industries, Inc., Excellon Automation Company, and EA Technologies Corporation); Excellon Acquisitions, LLC; Excellon Technologies, LLC; Esterline Technologies Corporation; and Hi-Shear Corporation (also known as Lisi Aerospace)
EA Properties	East Adjacent Properties of Hi-Shear Corporation
EAP IRAP	Removal Action Workplan for the East Adjacent Properties
EISB	Enhanced In Situ Bioremediation
ENA Zone	Evaluate Need for Action Zone
Esterline	Esterline Technologies Corporation
ft-bgs	Feet below ground surface
GW IRAP	Groundwater Removal Action Plan
GWRAP	Groundwater Remedial Action Plan, dated May 10, 2016
GSI	GSI Environmental, Inc.
HHRA	Human Health Risk Assessment
Hi-Shear	Hi-Shear Corporation
IRAP	Interim Remedial Action Plan
ISCO	In Situ Chemical Oxidation
Lomita	City of Lomita
MCL	Maximum Contaminant Level for drinking water
Middletown	Magellan Aerospace, Middleton, Inc.
MNA	Monitored natural attenuation
Revised M&RP	Revised Monitoring and Reporting Program
µg/L	Microgram per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan, commonly referred to as the National Contingency Plan
PCE	Tetrachloroethene

Project Update	Project Update and Notice of Opportunity to Comment, May 2022
Property 1	24751 and 24777 Crenshaw Boulevard; current day Lexus property
Property 2	24707, 24747 and 24701 Crenshaw Boulevard; current day Dasco Engineering property
Property 3	2530 and 2540 Skypark Drive; current day Robinson Helicopter property
RAO	Removal Action Objective
RAP	Remedial Action Plan
RTC	Response to Comment
RWB or LAWB	California Regional Water Quality Control Board, Los Angeles Region
SCM or CSM	Site conceptual model or conceptual site model
SVE	Soil vapor extraction
SWRCB or State Water Board	State Water Resources Control Board
TCE	Trichloroethene
Terraphase	Terraphase Engineering, Inc.
VI	Vapor Intrusion
VIRP	Vapor Intrusion Response Plan
VOC	Volatile organic compound
WDR	Waste Discharge Requirements
ZVI barrier	Zero Valent Iron Barrier

Comment Identifier	Commenter	Comment Summary	Response
A.1	Middletown	Middletown identified the comments in the letter to be preliminary observations to Terraphase's EAP IRAP.	<p>This <i>Response to Public Comments</i> document only responds to comments pertinent to the GW IRAP. Comments made to other technical documents will not be addressed and/or discussed at length.</p> <p>Comments made to the EAP IRAP may be resubmitted for RWB's consideration during its 30-day public comment period that concludes October 14, 2022. The <i>Project Update and Notice of Opportunity to Comment</i> for the revised EAP IRAP was distributed September 6, 2022.</p>
A.2	Middletown	Middletown questions the conclusions made in the EAP IRAP and identified data gaps, primarily associated with Property 1, that need to be addressed with additional fieldwork.	<p>RWB staff generally concurs. Based on feedback from Dischargers in recent meetings and their shared interest in addressing the data gaps in an expeditious manner, the RWB has proceeded in parallel with the review and conditional approval of the investigative component of the June 24, 2022 revised EAP IRAP. The RWB letter was issued on July 27, 2022.</p> <p>This comment is not pertinent to the GW IRAP (See RTC A.1).</p>
A.3	Middletown	Middletown identified several environmental reports submitted that have not received comments and/or approvals from the RWB.	<p>The reports identified in the comment are not pertinent to the GW IRAP. Middletown identified reports that have been previously responded to, will be responded, and/or do not warrant RWB responses.</p> <p>Separately, the RWB staff communicated with Middletown's technical consultant and determined that their assessment work plan previously submitted significantly overlaps with the investigative component of the June 24, 2022 revised EAP IRAP. The RWB conditionally approved the investigative component of the revised EAP IRAP on July 27, 2022.</p>
B.1	GSI	GSI begins its letter noting that they are responding to Middletown's preliminary observations to the EAP IRAP, dated March 21, 2022.	Based on RTC A.1 through A.3, GSI's responses to Middletown's letter will not be discussed further in this <i>Response to Public Comments</i> document.

Comment Identifier	Commenter	Comment Summary	Response
C.1	Hi-Shear	Hi-Shear begins its letter noting that they are commenting on the GW IRAP and EAP IRAP submitted on January 31, 2022 and February 28, 2022, respectively.	See RTC A.1.
C.2	Hi-Shear	Hi-Shear states that the ZVI barrier will not reduce VI risk or achieve water quality objectives in groundwater east of Crenshaw Boulevard. The ZVI barrier leaves VOC untreated in the unsaturated zone on both sides of Crenshaw Boulevard. Without additional treatment, the contaminated groundwater may not pass through the ZVI barrier before its abandonment (estimated 15 years).	RWB staff partially concurs with Hi-Shear's comment. The ZVI barrier alone will not reduce VI risk or achieve water quality objectives in groundwater east of Crenshaw Boulevard. The GW IRAP, in its present form, proposes interim remedial actions that primarily address groundwater impacts beneath the Site and mitigates further contaminant migration (i.e., from the Site to east of Crenshaw Boulevard) by decreasing the concentrations at the source (i.e., EISB injections) and preventing or limiting the continued migration from the known source(s) (i.e., ZVI barrier). The RWB considers the ZVI barrier and EISB injections as interim remedial actions, and a phased approach to Site cleanup, until a comprehensive RAP is submitted to address on- and off-site wastes. Requirement 4.b. of the CAO requires a comprehensive RAP to address on- and off-Site wastes in the soil matrix, soil vapor, and groundwater. RWB notes that Requirement 3.a. of the CAO also requires complete delineation on-Site and off-Site. Delineation is not yet complete; data gaps remain to the east, south, and west of the Site.
C.3	Hi-Shear	Hi-Shear notes that the GW IRAP did not propose any cleanup of soil vapor or groundwater east of Crenshaw Boulevard and that the VI risk will remain indefinitely.	See RTC C.2.
C.4	Hi-Shear	Hi-Shear states that Terraphase proposes an insufficient network of monitoring wells to monitor the effectiveness of the ZVI barrier. Furthermore, the barrier does not extend far enough south and north beneath impacts at Property 1 and Property 3, respectively.	RWB staff partially concurs with Hi-Shear's comment. In the RWB's July 27, 2022 conditional approval of the investigative component of the revised EAP IRAP, five groundwater monitoring wells will be installed in the regional groundwater zone (three on Property 1, one on Property 2, and one on the former Nike Missile Base). These wells will be required to be included in the network of monitoring wells to monitor the effectiveness of the EISB injections and ZVI barrier.

Comment Identifier	Commenter	Comment Summary	Response
			<p>The ZVI barrier must be extended, based on the most recent groundwater monitoring data and in-field confirmation groundwater samples, which is reflected in the October 18, 2022 RWB letter conditionally approving the GW IRAP.</p> <p>See Comments No. 1, 4, and 6 in the October 18, 2022 RWB letter “Review of Interim Remedial Action Plan for Site Groundwater.”</p>
C.5	Hi-Shear	Hi-Shear and its consultants believe in a comprehensive approach for the Site and area east of Crenshaw Boulevard rather than employing different remedial options in different areas.	<p>The RWB staff concurs with the comment. The RWB have reminded Dischargers of the benefits of collaborating to address investigative and cleanup actions at the Site. Nonetheless, the RWB is willing to approve the interim remedial measures discussed herein, which are designed to substantially reduce concentrations of pollutants beneath the Hi-Shear property as well as in the contaminant plume migrating offsite.</p>
C.6	Hi-Shear	Hi-Shear criticizes the GW IRAP for not considering and/or proposing a pump and treat with reinjection treatment method to address the commingled groundwater plume. Hi-Shear believes a recirculation cell where groundwater is extracted at the leading edge of the plume, treated, and reinjected at source area(s) would help in remediating said source area(s) while providing protection east of Crenshaw Boulevard. Hi-Shear believe this treatment method would be timelier than a ZVI barrier.	<p>See RTC C.5.</p> <p>The RWB does not specify the manner of compliance. Hi-Shear has known about the requirements to design interim and final remedial measures since June 18, 2021, when the CAO was adopted. If Hi-Shear wanted to propose a pump/treat/recirculation system, it could have done so.</p> <p>At this point in time, RWB staff has concerns about the logistics, timing, and feasibility of a pump and treat with reinjection treatment method described in Hi-Shear’s comment letter. The “leading edge of the plume” may extend up to and/or beyond Pennsylvania Avenue, which is approximately 1,600 feet (0.3 mile) from the easternmost edge of the Site. A conveyance system for a recirculation cell “where groundwater is extracted along the leading edge of the plume, treated, and then reinjected at source areas” is a substantial undertaking as compared with alternative, less expensive measures routinely used in remedial actions that can be implemented on a much faster timeframe. RWB staff encourage Hi-Shear to consider these factors, along with the other factors in SWRCB Resolution</p>

Comment Identifier	Commenter	Comment Summary	Response
			<p>No. 92-49 when considering alternative feasible remediation strategies in developing a comprehensive RAP.</p> <p>The RWB considers both the GW IRAP and the revised EAP IRAP to be proposed interim remedial actions for onsite contamination source reduction and containment, that can occur expeditiously, and not a final comprehensive RAP for the Site.</p>
C.7	Hi-Shear	Hi-Shear criticizes the GW IRAP for not considering a comprehensive approach to treat groundwater, which should have considered remedial options for treating soil and soil vapor at the Site and east of Crenshaw Boulevard as opposed to two IRAPs seemingly neglecting potential time and cost savings.	See RTC C.5 and C.6.
C.8	Hi-Shear	Hi-Shear made general comments on the EAP IRAP regarding the proposed investigative component and proposed remedial aspects, which include a limited SVE system, EISB injections to the regional groundwater, and ISCO injections to the perched groundwater.	<p>See RTC A.1.</p> <p>A revised EAP IRAP (Revised EAP IRAP) was submitted by Terraphase on behalf of Torrance on June 24, 2022. On July 27, 2022, the RWB conditionally approved the investigative component of the Revised EAP IRAP.</p> <p>The remedial component of the Revised EAP IRAP will be reviewed under separate cover in a future correspondence following completion of the public comment period.</p>
D.1	Lomita	Lomita acknowledged that the remedial actions proposed in the GW IRAP and EAP IRAP will have a positive effect but expressed concerns that the IRAPs did not address contamination that is currently present in the City of Lomita.	<p>We agree. See RTC C.2 and C.6.</p> <p>The RWB concurs with Lomita that further action(s) is needed to address contamination currently present in the City of Lomita (i.e., east of Crenshaw Boulevard). A comprehensive RAP is required by the Order to address off-Site contamination. RWB staff are pleased that Hi-Shear has committed to designing a RAP and have encouraged it to proceed as quickly as possible.</p> <p>The ongoing implementation of the VIRP has indicated that concentrations of COCs in all areas investigated to date for VI risks at ARZ properties east of Crenshaw Boulevard do not exceed residential thresholds. The ARZ was designated based on</p>

Comment Identifier	Commenter	Comment Summary	Response
			<p>soil vapor VOCs concentrations in the public right of way that generally exceeded ten times their respective screening levels; the ARZ would presumably pose the greatest potential VI risk off-Site. Access requests have been issued to ENA Zone properties for VI assessment of additional properties in the City of Lomita. The semi-annual soil vapor monitoring program for the areas east of Crenshaw Boulevard and tri-annual groundwater monitoring program for all wells associated with the Site will continue to monitor soil vapor and groundwater conditions in the City of Lomita.</p>
D.2	Lomita	<p>Lomita identified groundwater monitoring well MW-20 when highlighting recent maximum TCE and PCE groundwater concentrations beneath the City of Lomita. TCE and PCE groundwater concentrations were approximately 490 times and 87 times greater than their MCLs, respectively. Lomita is concerned that the portion of the contaminant plume already in the City of Lomita will continue to migrate and degrade the quality of downgradient regional groundwater.</p>	<p>The RWB understands and shares Lomita’s concerns about controlling the contaminant plume migration. In this current interim remediation phase, the approach, as proposed in both the GW IRAP and revised EAP IRAP, primarily focuses on on-Site contamination source(s) reduction and containment. The RAP required by the CAO will address offsite impacts and ensure the contaminant plumes do not reach water supply wells.</p> <p>According to Figure 2 – Layout and Property Locations of the <i>First Tri-Annual 2022 Groundwater Monitoring Report</i> (GER, May 13, 2022, on behalf of Hi-Shear), groundwater monitoring well MW-20 is in the vicinity of the shared boundaries between the cities of Torrance and Lomita. While PCE and TCE concentrations at this this well are greater than their respective MCLs, there is a network of monitoring wells downgradient from MW-20 to monitor the extent of the VOC groundwater plume. The TCE groundwater contaminant plume has been delineated to Cypress Street and the PCE groundwater contaminant plume has been delineated to Pennsylvania Avenue. Lomita’s drinking water well (Well #5) is located approximately 0.7 mile from the network’s outermost downgradient groundwater monitoring well and known extent of the contaminant plume; Well #5 is approximately 1.25 miles from the Site. The tri-annual groundwater monitoring program will continue to provide data on the extent of the groundwater plume.</p>

Comment Identifier	Commenter	Comment Summary	Response
D.3	Lomita	Lomita expressed concerns regarding insufficient characterization of VOC soil vapor source(s) east of Crenshaw Boulevard.	<p>The RWB acknowledges and shares Lomita’s concerns. In order to address these concerns, the CAO requires the implementation of the VIRP, continued ongoing assessment and monitoring of the ARZ and ENA Zone, and further delineation. The continued and completed assessment and monitoring of the zones will better inform the RWB and stakeholders on how to address impacts east of Crenshaw Boulevard.</p> <p>Requirement 3.a. of the CAO requires assessment, characterization, and delineation of the extent of wastes in soil, soil vapor, and groundwater.</p>
D.4	Lomita	Lomita expressed concerns that the GW IRAP and EAP IRAP do not address the soil vapor impacts and isolated areas of impacted perched groundwater east of Crenshaw Boulevard. Lomita further recommends that a HHRA should be conducted to assess potential risk to human health	<p>See RTC C.5, C.6, D.2 and D.3.</p> <p>The ongoing implementation of the VIRP has not indicated VI risk at the commercial and residential properties located in the ARZ and ENA Zone.</p> <p>There is currently a semi-annual soil vapor monitoring program and a tri-annual groundwater monitoring program in-place that helps inform RWB of any significant changes in soil vapor and groundwater conditions that may potentially affect VI risks and other risks at private properties and in the Lomita neighborhood. Requirement 2.a of the CAO requires a comprehensive HHRA. The ongoing implementation of the VIRP (i.e., assessment of the ENA Zone) will help in the development of a more informative comprehensive HHRA. Following completion of the ARZ and ENA Zone sampling and off-Site assessment work, a comprehensive HHRA inclusive of portions of Lomita (i.e., off-Site and downgradient of the Site) will be required.</p>

Comment Identifier	Commenter	Comment Summary	Response
D.5	Lomita	Lomita reiterates that more action is needed to address contamination that is above action levels within the City of Lomita.	We agree. See RTC C.2, C.6, D.1, D.2 and D.4.
E.1	Middletown	Middletown identified some of its submitted reports that the RWB has not responded to and highlighted the data gaps on Property 1 that need to be addressed.	See RTC A.2 and A.3
E.2	Middletown	Middletown is concerned about implementing the proposed interim remedial actions in the GW IRAP and its effects on the EAP IRAP and vice-versa. Middletown encourages the integration of the two IRAPs for “completeness, efficiency, and technical appropriateness.”	See RTC C.5 and C.6. Given the similarities in the proposed remedial alternatives in both the GW IRAP and revised EAP IRAP (i.e., EISB, ZVI, and SVE), it is not expected that implementation of each would negatively affect the another or exacerbate the groundwater conditions. The remedial alternatives are reductive techniques and are anticipated to be complementary of each other. Additionally, the potential timeline and chronology of implementation, along with the physical locations, are not proximal to one another. RWB staff concur that the parties should collaborate in designing remedial alternatives, but has also been willing to approve these separate proposals in order to begin remedial efforts as quickly as possible.
E.3	Middletown	Middletown believes the proposed interim groundwater remedial options will not achieve the objectives of the GW IRAP, which include the following: 1. Reduce the risk of VI potential in the residential and commercial properties east of Crenshaw Boulevard by addressing the principal cause of the soil vapor contamination in the area – the VOC-impacted regional groundwater that continues to migrate from the Hi-Shear property; 2. Reduce contaminant mass and migration in groundwater at the Hi-Shear property source areas; and	See RTC C.2, C.5, D.1, D.3, and D.4. As stated in RTC C.2, C.3, C.6, D.2, and E.5, the RWB acknowledges that the remedies proposed in the GW IRAP are interim remedial measures to reduce and contain the groundwater plume. Interim remedial measures are warranted due to persistent elevated VOC groundwater concentrations exceeding MCLs that have remained largely untreated with the exception of the limited injections in 2017 on the Hi-Shear property. A series of EISB pilot testing was conducted between 2013 and 2016 that supported the RWB’s conditional approval of Hi-Shear’s GWRAP. EISB was implemented in accordance with the

Comment Identifier	Commenter	Comment Summary	Response
		<p>3. Achieve water quality objectives in groundwater east of Crenshaw Boulevard within a reasonable time frame.</p>	<p>GWRAP in the first quarter of 2017. Groundwater monitoring and sampling were conducted at MW-7R (served as an upgradient well); MW-6, MW-15, MW-18, MW-5, MW-10, MW-16, MW-19, CMW-11C (served as treatment zone wells), and MW-8 and MW-12 (served as downgradient wells). Based on the cluster of dual-nested injection wells installed in the immediate vicinity of groundwater monitoring well MW-15, this well benefited the most from the EISB pilot testing and GWRAP implementation.</p> <p>Following implementation, PCE and TCE concentrations in MW-15 decreased more than one order of magnitude and three orders of magnitude, respectively; the decreased PCE and TCE concentrations were sustainable until approximately December 2021. Recently (approximately 4 years after implementation), PCE and TCE concentrations in groundwater at MW-15 appear to be rebounding; this is an indication that the success of the remedy hinges on successive injections and performance monitoring. Other treatment zone wells have experienced similar benefits and trends.</p> <p>Following GWRAP implementation, downgradient groundwater monitoring well MW-8 experienced greater than one order of magnitude decreases in PCE and TCE groundwater concentrations and appeared to have sustained the decreased concentrations until 2019, when concentrations began rebounding. Downgradient groundwater monitoring well MW-12, on the other hand, experienced relatively stable PCE and TCE concentrations with slight, but sustained, decreases.</p> <p>Subsequent IRAPs and/or comprehensive RAPs are warranted to address impacts east of Crenshaw Boulevard.</p>
E.4	Middletown	<p>Middletown notes that a comprehensive SCM and hydraulic analysis of the Site has not been completed. Hydraulic analysis of groundwater system(s) is necessary to inform remedial action(s) selection and design.</p>	<p>Hi-Shear and their technical consultant developed an updated SCM dated November 24, 2021. The updated SCM includes discussion of the horizontal and vertical hydraulic gradients for the shallow and intermediate water bearing zones at the Site.</p>

Comment Identifier	Commenter	Comment Summary	Response
			<p>Based on available Site data and the local hydrogeology described in the aforementioned updated SCM, there is no evidence of fine-grained sediments (clay or silt) at or near the water table that act as a confining layer or geologic evidence of lithologic or structural changes that might create hydrogeologic barriers. The regional groundwater table, along with the contaminant plume, sits primarily in a permeable sand zone. The proposed remedial alternatives were selected as the most widely accepted and readily implementable approach.</p>
E.5	Middletown	<p>Middletown suggests that the use of the term “barrier” in the proposed ZVI barrier remedy alternative in the GW IRAP is a misnomer. The approach proposed (i.e., injection points) in the GW IRAP, aligns more closely with a creation of a biochemically enhanced zone rather than a barrier. Middletown then expresses concern that without hydraulic analysis and pilot studies, the spacing of injection points and volume of ZVI cannot be accurately determined thus likely affecting design, cost, and effectiveness. Without testing, the performance of ZVI barrier remedial alternative, as proposed in the GW IRAP, is speculative.</p>	<p>See RTC E.2 and E.4.</p> <p>RWB acknowledges and partially concurs with Middletown that the GW IRAP’s use of the term “barrier” may be a misnomer but is also a commonly used term in the environmental consulting industry. The ZVI barrier should be thought of as a barrier to the high(er) concentrations but not necessarily a barrier that eliminates all contaminant concentrations passing through. Ongoing monitoring will determine the effectiveness of the barrier and whether additional remedial efforts are necessary.</p> <p>RWB shares Middletown’s concerns for potential inadequacies and/or nonuniformity across the reactive media zone. However, the GW IRAP proposes a ZVI barrier design with an array of two rows of injection locations and anticipates overlapping propagation radii for contingencies. The proposed in-field activities that are part of the ZVI barrier installation, along with the activities that are part of the investigative component of the revised EAP IRAP conditionally approved by the RWB on July 27, 2022, will assist in fine tuning the ZVI barrier details.</p> <p>The benefit of having a ZVI barrier in-place along the eastern boundary of the Site (i.e., along Crenshaw Boulevard) outweighs the ongoing migration of on-Site contamination source(s) and poses little risk to impeding alternative, additional remedial efforts.</p>

Comment Identifier	Commenter	Comment Summary	Response
E.6	Middletown	Middletown noted that the perched groundwater emanating from the former Nike Missile base should be further defined to determine if this area should be considered for remedial action. Middletown also identifies that the ZVI barrier's injection points along Crenshaw Boulevard do not address the suspected downgradient VOC source areas along Amsler Street.	<p>RWB concurs that the perched groundwater in the vicinity of the former Nike Missile base should be further delineated. On July 27, 2022, the RWB conditionally approved the investigative component of the revised EAP IRAP that includes investigations and assessments of the perched groundwater and portions of the former Nike Missile Base (i.e., soil samples, grab groundwater samples, groundwater monitoring wells, soil vapor probes). Additional investigative and assessment work is warranted but the RWB has concluded that it should not delay the implementation of interim remedial actions at the Site.</p> <p>RWB acknowledges that the proposed ZVI barrier alternative along Crenshaw Boulevard does not address suspected downgradient VOC source areas along Amsler Street. The GW IRAP is focused on contaminant source reduction and reducing contaminant concentrations in the plume migrating offsite.</p> <p>(See RTC C.2, C.5, D.1, D.3, D.4, and E.3).</p>
E.7	Middletown	Middletown is concerned about potential unanticipated impacts following implementation of the injections. Middletown recommends examining geochemistry alteration by evaluating the remedial measures (i.e., SVE and injections in 2013 – 2017) implemented at the Hi-Shear property and their impacts on fate and transport of contaminants.	<p>See RTC E.2 through E.5.</p> <p>RWB acknowledges Middletown's comment regarding future fate and transport. Studies, assessments, and monitoring will be necessary to evaluate these concerns and the overall effectiveness of remedial measures.</p>
E.8	Middletown	Middletown criticizes the GW IRAP for not including remedial alternatives that address the soil vapor or groundwater impacts east of Crenshaw Boulevard.	See RTC C.2, C.3, C.5, D.1, and D.4
E.9	Middletown	Based on more recent groundwater monitoring reports, additional injection wells may be warranted to target areas of highest concentrations at the Hi-Shear property.	RWB concurs that additional injection points may be necessary to address areas (new or old) of higher VOC concentrations beneath the Hi-Shear property based on more recent groundwater monitoring data.

Comment Identifier	Commenter	Comment Summary	Response
			See Comment No. 2 in the October 18, 2022 RWB letter “Review of Interim Remedial Action Plan for Site Groundwater.”
E.10	Middletown	<p>Middletown criticizes how the GW IRAP addresses its following RAOs:</p> <ol style="list-style-type: none"> 1. Reduce potential for VI risk into the City of Lomita 2. Reduce VOCs in regional groundwater to applicable MCLs <p>Middletown notes that the GW IRAP did not propose remedial activities that address the already existing subsurface impacts and VI risk in the City of Lomita.</p> <p>Middletown notes that there was no discussion about risk based management for the Site and affected areas east of Crenshaw Boulevard.</p>	<p>We concur with these concerns. See RTC C.2, C.3, C.5, D.1, D.3, D.4, E.3, E.6, and E.8.</p> <p>Note that SWRCB Resolution No. 92-49 establishes that the Regional Board shall require dischargers to clean up and abate the effects of discharges in a manner that promotes attainment of either background water quality or, if background levels of water quality are not achievable, the best water quality which is reasonable. If background levels of water quality are not achievable, alternative cleanup levels must be established that are protective of human health and the environment and which take into account technical and economic feasibility. (See Cal. Code Regs., tit. 23, § 2550.4.) It is premature to propose cleanup goals to applicable MCLs, without demonstrating that cleanup to background concentrations is not achievable.</p>
E.11	Middletown	Middletown criticizes the GW IRAP for not considering other traditional alternatives. Middletown suggest providing more comprehensive discussions of retained alternatives and the disadvantages of other alternatives that were considered but not selected.	See RTC C.5 and C.6.
E.12	Middletown	Middletown recommends better explanations of the remedial alternatives “No Action” and MNA. Middletown acknowledges that MNA is not an active remedy but could be a groundwater remedy in parts of the Site.	Due to the elevated concentrations of VOCs in groundwater and commensurate threats to human health and the environment, “No Action” will not be considered and MNA is not a remedial alternative that is appropriate as the only remedial measure for the Site. Groundwater concentrations beneath the Site need to be addressed by active remedial alternatives. RWB may consider MNA in the future, if proposed, depending upon the

Comment Identifier	Commenter	Comment Summary	Response
			extent of positive results of the active interim remedial alternatives implemented.
E.13	Middletown	Middletown criticizes the GW IRAP for not including technical and quantitative analyses of the historical EISB actions performed at the Hi-Shear property and beyond. Middletown states that the GW IRAP lacks discussion on the maintenance of EISB/geochemical conditions post-injections and does not provide design details, calculations, and criteria for amendment needed.	See RTC E.4, E.5 and E.7.
E.14	Middletown	Middletown claims it is premature to retain the ZVI barrier since its effectiveness has not been evaluated nor has its proposed locations (i.e., injection points) been completely characterized.	See RTC C.5, C.6, E.5, E.6 and G.6. In its design discussion (Section 7.1.2 of the GW IRAP), Terraphase notes that confirmation groundwater samples during installation will better inform the length and make-up of the ZVI barrier.
E.15	Middletown	Middletown is concerned for the conditions of the existing 77 dual-nested wells on the Hi-Shear property and subsequently the implementation of the EISB interim remedial alternative, as proposed in the GW IRAP. The unknown conditions of the wells and lack of critical analysis of Hi-Shear's 2017 EISB injection program presents speculative design, cost, and effectiveness.	See RTC E.9. RWB also has concerns regarding the conditions of the existing 77 dual-nested wells at the Hi-Shear property; however, wells that are deemed unusable shall be reinstalled with similar construction and additional new wells shall be installed to target areas of higher groundwater concentrations (based on recent groundwater monitoring data) that are not otherwise addressed by existing operational injection wells. See Comments No. 2 and 3 in the October 18, 2022 RWB letter "Review of Interim Remedial Action Plan for Site Groundwater."
E.16	Middletown	Middletown criticizes the GW IRAP for lacking technical analysis of the proposed interim remedial alternative(s) that the NCP requires. Middletown recommends pilot/lab studies to assess the effectiveness of the retained interim remedial alternative(s).	The NCP is a federal government guideline/document for responding to oil spills and hazardous substance releases. The NCP is a useful document that provides a framework for responses and plans that can be considered. The Site is under the oversight of the RWB, however, which is a state agency that is responsible for the protection of groundwater and surface water quality within portions of the Los Angeles and Ventura counties. Therefore, the process for evaluation and analysis of

Comment Identifier	Commenter	Comment Summary	Response
			<p>proposed interim remedial alternatives is subject to applicable California state plans, policies and regulations.</p> <p>Although there may be some merit and benefits for additional pilot/lab studies, the GW IRAP proposes actions that have been implemented previously at the Hi-Shear property and proposes in-field (i.e., during installation) auxiliary actions to collect additional data for technical analysis (i.e., baseline groundwater sampling that is included in the project schedule).</p> <p>See RTC C.6, E.3, and E.5.</p>
E.17	Middletown	Middletown states that the WDR Program is insufficient when evaluating remedy(ies) performance. Other available technical guidance documents and parameters should be considered.	<p>See RTC C.4.</p> <p>See Comments No. 1, 4, and 5 in the October 18, 2022 RWB letter “Review of Interim Remedial Action Plan for Site Groundwater.” The RWB uses current technical guidance providing conservative assumptions about the protection of human health and the environment.</p>
F.1	Hi-Shear	Hi-Shear recommends RWB refrain from approving the GW IRAP and order Torrance to conduct and submit a comprehensive feasibility study that considers and analyzes all potential remedial options; the GW IRAP has failed to do so.	See RTC C.5 and C.6. All dischargers are responsible for complying with the investigation and remediation components of the CAO.
F.2	Hi-Shear	Hi-Shear criticizes the GW IRAP for not considering ASVR for the Site and off-Site. Hi-Shear goes on to claim the remedial alternative would clean up the groundwater plume in a relatively short amount of time and would enhance SVE at the Site.	<p>See RTC C.5 and C.6.</p> <p>Although an ASVR for the Site could be a remedial alternative for the Site, albeit untested to Site-specific conditions, the RWB considers the proposed EISB (which was previously tested) for groundwater beneath the Hi-Shear property and ZVI barrier along Crenshaw Boulevard as acceptable proposed interim remedial technologies for remediation of VOCs in groundwater beneath the Hi-Shear property and for containment of the VOC groundwater plume along Crenshaw Boulevard. See RTC E.2.</p>
F.3	Hi-Shear	Hi-Shear references a nearby site (Former Honeywell Early Avenue Facility, approximately 1 mile from the Site) where ASVR was proven to be effective. Hi-Shear notes that a brief	See RTC C.5, C.6, E.2, and F.2.

Comment Identifier	Commenter	Comment Summary	Response
		(approximately 4 hours) air sparge pilot test was conducted in 1998 that yielded nearly one order of magnitude decreases in PCE and TCE concentrations to support ASVR.	
F.4	Hi-Shear	Hi-Shear suggests that the GW IRAP proposes flawed and incomplete remedial options that would waste costs, time, and resources. Hi-Shear recommends a comprehensive feasibility study to consider all available remedial options to ensure the most efficient and effective remedy and is consistent with the NCP process. Hi-Shear expressed optimism in a single remedial option that will comprehensively address the entire groundwater plume (i.e., Comment C.6) and the impacted soil vapor above the plume.	See RTC C.5, C.6, E.16 and F.2 As stated RTC C.6, and F.2, the RWB considers the GW IRAP as an interim remedy for remediation of VOCs in groundwater beneath the Hi-Shear property and for containment of the VOC groundwater plume along Crenshaw Boulevard. Note that the RWB conditionally approved the investigative component of the revised EAP IRAP on July 27, 2022. The investigative component addresses data gaps associated with the EA Properties. RWB concurs that the comprehensive RAP should also evaluate implemented remedial technologies proposed in the IRAPs, such as the GW IRAP as well as propose new additions and/or augmentations to address the extent of on-Site and off-Site impacts to soil, soil vapor and groundwater in a timely manner. Findings and data collected from the planned and completed assessment are needed in developing a comprehensive RAP to address the full extent of the soil, soil vapor, and groundwater contamination.
G.1	Esterline	Esterline contends that the current characterization of the Site is insufficient for selecting or designing the interim remedial alternatives proposed in the GW IRAP. There is limited characterization of hydraulic and geobiochemical conditions.	See RTC E.2, E.4, E.5, and E.7.
G.2	Esterline	Esterline recommends regular, consistent, and comprehensive monitoring to develop representative site wide SCM and identify data gaps (inclusive of adjacent former Nike Missile base).	RWB concurs that routine monitoring would be beneficial for the development of a more comprehensive SCM. Note that Hi-Shear's technical consultant developed an updated SCM dated November 24, 2021. The updated SCM includes discussion of the current distribution of contaminants and data gaps. The updated SCM also goes on to identify that there is no documentation specific to chemical use at the adjacent former Nike Missile base.

Comment Identifier	Commenter	Comment Summary	Response
G.3	Esterline	<p>Esterline notes that perchlorate has been a contaminant associated with the Hi-Shear property and has been an identified issue with the former Nike Missile Battery base. Perchlorate is useful as a tracer for characterizing groundwater flow conditions as well. For these reasons, monitoring and investigation should be required to include perchlorate as a COC.</p>	<p>RWB staff acknowledges Esterline’s comment. Perchlorate continues to be a contaminant that is monitored in the tri-annual groundwater monitoring program. Perchlorate groundwater concentrations at the Site have historically been less than two orders of magnitude of its MCL and more recently have been less than the one order of magnitude of its MCL. The downgradient extent of perchlorate is delineated by non-detects in the downgradient monitoring wells along Pennsylvania Avenue; however, delineation data gaps remain to the south of the Site (see RTC C.2). The chlorinated VOCs (primarily TCE and PCE) have been the drivers of the Site’s investigations and assessments; the concentrations of PCE and TCE beneath the Site remain multiple orders of magnitude greater than their respective MCLs.</p>
G.4	Esterline	<p>Esterline suggest that the GW IRAP’s RAOs are more aligned with final remedial objectives as opposed to interim remedial objectives and may be inappropriate at this stage of the project. Esterline recommends the following interim objectives:</p> <ol style="list-style-type: none"> 1. Complete site characterization of the Site including the former Nike Missile base. 2. Complete SCM of the Site and off-Site areas east of Crenshaw Boulevard. 	<p>See RTC A.2, A.3, C.6, D.2, E.5 and E. 10.</p> <p>RWB agrees that additional site assessment is warranted to complete Site characterization, and this is a requirement under Task 3 of the CAO. However, the RWB consider the proposed RAOs in the Groundwater IRAP as appropriate and the RWB considers the GW IRAP, along with the revised EAP IRAP, as efforts to comply with the CAO’s IRAP requirement (i.e., Requirement 4.a.).</p>
G.5	Esterline	<p>Esterline recommends the integration of the two IRAPs as there are common issues concerning the properties that make up the Site. Esterline is concerned about the effects that implementing the proposed interim remedial action in the GW IRAP may have on the ability to implement the EAP IRAP and vice-versa. Esterline acknowledges that although technical design can avoid potential issues, the risk is greater if there is no integration.</p>	<p>See RTC C.5, C.6, and E.2. We reiterate prior comments that all parties should collaborate on effective, efficient and complementary remedial options. To date, Esterline has not taken a leading role in this effort.</p>

Comment Identifier	Commenter	Comment Summary	Response
G.6	Esterline	<p>Esterline notes that the lateral hydraulic gradient has not been defined within the GW IRAP with sufficient detail for selecting the ZVI barrier remedial alternative. Esterline suggests that the hydraulic gradient is nearly parallel with the alignment of the ZVI barrier and such a design miscue is more prone to failure (insufficient potential capture of groundwater and contact time).</p> <p>Furthermore, the GW IRAP does not provide or account for groundwater velocity for the retained remedy alternatives. A conceptual hydrogeologic model should be completed.</p>	<p>See RTC C.4 and E.4.</p> <p>Additionally, the RWB disagrees with Esterline’s interpretation that the gradient is in a direction that is parallel to the proposed alignment of the ZVI barrier. The regional groundwater flow direction has historically been in the southeast direction. RWB is unable to comment on the potential insufficiencies of the ZVI barrier and its capture of contaminated groundwater at this time, but confirmation groundwater sampling during its installation, data from the investigative component of the EAP IRAP (i.e., grab groundwater sample data from the transects), and monitoring of this interim remedial action will provide the information necessary to adjust or modify the barrier to ensure its effectiveness.</p> <p>See Comments No. 1, 5, and 6 in the October 18, 2022 RWB letter “Review of Interim Remedial Action Plan for Site Groundwater.”</p>
G.7	Esterline	<p>Esterline criticizes the GW IRAP for not providing a detailed analysis of the retained EISB remedial alternative beyond what has been proven and tested at the Hi-Shear property in 2013 – 2017.</p> <p>Esterline questions the use of the word “successful” when discussing EISB at the Hi-Shear property in RWB’s <i>Project Update and Notice of Opportunity to Comment</i> dated May 2022.</p> <p>Esterline suggests a fully comprehensive geochemical and hydraulic evaluation of the 2013 – 2017 program prior to implementing EISB due to the lack of the geochemical and biochemical constituents and parameters in the groundwater monitoring reports.</p>	<p>See RTC E.3, E.4, E.5, E.7, and E.13.</p> <p>The Project Update states, “The EISB tests were successful and EISB is one of the remedial technologies proposed in the Groundwater IRAP to treat the contamination in groundwater.” This statement is accurate as EISB pilot testing between 2013 and 2016 led to RWB’s eventual conditional approval of Hi-Shear’s GWRAP.</p>
G.8	Esterline	<p>Esterline shares that the ZVI barrier is not a continuous barrier but is a series of injection wells that would inject a ZVI-based solution to emplace the treatment media. Esterline expresses concern for ZVI barrier failure due to insufficient hydraulic</p>	<p>See RTC E.5.</p>

Comment Identifier	Commenter	Comment Summary	Response
		analysis, emplacement, etc. Site characterization details are insufficient for selecting, designing, and completing the proposed remedial alternative.	
G.9	Esterline	Esterline recommends a robust multi-level monitoring well network for the ZVI barrier remedial alternative and to analyze performance parameters (includes – mineralization, treatment process, standard water quality parameters).	We concur that a robust monitoring of all interim remedial actions is necessary. See RTC C.4. See Comments No. 1 and 5 in the October 18, 2022 RWB letter “Review of Interim Remedial Action Plan for Site Groundwater.”
G.10	Esterline	Esterline recommends the GW IRAP clarify its RAO regarding VI risk to indicate that an appropriate remedial plan will be developed after complete characterization and the development of a SCM. The source of VI risk east of Crenshaw Boulevard has not been completely determined.	See RTC D.3, E.5, and E.10 RWB acknowledges Esterline’s comment. The Site has not yet been fully delineated and characterized; therefore, it is important to view the current remedial/removal action work plans submitted as interim remedial actions as they primarily focus on on-Site contamination source(s) reduction and containment.
G.11	Esterline	Esterline recommends additional details to differentiate “No Action” and MNA. Esterline recommends retaining MNA as management approach (i.e., a monitoring program) and could be a groundwater remedy in parts of the impacted area(s).	See RTC E.12
G.12	Esterline	Esterline indicates that the WDR program is insufficient when evaluating remedy(ies) performance. EISB and ZVI remedies need to rely on more than the current standard groundwater monitoring to ensure the success of their implementation. Other available technical guidance documents and parameters should be considered by remedy.	See RTC E.17. See Comments No. 1, 2, 4, 5 and 6 the October 18, 2022 RWB letter “Review of Interim Remedial Action Plan for Site Groundwater.”

Los Angeles Regional Water Quality Control Board

Response to Public Comments: Groundwater Removal Action Plan

(Comment Period: May 18, 2022 – June 20, 2022)

Comments received

Bates Page

A. Magellan Aerospace, Middleton, Inc., 3/21/2022	1 – 75
B. City of Torrance (in response to Middletown), 4/5/2022	76 – 88
C. Hi-Shear Corporation, 4/25/2022	89 – 98
D. City of Lomita, 6/17/2022	99 – 101
E. Magellan Aerospace, Middletown, Inc., 6/17/2022	102 – 112
F. Hi-Shear (Supplemental Comments), 6/17/2022	113 – 118
G. Esterline Technologies Corporation, 6/20/2022.....	119 – 148

Magellan Aerospace, Middleton, Inc., 3/21/2022



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March 21, 2022

VIA E-MAIL

Ms. Rene Purdy
Los Angeles Regional Water Quality Control Board
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E-Mail: renee.purdy@waterboards.ca.gov

Re: Cleanup & Abatement Order No. R4-2021-0079
Response to City of Torrance Removal Action Workplan

Dear Ms. Purdy:

A.1 On behalf of Magellan Aerospace, Middleton, Inc. (“Middletown”), we provide preliminary observations on the Terraphase Engineering, Inc. (“Terraphase”) report entitled “Removal Action Workplan for the East Adjacent Properties” dated February 28, 2022 (the “RAW”).

On March 11 we asked for the opportunity to meet with the Regional Water Quality Control Board (“RWQCB”). We are coordinating with Kevin Lin to schedule a meeting with the RWQCB team assigned to this matter where we will be able to more fully discuss the matters summarized in this letter.

We understand that the City of Torrance recently replaced its former environmental consultant GSI Environmental, Inc. (“GSI”) with Terraphase which in about seven months was tasked with processing data which spans decades and with the development of the RAW.

A.2 During its review window, Terraphase drew conclusions which diverge from those reached by others who had the benefit of a longer review period, including the RWQCB and GSI. This letter highlights the diverging conclusions and provides the RWQCB with an opportunity to evaluate which conclusions are more reasonable and plausible especially in light of the underlying assumptions and foundation upon which those conclusions rest. At a minimum, the diverging conclusions, the underlying assumptions, and an action plan which at times is at odds with the existing data suggest that there is a need for additional field work. This letter concludes by highlighting specific areas where it may make sense to perform additional field work, the data from that work may shed light on the validity of the assumptions and conclusions drawn in the RAW or may indicate the need for additional field work.

1. Environmental Reports Submitted by Middletown

The RWQCB has received several documents from Middletown pertaining to this matter, including Property 1. These include:

- “Data Gap Workplan” prepared by MK Environmental Consulting Inc. (“MKECI”), dated August 21, 2020;
- “Indoor Air Quality Investigation and Sub-Slab Soil Vapor Sampling Report” prepared by Frey Environmental, Inc., dated February 11, 2021;
- “Subsurface Soil and MIP Boring Report” prepared by Frey Environmental, Inc., dated March 18, 2021 and submitted to the RWQCB on March 19, 2021;
- “Human Health Risk Assessment Report” prepared by Environmental Health Decisions, dated September 8, 2021 and submitted to the RWQCB on September 10, 2021;
- “Data Gap/Preliminary Site Assessment Workplan” prepared by MKECI, dated September 10, 2021; and a
- “Preliminary Site Conceptual Model” prepared by MKECI, dated September 10, 2021.

To date, Middletown has neither received any comments or approvals on these documents from the RWQCB.

2. Property 1

Property 1 currently consists of Building 1 which is the largest building at the property. There is a Lexus auto showroom and mechanic bays located at Building 1.

There is a smaller structure, referred to as Building 2 or the unoccupied building currently located to the south of Building 1. Building 2 is immediately to the north of the Torrance Airport. Building 2 is demised into three spaces and is used for warehousing and storage purposes.

As discussed below, there was a Nike Missile base located on the part of the airport which was adjacent to Property 1. Hi-Shear Corporation (“Hi-Shear”) is located to the east of Property 1.

Exhibit 1 provides historic aerial photographs and diagrams of the area.

3. ***There are Diverging Conclusions on the Source of the Perched Groundwater Contamination***

Terraphase, like every other environmental consultant who has worked on this matter, was unable to find any documents or witness accounts indicating that chlorinated volatile organic compounds (“cVOCs”) were ever released at Building 2 or anywhere else at Property 1 by anyone. To date, the Hi-Shear site is the only confirmed location of cVOC releases.

However, the RAW now identifies Building 2 at Property 1 as a cVOC release point. This is based on the assumption that a degreaser located in the eastern portion of Building 2 released cVOCs with such frequency and at such volumes that cVOCs were pushed down 40 feet to the perched groundwater. RAW Section 5.1.2.

Outcome bias is a failing which many guard against by carefully considering the reasoning and conclusions drawn by peers and by opening up one’s field of vision and analysis. In this case, the RAW singularly directs and constructs a workplan around the assumption that a degreaser located in the eastern portion of Building 2 released cVOCs with such frequency and at such volumes that cVOCs were pushed down 40 feet to the perched groundwater. More specifically, Terraphase’s premise is based on what it characterizes as “[f]our lines of evidence [which] indicate that releases potentially occurred at... Property 1.” RAW Section 5.1.2. The four lines of “evidence” consist of assumptions and inferences drawn from data which others, including the RWQCB and GSI, have viewed very differently.

Based on the presumed leaking degreaser in Building 2, the RAW then constructs a workplan which focuses on the presumed Building 2 release area to address the cVOCs in the soil, soil vapor, and perched groundwater. RAW Section 5.2.

In contrast to the assumptions made in the RAW, based on the same data, GSI concluded that “[s]oil, soil vapor, and groundwater data identify releases of TCE and PCE at historical Hi-Shear operational Site features, and these releases have caused a soil vapor and groundwater plume beneath the Hi-Shear Site, EA Properties, and Residential Properties.” Exhibit 2 p. 1, *see also*, pgs. 16, 20, 24, 27, 30-31, 32, 33.

The RWQCB similarly concluded that the source of PCE and TCE in down-gradient locations emanates from the Hi-Shear site. Exhibit 3. In its comments, the RWQCB notes:

“The absence of the highest PCE concentrations in the 5-foot samples at VP-49 and VP-50 (located on Property 1) indicates that the PCE may not have been released at these two locations.”

“The detection of the highest PCE in soil gas at 85-feet bgs (above the water table) in VP-49 and its decrease to 17,700 ug/L at 5feet indicates upward migration of

PCE vapors from the underlying groundwater plume and lateral migration of PCE vapors in the vadose zone.”

“Absence of the highest TCE concentrations in the 5-foot samples collected from VP-49, VP-50, and VP-25 (on Property 1) indicates that TCE may not have been released at these locations. Similarly, the detections of the highest TCE concentrations of 1,200 ug/L in the 85-foot soil gas sample collected from VP-49, 893 ug/L in the 53-foot samples from VP-50, and 874 ug/L in the 65-foot samples also indicates upward migration of TCE vapors from the underlying groundwater plume.”

Ex. 3 p. 3.

As the RWQCB observed, there are many anomalies in the data which go unexplained by Terraphase’s premise of a leaking degreaser in Building 2 which become more understandable when viewed in the larger context of confirmed releases from the Hi-Shear site, from surface features on neighboring properties, from the lithology beneath neighboring properties, and from historic operations at neighboring properties. These are unaddressed in the RAW, and this raises grave questions about the soundness of the presumed leaking degreaser in Building 2 theory offered by Terraphase and, in turn, the workplan model built upon such a questionable foundation.

4. The Elevated cVOC Levels Along Property 1 – Former Nike Missile Site Border

Given that there are no historic records or witnesses supporting the leaking degreaser premise, the RAW casts a myopic and very focused eye on the data from MIP-8 in Building 2 and the data from VP-49 and MIP-7 which are located in the driveway to the north of Building 2 and approximately 30-40 yards away from the presumed leaking degreaser.

The RAW ignores obvious anomalies even within the soil data column from MIP-7, MIP-8, and VP-49. Shallow soil sample collected in the area of the presumed leaking degreaser (MIP-8) fall short of supporting the premise. For example, as the table below illustrates the 5-foot sample detected very low concentrations of cVOCs whereas the 20-foot sample is higher in concentrations.

Boring Location	Depth	1,1,1-TCA	1,1-DCA	1,1-DCE	Cis-1,2-DCE	PCE	TCE
MIP-8	5'	1.5	ND	54	ND	210	19
	10'	2	ND	100	ND	650	23
	15'	9	1.7	430	1.3	1,100	48
	20'	20	2.1	600	2	1,100	56

Measured in micrograms per kilogram
ND – non-detect

There are ongoing assertions, sometimes affirmative and other times implicit, that because contamination happens to have been found at depth beneath Property 1, such contamination must have descended along an uninterrupted vertical path from the southern portion of Building 2 down to the perched groundwater. However, the analysis and reasoning gets more complicated when, as here, the cVOCs at or near the surface are below any action levels and only spike at depths of 40' to 55' bgs. This data suggests that the cVOC spikes found at depth are the product of volatilizing cVOCs from the perched groundwater rather than the product of a surface release from Building 2. The RAW fails to offer this more reasonable and plausible explanation of the data.

Lifting the analysis horizon by a few degrees raises other critical omissions in the RAW. The data from VP-50, VP-113, and VP-114 all establish a uniform and clear pattern of cVOCs spiking at depth (*i.e.*, 40-55' bgs) while being at below action levels at or near the surface. The RAW offers no explanation or analysis as to how purported releases from Building 2 are found at depth at these other locations. VP-50, VP-113 and VP-114 are respectively approximately 120, 100, and 150 yards away from the presumed leaking degreaser in Building 2.

The RAW also lacks a contextual understanding of the boundaries of Property 1 and of the activities at the Nike Missile Site. As discussed in the September 10, 2021 Preliminary Site Conceptual Model prepared by MKECI, over the decades there has been a misunderstanding over the footprint of Property 1 and the Torrance Airport which shares a common border with Property 1. Exhibit 4. This has led to the more easily reached conclusion that contamination found beneath a property boundary necessarily originated from that property.

The Torrance Airport dates back to the 1940s when the United States established a flying field there known at the time as the Lomita Flight Strip. After World War II, the U.S. quitclaimed (1948) the airport to the City of Torrance. However, with the onset of the Cold War in 1955 the U.S. leased back the area immediately adjacent to Property 1 and built a Nike Missile Site there. The Nike Missile Site was decommissioned in the 1970s.

Despite the very clear record of owners and operators at the airport and the historic activity there, just last year Hi-Shear delivered a GE&R environmental report which, as has occurred on numerous prior occasions, incorrectly showed the boundary of Property 1 extending over and into the Nike Missile Site. This, compounded by the fact that data has been more readily obtainable from a private property than from a missile base or an operating airport, has led to more data being available on the private property side of a fence. This allows for statements like “PCE and 1,1-DCE detections in perched groundwater attenuate with distance away from...Property 1 until they are not detected on the former Nike Missile Base property.” RAW Section 4.3. While this an accurate statement based on the existing data, such a statement incorrectly and misleadingly suggests that similar sampling protocols were implemented at the Nike Missile Site and other areas of the airport. A far more accurate statement is to plainly note that the reason for non-detects at the airport is that scant field work was performed there. However, concluding that the airport cannot be a source of the persistent contamination levels found at depth along the airport border based on an absence of data cannot measure up to finding non-detects in samples obtained through a well-designed sampling program at the airport.

2021 was the first year that environmental field work was ever performed at the airport. A close analysis of that field work suggests that it was sparing, random and incomplete. While Hi-Shear should be given credit for finally taking the lead in this important aspect of the investigation, the implemented sampling program stopped short of the groundwater in many instances. Other times, when overlaid with site features and operations visible from historic aerial photographs, sampling locations were picked with apparently little to no thought of the topography, the underlying lithology, or the historic operations. For example, there were no borings located in the area where 55-gallon drums were stored and scrap material was dumped on the former Nike Missile Site; an area which is located just 15 feet or so to the east of Building 2 – and on the former Nike Missile Site. Exhibit 5. Rather than concluding that the airport is not a potential source of the contamination observed at depth at VP-50, VP-108, VP-113 and VP-114, a more reasonable and plausible conclusion to reach is that the contamination found at depth originates from a source other than the presumed leaks from a degreaser in Building 2. Such conclusions were shared by others, including the RWQCB (Exhibit 3) and GSI (Exhibit 2).

The inferences drawn from the RAW seem to propagate the narrative which Hi-Shear (through GE&R) continues to offer as recently as last year by incorrectly stating that the Nike Missile Site was located within the footprint of Property 1. Using property lines as a simple benchmark from which to delineate source points of contamination, VP-108, VP-113 and VP-114 are all located within the boundaries of the former Nike Missile Site. VP-50 which is located at the airport – Property 1 border has the telltale characteristics of an offsite release. No one at Property 1 operated at that location, the cVOC levels at or near the surface are below action levels but at depth spike up. A review of historical aerial photographs shows that a trench runs from the former Nike Missile Site and ends in the vicinity of VP-50. Exhibit 4. As discussed below, other topographic features at, and the lithology under, the airport indicate that surface and subsurface releases at the airport would have migrated from the airport to Property 1,

not vice-versa. Even the RAW concedes that “the highest concentrations [of cVOCs are] centered around the southern portion of...Property 1...” adding that “the center mass is located around vapor probes VP-49, VP-50, and VP-114.” RAW, Section 4.2.

Though VP-50, VP-108, VP-113 and VP-114 are now located within the boundaries of current-day Property 1, no one at Property 1 operated at these locations either in the past or today.

Historical aerial photographs clearly show that VP-50, VP-108, VP-113 and VP-114 are all far closer to activities associated with the former Nike Missile Site than those associated with the more distant and presumably leaking degreaser in Building 2.

Nonetheless, the RAW freely concludes that the presumed leaking degreaser in Building 2 is the sole source and explanation for the data found at these locations.

As noted above, this conclusion is not based on eye-witness accounts or on documented releases in historic records for Property 1 but instead is based on general practices of manufacturers who use cVOCs and degreasers.

According to the RAW, the standard for drawing inferences from general practices is reliable when applied to private property and operators but unreliable when applied to publicly owned land or government operators. In passing, the RAW discounts – or to be more accurate – disregards the Nike Missile Site altogether. The RAW dismissively asserts that although “general practices at Nike Missile sites are presented,” these do “not directly link[]...the former Nike Missile Base south of...Property 1” to the contamination. RAW p. 25. Apparently, reputations and innuendos are fair foundations upon which to draw inferences when applied to private operators but unreliable in other settings despite the U.S.’s well-earned reputation for managing and closing military installations.

Through silence buttressed by omissions, the RAW implicitly infers that the former Nike Missile Site could not possibly be a source of the contamination found at VP-50, VP-108, VP-113 or VP-114. The RAW reaches this assumption without considering aerial historic photographs which show that the area at the Nike Missile Site which is immediately adjacent to Building 2 was used as an outdoor 55-gallon drum collection field and at other times as a debris collection field (euphemistically speaking). Though it is reasonable and plausible to conclude that such activities explain the elevated cVOCs found at depth at VP-50, VP-108, VP-113 or VP-114, the RAW is silent on this.

The RAW also fails to consider topographic features at the airport. Historic aerial photographs show that there were trenches at the former Nike Missile Site traces of which are still apparent. Since the former Nike Missile Site was historically at a higher elevation than Property 1, any runoff which was channeled into these trenches would have funneled to Property

1. One of these aerial photographs shows a trench located at the former Nike Missile Site running to and ending in the immediate vicinity of VP-50. Exhibit 4. Though it is reasonable and plausible to conclude that these surface features explain the elevated cVOCs found at depth at VP-50, VP-108, VP-113 or VP-114, the RAW is also silent on this.

The RAW also fails to consider the lithology beneath the airport. Based on the data which was collected from GE&R's field work and presented in their "Soil, soil Vapor, and Groundwater Delineation – Updated Module III Report" and "Updated Site Conceptual Model," there are two perched water zones converging beneath Property 1. The gradient from one perched water zone runs from the Hi-Shear site towards Property 1. The gradient from the other perched water zone runs from the former Nike Missile Site towards Property 1. Exhibit 7.

The discussion at p. 10 and 22 of the RAW on the perched groundwater beneath the southern portion of Property 1 is especially misleading: Terraphase states "Perched groundwater has been encountered in the southern portion of Property 1 and extends to the south and east on to the former Nike Missile base and into the City of Lomita." RAW p. 22 ¶ 3. In contrast, GE&R found that the perched groundwater zone is present beneath the Nike Missile Site and flows in a northwesterly direction to the southern portion of Property 1. *See*, GE&R "Soil, Soil Vapor, and Groundwater Delineation – Updated Module III Report" dated April 30, 2021, *see also*, GE&R "Updated Site Conceptual Model" dated November 24, 2021.

As the RWQCB correctly noted (Ex. 3), the highest concentrations of cVOCs in the perched groundwater beneath Property 1 were detected at VP-50, VP-108, VP-113, and VP-114. The highest concentrations in soil vapor were found at depths of 45 feet which is the reported perched groundwater depth. These concentrations are along the southern portion of Property 1 in the vicinity of the former Nike Missile Site and in areas which were never occupied by Aeronca or anyone else who leased space at Property 1. Exhibit 6.

The RAW summarizes the maximum detected concentrations in soil and soil vapor at Property 1 as follows:

- PCE at 3.39 mg/kg -- found at 55' bgs in VP-50 (at the airport – Property 1 border where there is no record of anyone at Property 1 operating);
- TCE at 0.223 mg/kg -- found at 40' bgs in VP-25;
- cis-1,2-DCE at 0.0429 mg.kg -- found at 40' bgs in VP-25; and
- 1,1-DCE at 6.32 mg.kg -- found at 55' bgs in VP-50.

All of these elevated concentrations – whether from soil samples or from soil vapor – were found at depth; none were found at or near the surface of Property 1. The highest

concentrations of PCE, TCE, and 1,1-DCE were found at 53' bgs in VP-50 which is at the airport – Property 1 border and where no one from Property 1 ever operated.

The historical aerial photographs obtained by Middletown run counter to the conclusion that Property 1 is the sole source point of cVOCs; these photographs reinforce the conclusion that the cVOCs detected at Property 1 are migrating from off-site sources. As discussed above, the aerial photographs show that about 15 feet to the east of Building 2 – at the former Nike Missile Site (not Property 1) – there was a 55-gallon drum storage area which devolved over the years into a debris field as so often happens to such areas at military installations. Exhibit 5.

Based on the foregoing, as the RWQCB and GE&R previously noted, the data points to an offsite source of contamination which is migrating onto and beneath Property 1. At a minimum, it is far too premature to speculate that activity at Building 2 is the sole source of the cVOCs in the perched groundwater or, as the RAW implicitly states, none of the cVOCs in the perched groundwater can possibly be attributed to confirmed releases at the Hi-Shear site and/or to activity at the former Nike Missile Site.

5. Terraphase Proposed Workplan

Although Terraphase proposes a workplan for the vadose zone, the perched groundwater, and the regional groundwater beneath Property 1, the workplan seems directed at the presumed release from Building 2 and ignores the actual data generated to date.

The workplan proposes soil vapor extractions on the eastern side of Building 2 based on the presumed degreaser release points. Leaving theory aside and developing a workplan on known facts, the highest cVOC concentrations are found to the south of Building 2 (e.g., VP-50) and to the south and east of Building 2 along the current Nike Missile Site - Property 1 border (e.g., VP-49, VP-108, VP-113.) Exhibit 8. The proposed workplan focuses on the high cVOC concentrations found at VP-50 and VP-114 but it does not address other areas where elevated cVOC concentrations are known to exist (e.g., VP-49, VP-108, and VP-113). Exhibit 8.

GE&R's 2021 investigation of the airport and in particular of the former Nike Missile Site is incomplete. Borings were not advanced to consistent depths and the boring locations appear random and chosen without the valuable guidance provided by historical aerial photographs and an understanding of site operations. Key areas of interest based on site history (e.g., drum and barrel storage at the former Nike Missile Site) were not investigated. Instead of acknowledging the images captured in historic aerial photographs, the RAW states that there is no evidence of chemical usage or releases at the Nike Missile Site.

6. Areas Where Additional Investigations May be Warranted

The existing data clearly shows that the cVOCs detected beneath Property 1 are migrating from offsite sources; the data uniformly shows that cVOCs are found at depth. The

data also confirms that there are two perched groundwater zones, one running from the Hi-Shear site to Property 1 and the other running from the airport to Property 1. To the extent cVOCs were detected in the shallow soils at Property 1, these have always fallen below action levels, even in the vicinity of the presumed leaking degreaser. The data is consistent with the historical information for Property 1. Despite decades of thorough investigations, there is no record nor an eyewitness account that anyone at Property 1 released cVOCs whether at Building 2 or anywhere else.

Since unfounded questions continue to be raised and unfounded theories continue to be offered, Middletown has offered to undertake investigations to address the foregoing.

The RWQCB may recall that in September 2021 MKECI proposed field investigations which are awaiting the RWQCB's comment or approval. Now that the RAW raises additional questions, MKECI will develop an updated workplan to address the questions and concerns identified in the RAW.

The RAW also appropriately notes that additional soil, soil vapor, and groundwater characterizations at the Nike Missile Site are necessary. As discussed above, the 2021 investigation of the airport and of the former Nike Missile Site is very deficient; borings were not advanced to consistent depths and the locations appear to have been randomly chosen. Key areas of interest based on the site history (*e.g.*, drum and barrel storage on the former Nike Missile Site) were not investigated.

7. Conclusion

We trust that this letter outlines some of the more salient issues raised by the RAW. Michael Kinworthy from MKECI and I look forward to discussing these with the RWQCB team when we meet. In the meantime, if you have any questions, please do not hesitate to contact me at the office (213) 630-5570, on my cell (310) 490-9999, or via e-mail at prendon@lkfirm.com.

Very truly yours,



Patrick L. Rendón, Esq.

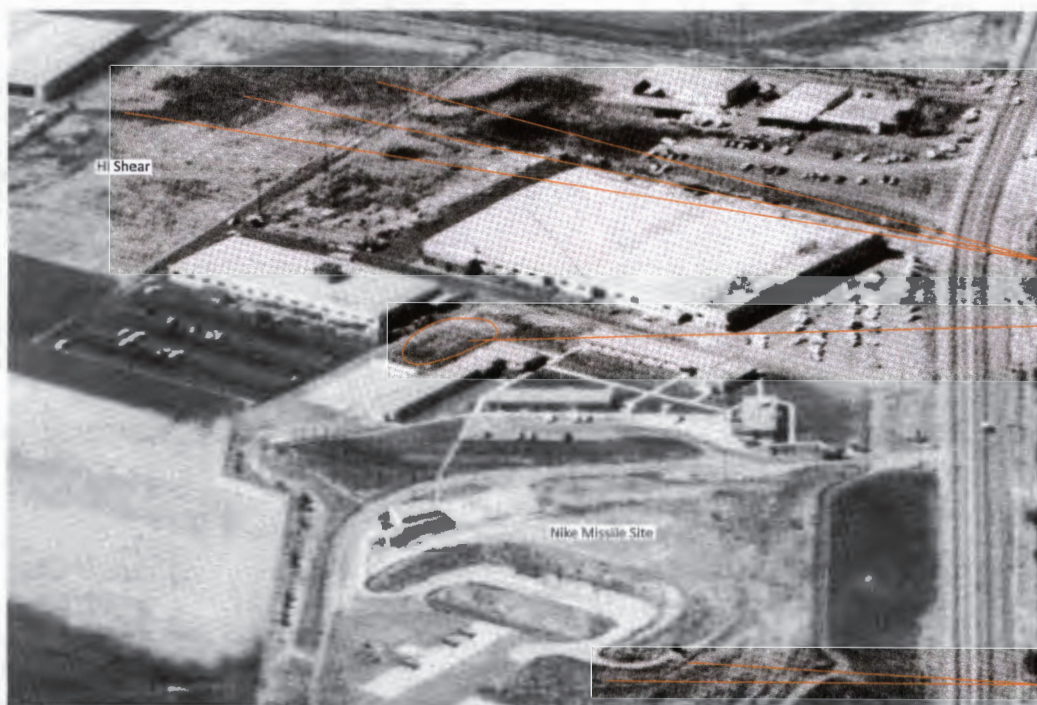
Enclosures

cc: Jillian Ly, RWQCB (Via E-Mail only: jillian.ly@waterboards.ca.gov)
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Steve Van der Hoven, Genesis Engineering & Redevelopment
(Via E-Mail only: svanderhoven@gercorp.com)
Service List for parties in *City of Torrance v. Hi-Shear Corporation*, Case 2:17-cv-07732-DSJ-JPR (Via Case Anywhere)

EXHIBIT 1





June 28, 1960 –
UCLA Department
of Geography,
Benjamin and
Gladys Thomas Air
Photo Archives,
Spence Air Photo
Collection

Slot trench drainage directs surface
water to area of darker vegetation

Cylindrical barrels or drums

Drainage ditch

June 28, 1960 AERIAL

24751/24777 Crenshaw Boulevard

LARRY D GURROLA, PHD, PG, CEG, INC

MAY 8, 1960 AERIAL

24751/24777 Crenshaw Boulevard

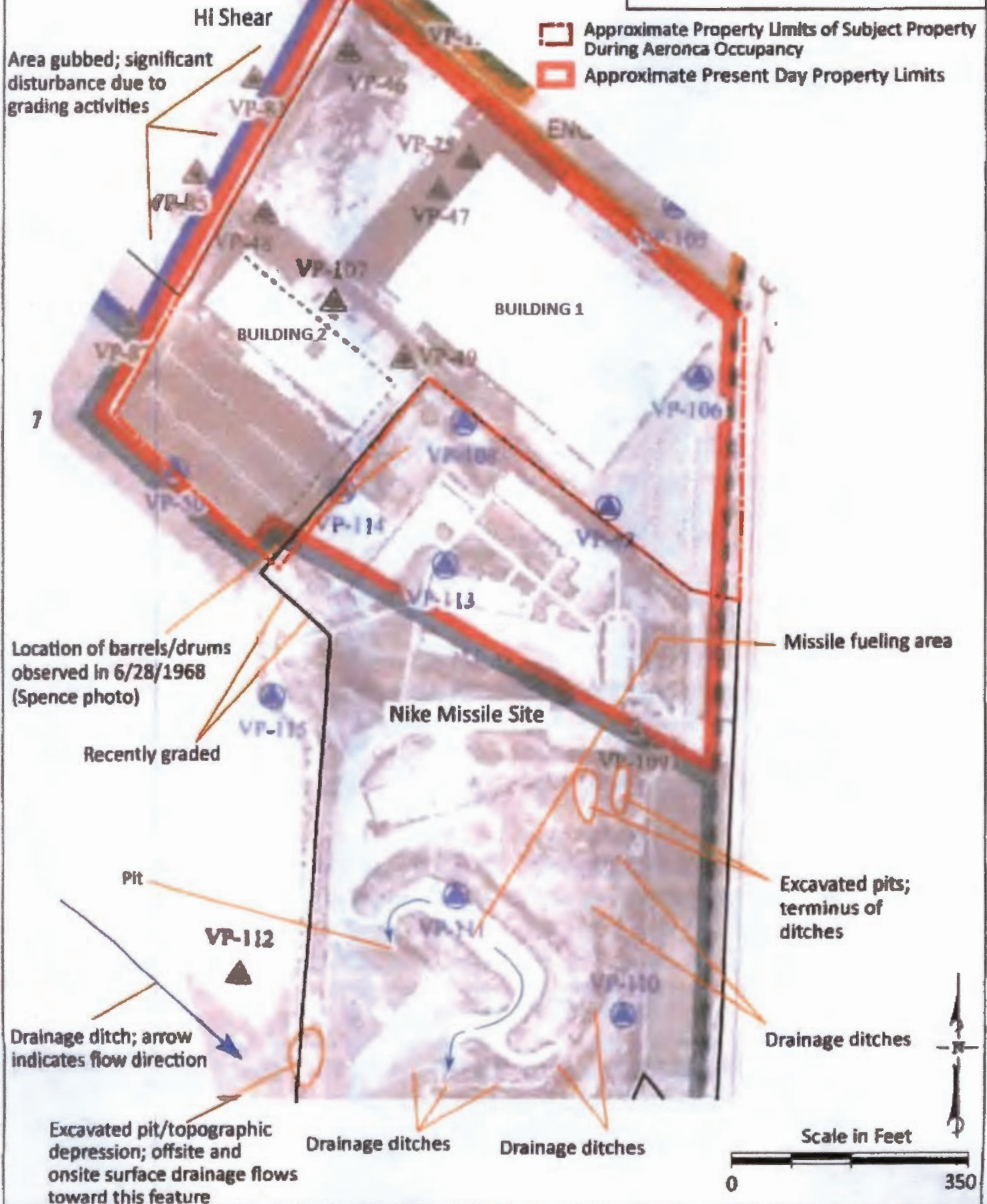


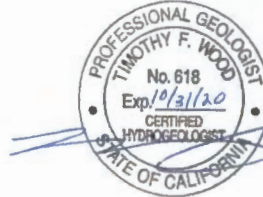
EXHIBIT 2

TECHNICAL MEMORANDUM

TO: Rene Purdy, Executive Officer, LA Regional Water Quality Control Board

Cc: Rutan & Tucker, LLP

FROM: Timothy F. Wood, P.G., CHG,
Kate E. Richards, P.G., CHG, and
Peter Scaramella



RE: Review and Analysis of Current Data on Historical Site Use and Environmental Conditions at the Hi-Shear Site, 2600 Skypark Drive, Torrance, California

GSI Environmental Inc. (GSI) has conducted a review of currently available historical records, Environmental Site Assessment reports, groundwater monitoring and remedial actions, and available analytical data for the groundwater plume containing chlorinated volatile organic compound (CVOC) concentrations (primarily trichloroethylene [TCE] and tetrachloroethene [PCE]) at the Hi-Shear Corporation ("Hi-Shear") site located at 2600 Skypark Drive, Torrance, California (referred to herein as the "Hi-Shear Site"). The Hi-Shear Site has been leased by H-Shear and its corporate successors (currently LSI Aerospace) since 1954 for the manufacture, production, assembly and cleaning of fasteners for the aerospace industry (Los Angeles Regional Water Quality Control Board [LARWQCB], 2020). Hi-Shear and its corporate successors are collectively referred to herein as "Hi-Shear."

This technical memorandum provides a preliminary summary of the Hi-Shear on-Site operations that involved the use of TCE and PCE and the results of Environmental Site Assessment activities that have identified significant source areas of TCE and PCE at the Hi-Shear Site to soil, soil vapor, and groundwater.

In addition, GSI has reviewed available soil vapor and groundwater data collected at the Hi-Shear Site and downgradient areas, which indicate that TCE and PCE are migrating in groundwater from the Hi-Shear Site to commercial and residential properties located east (and hydraulically downgradient) of the Hi-Shear Site.

Key findings of this review are:

1. Hi-Shear's operations involved the significant use and storage of TCE and PCE on the Hi-Shear Site, historical Hi-Shear operational Site features provided pathways for TCE and PCE to be released to the subsurface, and waste handling practices were documented to be poor in 1991.
2. Soil, soil vapor, and groundwater data identify releases of TCE and PCE at historical Hi-Shear operational Site features, and these releases have caused a soil vapor and groundwater plume beneath the Hi-Shear Site, EA Properties, and Residential Properties.
3. The TCE and PCE soil vapor and groundwater plumes represent a single plume emanating from the Hi-Shear Site.
4. TCE is the remedy driver for groundwater impacts both on the Hi-Shear Site and downgradient on the EA Properties and Residential Properties.

The narrative being forwarded by Hi-Shear's consultant (Genesis Engineering & Redevelopment,

Inc. [Genesis]) that there are two distinct plumes of soil vapor and groundwater is false and unsupported by the data. The plume was "bisected" in recent years from limited pilot test remediation efforts by Hi-Shear.

Background information related to this technical evaluation is presented below. The historical information and environmental site assessment data that support the key findings are presented in Sections 1 through 3.

Sources of Documents Reviewed

GSI obtained publicly available agency records and environmental site assessment reports from the following sources:

- South Coast Air Quality Management District (SCAQMD);
- Los Angeles County Sanitation Districts (LACSD) Industrial Waste Division; and
- State Water Resources Control Board (State Water Board) GeoTracker website.

Hi-Shear initiated operations at the Hi-Shear Site in the mid-1950s. However, the earliest environmental site assessment report identified by GSI was prepared in 1991.

Site Description

The approximately 12.25-acre Hi-Shear Site is identified within Los Angeles County Assessor's parcel number (APN) 7377-006-905. The Hi-Shear Site is bound to the south by the Torrance Municipal Airport, to the north by Skypark Drive, and to the west by Lowe's Home Improvement Center (Lowe's). The Hi-Shear Site historically included the area currently occupied by Lowe's until approximately 2006, when this portion of the Hi-Shear Site was subleased by Hi-Shear to La Caze Development and redeveloped.

The commercial properties located within APN 7377-006-905 and east of the Hi-Shear Site are referred to as the Eastern Adjacent Properties (EA Properties). The EA Properties are further subdivided into the following three properties:

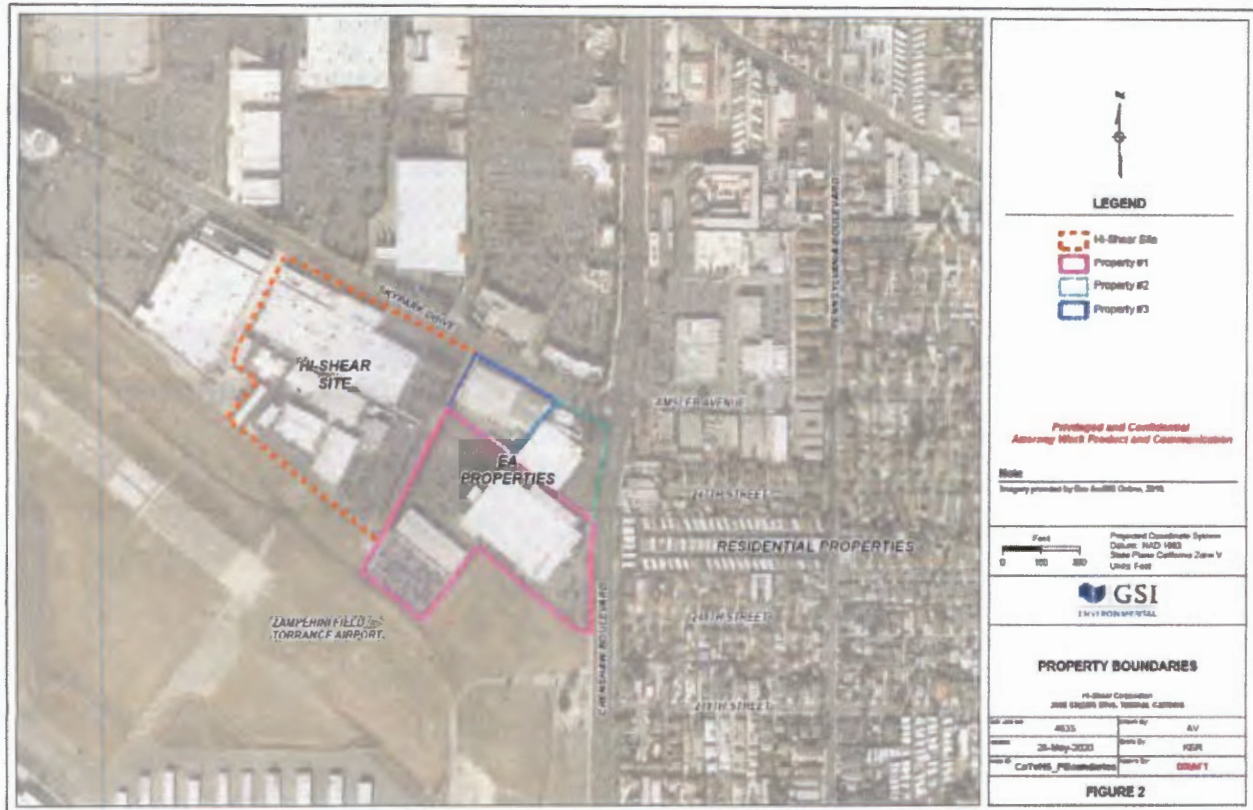
- EA Property 1 is identified with 24751 and 24777 Crenshaw Boulevard and currently occupied by South Bay Lexus (vehicle dealership);
- EA Property 2 is identified with 24707, 24747 and 24701 Crenshaw Boulevard and currently occupied by Dasco Engineering Corporation (manufacturer of precision mechanic aircraft and space components); and
- EA Property 3 is identified with 2530 and 2540 Skypark Drive and currently occupied by Robinson Helicopter.

The entire parcel APN 7377-006-906, which includes the Hi-Shear Site, Lowe's, and EA Properties, is owned by the City of Torrance and has been leased to commercial entities since 1954.

The residential neighborhood located within the City of Lomita and east of the EA Properties and of Crenshaw Boulevard, is herein referred as the "Residential Properties."

The Hi-Shear Site, EA Properties, and Residential Properties are shown on Exhibit 1 below.

Exhibit 1. Property Boundaries



Constituents of Concern (COCs) in Groundwater

The primary constituents of concern (COCs) in groundwater at the Hi-Shear and adjacent properties are TCE and PCE. Other detected VOCs include daughter products cis-1,2-dichloroethylene (cis-1,2-DCE) and vinyl chloride, as well as 1,1-dichloroethylene (1,1-DCE), 1,1,1-trichloroethane (1,1,1-TCA), trans-1,2-dichloroethylene (trans-1,2-DCE), 1,2-dichloroethane, 1,1,2-trichloroethane, benzene, toluene, ethylbenzene, hexavalent chromium, 1,4-dioxane, and perchlorate (Alta Environmental LP, [Alta], 2017). A review of available groundwater monitoring data indicates that TCE is the constituent detected at the highest concentrations and the remedy driver for groundwater impacts at the Hi-Shear Site, adjacent EA properties, and Residential Properties. For example, on-Site, the maximum historical measured TCE concentration (190,000 micrograms per liter [µg/L] in MW-3) is almost 12 times greater than the maximum measured historical concentration of PCE (16,000 µg/L in MW-3). In groundwater monitoring well MW-18 (which is located on the Hi-Shear Site and reported the highest TCE concentrations in August 2018), TCE concentrations have exceeded PCE concentrations by a factor of approximately 30 to 60 times (i.e., TCE concentrations are greater than 1 order-of-magnitude [OoM] than PCE).

1.0 Hi-Shear's operations involved the significant use and storage of TCE and PCE on the Hi-Shear Site, historical Hi-Shear operational Site features provided pathways for TCE and PCE to be released to the subsurface, and waste handling practices were documented to be poor in 1991.

The Hi-Shear aerospace fastener manufacturing operations includes and previously included fastener manufacturing, heat treatment, process coating, ordinance assembly, plating with in-ground plating pits, and parts cleaning. These operations typically had included the use, storage and handling of significant quantities of chlorinated solvents. The use of significant quantities of TCE and PCE at the Hi-Shear Site is consistent with typical aerospace manufacturing and the subsurface data at the Site. "Aerospace manufacturers often use large quantities of solvents in a variety of cleaning and degreasing operations including parts cleaning, process equipment cleaning, and surface preparation for coating applications," (United States Environmental Protection Agency [USEPA], 1998).

Historical records obtained to date for the Hi-Shear Site identified equipment that typically involved the use of TCE and PCE and that was located throughout the Hi-Shear Site. Solvent degreasers were located at several buildings since at least 1968 and at least 18 underground storage tanks (USTs) were located at the Hi-Shear Site. The Hi-Shear operations included a distillation unit for the distillation of spent solvent and a wastewater treatment plant for treating industrial wastewater from the plating operations (Hygienetics, Inc., [Hygienetics], 1991). These features indicate the Hi-Shear operations were of considerable size and involved the use and storage of significant quantities of TCE and PCE.

Historical features at the Hi-Shear Site include structures that are frequently associated with chemical releases to the subsurface. A shallow drywell was located on the Hi-Shear Site, and dry-wells historically were used for waste disposal. In addition, clarifiers, and USTs were located at the Hi-Shear Site, and these structures are prone to leakage and release of solvents.

Historical records document that Hi-Shear waste handling practices were poor. Hi-Shear waste handling practices resulted in releases of TCE and PCE to the subsurface, including the discharge of waste to the sewer system that connected to the main sewer lines on Skypark Drive and Crenshaw Boulevard. TCE and PCE have been detected in samples collected from waste discharged to the sewer. The waste discharged at the Hi-Shear Site was associated with degradation of the sewer system.

A summary of historical information that describes the operations, historical features, and waste handling practices at the Hi-Shear Site is provided below. Note that we have not attempted to summarize all of the information reviewed to date and additional information likely is available at the LARWQCB office and from other sources, which have not been available for review due to COVID-19 impacts to the LARWQCB file review procedures. As such, the information presented below is a preliminary summary of key findings. Based on the records reviewed to date, GSI believes additional historical information may be available in the LARWQCB's physical files with information relevant to the identification of the historical use and release of TCE and PCE on the Hi-Shear Site.

1.1 Hi-Shear operations used TCE and PCE since at least 1968

SCAQMD "Permit to Operate" records were obtained for the Hi-Shear Site using their searchable online database for Facility ID No. 11192 (Hi-Shear Corporation).¹ These records document

¹ <https://www.aqmd.gov/nav/online-services/public-records/public-document-search>

equipment that has been permitted for use at the Site since 1968, including equipment that utilizes TCE, PCE and other chlorinated solvents.

The list of equipment that has been operated by Hi-Shear under an SCAQMD permit for one or more years between 1968 and the present includes (listings verbatim from SCAQMD records):

- SPRAY BOOTH PAINT AND SOLVENT
- DEGREASER 1,1,1 TRICHLOROETHANE (>1LB/D)
- SCRUBBER, OTHER VENTING S.S.
- DEGREASER PERCHLOROETHYLENE (>1LB VOC/D)
- STORAGE TANK TRICHLOROETHYLENE
- CHLORINE TREATING
- COATING & DRYING EQUIP CONTINUOUS ORG, WEB TYPE
- SOLV RECLAIM (1 STAGE) METHYLENE CHLORID
- STORAGE TANK FUEL OIL
- PLAN RULE 1166 (CONTAMINATED SOIL HAND.)
- I C E (50-500 HP) EM ELEC GEN-DIESEL
- I C E (50-500 HP) EM FIRE FGHT-DIESEL
- WASTE WATER EVAPORATION
- AFTERBURNER, DIRECT FLAME
- WASTE WATER TREATING (>50000 GAL/DAY)
- TANK, CADMIUM - PLATING
- TANK, SURFACE PREPARATION - OTHER ACIDS
- SOIL TREAT VAPOR EXTRACT OTHER VOC UNDER
- TANK, NITRIC ACID
- TANK, OTHER AQUEOUS SOLUTION
- SCRUBBER, PARTICULATES VENTING S.S.
- SCRUBBER, PARTICULATES VENTING M.S>
- TANK, SULFURIC/PHOSPHORIC ACID - ANODIZING
- SOLV RECLAIM STILL (1 STAGE) HYDROCARB
- DIP TANK COATING WAX
- DIP TANK COATING MISC
- OVEN, COOKING OR CURING
- SPRAY MACHINE - COATING
- SPRAY BOOTH(S) (1 - 5) W/ AFTERBURNER
- SOIL TREAT VAPOR EXTRACT GASOLINE UNDER

- SCRUBBER, OTHER VENTING M.S.
- SPRAY BOOTHS (>5) WITH AFTERBURNER
- SURFACE PREP TANK CONT. CHROMIC ACID
- SCRUBBER, TOXICS VENTING
- SOLVENTS MISC STRIPPING
- WASTE WATER TREATING (20000-50000 GAL/D)

The permit below is listed in SCAQMD records as Permit Number P66723 dated 6 April 1976 for "Degreaser Perchloroethylene (<1LB VOC/D)." The permit listing (Exhibit 1-1) establishes that Hi-Shear operated a PCE degreasing operation in addition to TCE storage tanks. The permit identifies a Detrex degreaser and solvent recovery still (Exhibit 1-2).

Exhibit 1-1. SCAQMD Permit Records for Hi-Shear Site

← → ↺ ↻ onbase-pub.aqmd.gov/publicaccess/DatasourceTemplate.aspx

South Coast AQMD

Select Search Type
 Permits to Operate

Please fill in at least ONE field. Use an Asterisk (*) after input to search items that START with input. Use Asterisks around input to search items that CONTAIN input (NOT APPLICABLE to Facility ID field)

Start: [] End: []

Appl. Nbr: []

Permit Nbr: []

Facility ID: 11192

Facility Name: []

Address: []

City: []


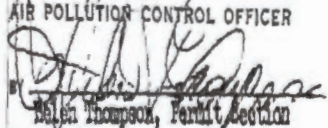
Zip Code: []

Equipment Descr: []

Search Results:

Permit Nbr	Facility Nbr	ID	Name	Address	City	Permit	Permit Expiration Date	Description
A49572	P26293	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	6/14/1968	SPRAY BOOTH PAINT AND SOLVENT
A70575	P51243	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	11/16/1972	DEGREASER 1,1,1 TRICHLOROETHANE (>1LB/D)
A77334	P57736	11192	HI-SHEAR CORPORATION	2600 SKYPARK DR	TORRANCE	90509	8/1/1974	SPRAY BOOTH PAINT AND SOLVENT
A77533	P57735	11192	HI-SHEAR CORPORATION	2600 SKYPARK DR	TORRANCE	90509	8/1/1974	SPRAY BOOTH PAINT AND SOLVENT
A77532	P57734	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	8/1/1974	SPRAY BOOTH PAINT AND SOLVENT
A87317	P63848	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	9/29/1975	SCRUBBER, OTHER VENTING S.S.
A87318	P63849	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	9/29/1975	SCRUBBER, OTHER VENTING S.S.
C01425	P66723	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	4/6/1976	DEGREASER PERCHLOROETHYLENE (>1LB VOC/D)
C07306	P68701	11192	HI-SHEAR CORPORATION	2600 SKYPARK DR	TORRANCE	90509	1/17/1977	SPRAY BOOTH PAINT AND SOLVENT
C08715	M01924	11192	HI-SHEAR CORPORATION	2600 SKYPARK DR	TORRANCE	90509	10/10/1977	DEGREASER 1,1,1 TRICHLOROETHANE (>1LB/D)
C28565	M16100	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	3/10/1981	OVEN, DRYING
C28287	M16101	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	3/10/1981	SPRAY BOOTH PAINT AND SOLVENT
C28288	M16098	11192	HI-SHEAR CORPORATION	2600 SKYPARK DR	TORRANCE	90509	3/10/1981	SPRAY BOOTH PAINT AND SOLVENT
C34660	M16886	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	4/10/1981	STORAGE TANK TRICHLOROETHYLENE
C34661	M17483	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	7/14/1981	STORAGE TANK TRICHLOROETHYLENE
C37733	M23966	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	4/9/1982	
C37734	M23965	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	4/9/1982	
C37732	M23967	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	4/9/1982	
C39792	M16653	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	4/30/1982	OVEN, BAKING
107708	M41339	11192	HI-SHEAR CORPORATION	2600 SKYPARK DR	TORRANCE	90509	11/16/1984	CHLORINE TREATING
129459	M43143	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	3/18/1985	OVEN, BAKING
134613	M60982	11192	HI-SHEAR CORPORATION	2600 SKYPARK DR	TORRANCE	90509	3/7/1988	SPRAY BOOTH PAINT AND SOLVENT
162076	M60980	11192	HI-SHEAR CORPORATION	2600 SKYPARK DR	TORRANCE	90509	3/7/1988	COATING & DRYING EQUIP CONTINUOUS ORG, WEB TYPE
162077	M60981	11192	HI-SHEAR CORPORATION	2600 SKYPARK DR	TORRANCE	90509	3/7/1988	COATING & DRYING EQUIP CONTINUOUS ORG, WEB TYPE
162079	M60985	11192	HI-SHEAR CORPORATION	2600 SKYPARK DR	TORRANCE	90509	3/7/1988	SPRAY BOOTH PAINT AND SOLVENT
162080	M60986	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	3/7/1988	SPRAY BOOTH PAINT AND SOLVENT
155374	M61911	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	4/13/1988	OVEN, DRYING
168730	D00162	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	6/13/1988	SPRAY BOOTH PAINT AND SOLVENT
168731	D00161	11192	HI-SHEAR CORPORATION	2600 SKYPARK DR	TORRANCE	90509	6/13/1988	SPRAY BOOTH PAINT AND SOLVENT
152749	D01679	11192	HI-SHEAR CORPORATION	2600 SKYPARK DR	TORRANCE	90505	8/9/1988	SOLV RECLAIM (1 STAGE) METHYLENE CHLORIDE
175688	D03782	11192	HI-SHEAR CORPORATION	2600 SKYPARK DR	TORRANCE	90505	11/29/1988	SPRAY BOOTH PAINT AND SOLVENT
207832	D13192	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	12/19/1989	OVEN, DRYING
207828	D16645	11192	HI-SHEAR CORPORATION	2600 SKYPARK DR	TORRANCE	90509	1/24/1990	STORAGE TANK FUEL OIL
218535	D20999	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	3/13/1990	SPRAY BOOTH PAINT AND SOLVENT
212275	D22825	11192	HI-SHEAR CORPORATION	2600 SKYPARK DR	TORRANCE	90505	4/7/1990	PLAIN RULE 1166 (CONTAMINATED SOIL HAND.)
218534	D22851	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	4/7/1990	SPRAY BOOTH PAINT AND SOLVENT
218533	D22850	11192	HI-SHEAR CORP	2600 SKYPARK DR	TORRANCE	90509	4/7/1990	SPRAY BOOTH PAINT AND SOLVENT

Exhibit 1-2. Permit for "Degreaser Perchloroethylene"

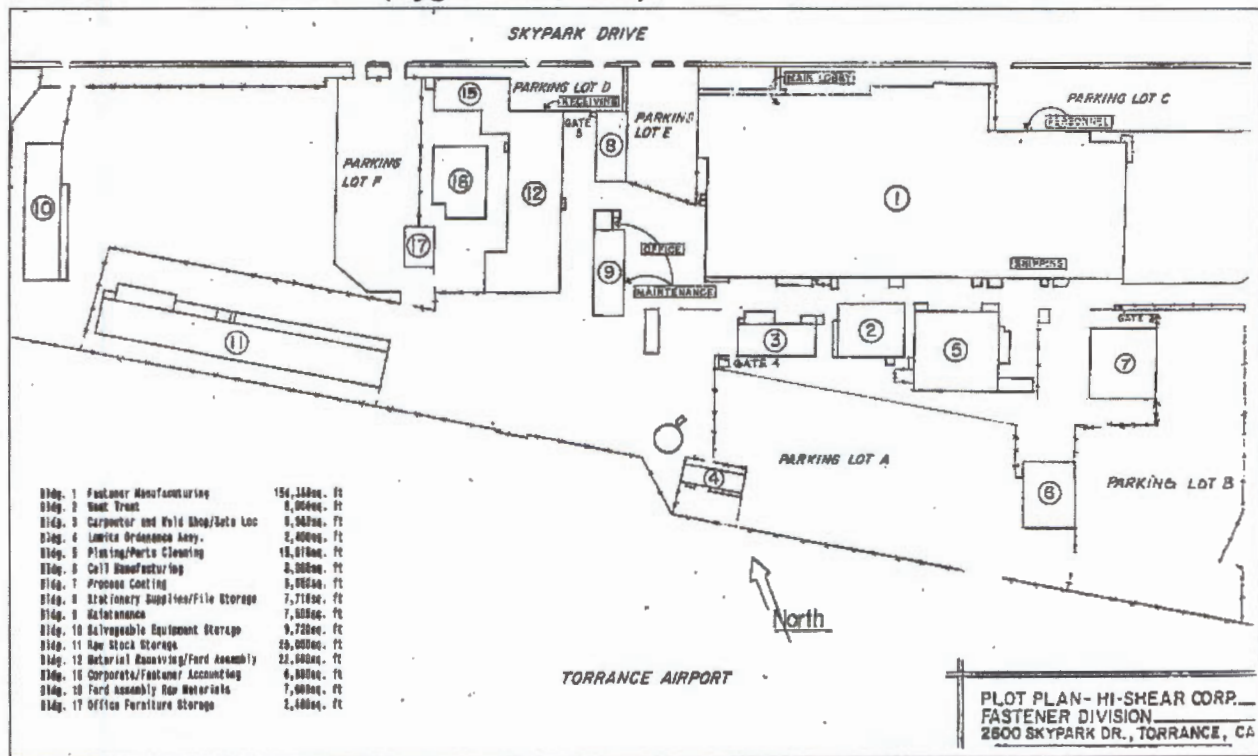
78P235M-12/71		AIR POLLUTION CONTROL DISTRICT Los Angeles, Calif 90013		P 66723	
		PERMIT TO OPERATE		SECTION CL	
<p>Operation under this permit must be conducted in compliance with all data and specifications included with the application under which this permit is issued. The equipment must be properly maintained and kept in good operating condition at all times. In accordance with Rule 10(c), this Permit to Operate must be posted or accessible.</p>					
LEGAL OWNER OR OPERATOR:	HI-SHEAR CORPORATION		Appl. No.	C-01425	
	2600 SKYPARK DRIVE TORRANCE, CALIFORNIA		PREVIOUS PERMIT NO.	P-26292	
EQUIPMENT LOCATED AT:					
EQUIPMENT DESCRIPTION AND CONDITIONS:	<p>DEGREASING SYSTEM CONSISTING OF:</p> <ol style="list-style-type: none"> 1. DEGREASER, DETHEX, VAPOR-SPRAY TYPE, MODEL NO. 20-500-B, SIZE 630, 3'-3" W. x 6'-3" L. x 5'-10" D., SERIAL NO. 60712, STEAM-HEATED WITH A 1/4 H.P. SOLVENT SPRAY PUMP. 2. STILL, DETHEX, MODEL S-175, 3'-6" W. x 6'-0" L. x 7'-6" H., STEAM-HEATED, WITH A 1/4 H.P. PUMP. <p>(CONDITION)</p> <p>PHOTOCHEMICALLY REACTIVE SOLVENT MUST NOT BE USED IN THIS EQUIPMENT UNLESS THE EMISSION OF ORGANIC MATERIALS INTO THE ATMOSPHERE IS REDUCED BY AT LEAST 85 PER CENT BY WEIGHT.</p>				
THIS PERMIT BECOMES VOID UPON ANY CHANGE OF OWNERSHIP OR ADDRESS, OR ANY ALTERATION:					
<p>This permit does not authorize the emission of air contaminants in excess of those allowed by Division 28, Chapter 2, Article 3, of the Health and Safety Code of the State of California or the Rules and Regulations of the Air Pollution Control District. This permit cannot be considered as permission to violate existing laws, ordinances, regulations or statutes of other governmental agencies.</p> <p>Filing fee only-total cost of permit-filing fee paid on</p> <p>valid number 7575, dated Sept. 24, 1975</p> <p>VOID UNLESS VALIDATED</p>			<p>AIR POLLUTION CONTROL OFFICER</p> <p></p> <p>Helen Thompson, Permit Section</p> <p>Air Quality Management District Certified Copy DATE <u>April 6, 1976</u></p>		

FILE COPY

1.2 Hi-Shear operations involved extensive storage, handling and use of solvents

Hi-Shear operated a large-scale aerospace fastener manufacturing operation at the Hi-Shear Site. In 1991, a Phase I Environmental Site Assessment was performed at the Hi-Shear Site on behalf of Chemical Bank by Hygienetics (1991). The Hygienetics report included the following Site plan, which shows a large facility with significant manufacturing operations:

Exhibit 1-3. 1991 Site Plan (Hygienetics, 1991)



The Hygienetics report described the use and storage of chlorinated solvents, including the use of degreasers, at Heat Treat Building #2 and Plating/Parts Cleaning Building #5. The 1991 assessment summarized the USTs that were present at the Hi-Shear facility in 1991:

Exhibit 1-4. List of USTs at Hi-Shear in 1991 (Hygienetics, 1991)

UNDERGROUND STORAGE VESSELS PAST AND PRESENT			
<u>NUMBER</u>	<u>LOCATION</u>	<u>CONTENTS</u>	<u>VOLUME</u>
1*	Southeast of Bldg. #9	Waste Oil	?
2	North of Bldg. #5	Plating Clarifier	2,000 gal
3	East of Bldg. #5	Plating Clarifier	2,000 gal
4	East of Bldg. #5	East Plating Pit	50,000 gal
5	West of Bldg. #5	West Plating Pit	75,000 gal
6	Bldg. #1	Grind Oil	2,000 gal
7	Bldg. #1	Coolant Oil	800 gal
8	Bldg. #1	Grind Oil	2,000 gal
9	Bldg. #1	Water Sump	900 gal
10	Southwest of Bldg. #3	Waste Oil Sump	2,000 gal
11	Bldg. #3	Steam Clean Sump	275 gal
12*	West of Bldg. #3	Waste Oil	250 gal
13*	West of Bldg. #3	Waste Oil	250 gal
14*	West of Bldg. #3	Waste Oil	250 gal
15*	West of Bldg. #6	Gasoline	?
16*	West of Bldg. #6	Gasoline	?
17	South of Bldg. #3	Soap, Grease & Water	?
18	South of Bldg. #3	Soap, Grease & Water	?

The Hygienetics report describes poor tracking practices for the USTs:

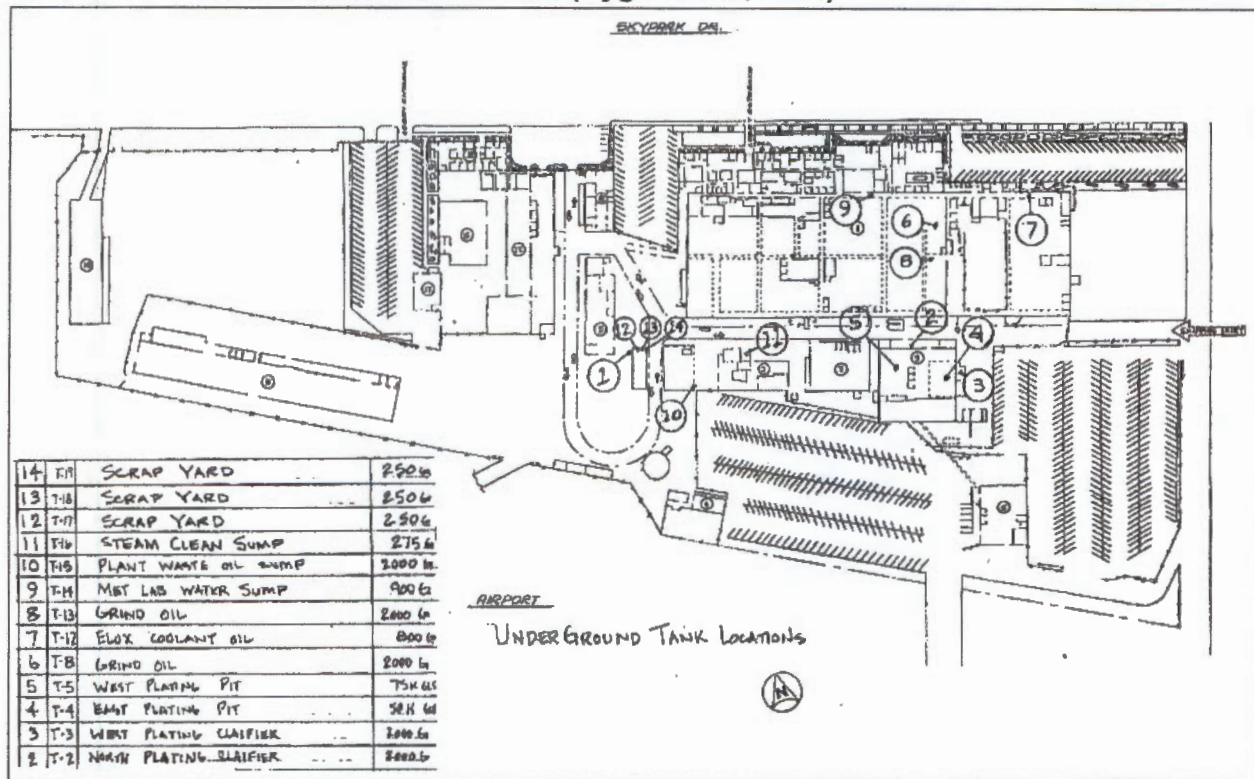
According to Hi-Shear, 11 underground storage tanks were registered. Of these 11 tanks, six have been removed and five still remain. However, it appears that there have been a total of 18 underground storage tanks on-Site (Hygienetics, 1991).

In addition, Hygienetics noted that:

No documentation was available on-Site regarding the integrity testing of the tanks currently on-Site (Hygienetics, 1991).

The Hygienetics presentation of the 18 USTs is included below as Exhibit 1-5.

Exhibit 1-5. 1991 Location of USTs Plan (Hygienetics, 1991)



At Building 5, two clarifiers and two plating pits were present in 1991 and the large capacity of the plating pits (50,000 and 75,000 gallons) indicate a large operation that would have involved significant quantities of solvents. The Hygienetics report also describes the degreasing operations at Building 5:

The southern part of Building #5 is dedicated to parts cleaning. Several degreasers are located here for removal of oil and grease with solvents (Hygienetics, 1991).

Based on the SCAQMD permit records, the degreaser operations included the use of both TCE and PCE (Exhibit 1-1).

1.3 Historical site features provided pathways for release of solvents to subsurface

Historical Site features that provided pathways for the release of TCE and PCE to the subsurface include a drywell, clarifiers, USTs, and sewer lines.

Drywell

Based on a 1992 Floor Plan for the Process Coating Building by SM Daderian & Associates, a drywell with a drain leading to a 24-inch diameter by 18-inch long pipe filled with fist size stones and gravel was located at Building 3. Exhibit 1-6 shows the drywell detail and Exhibit 1-7 shows the complete floor plan that includes this detail.

Exhibit 1-6. 1992 Floor Plan Call Out showing Drywell Detail (Part of Exhibit 1-7)

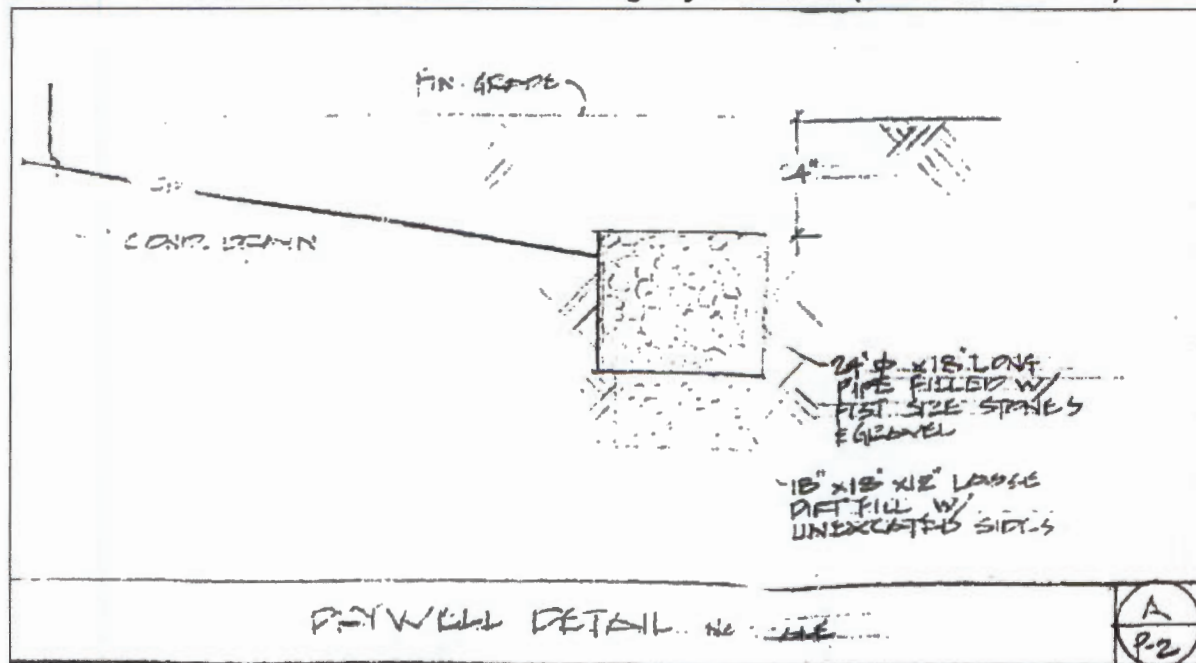
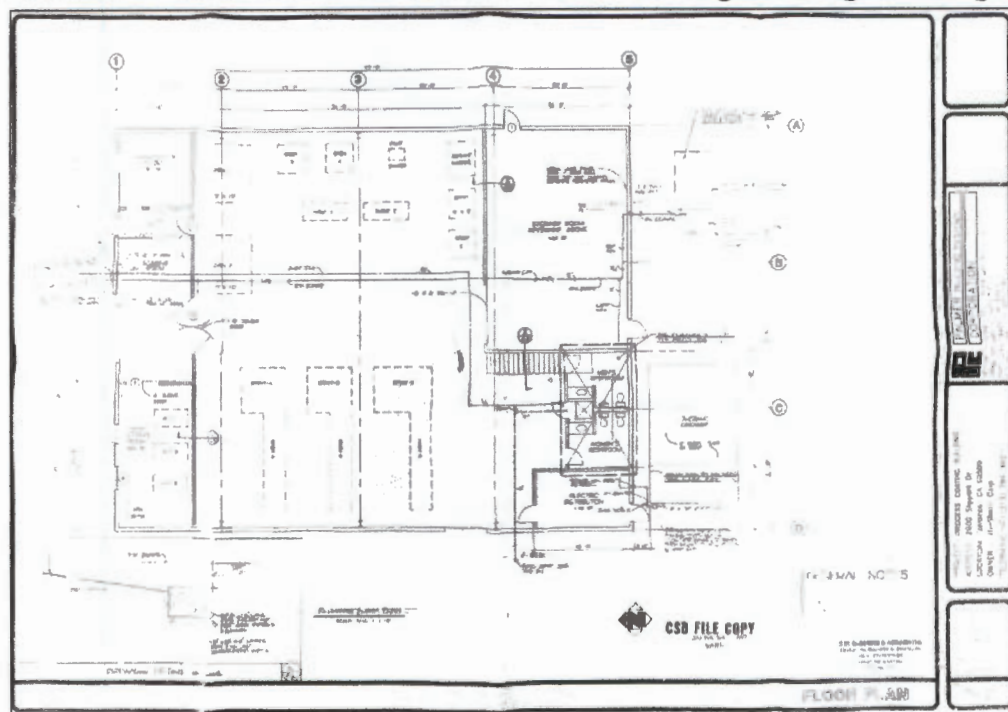


Exhibit 1-7. 1992 Floor Plan for the Process Coating Building Showing Drywell Detail



The dry well design provides a direct path to release liquids directly into soil.

As described above, at least 18 USTs, including in-ground plating pits and plating sumps, were located at the Hi-Shear Site. The Hygienetics report indicated that “[n]o documentation was available on-Site regarding the integrity testing of the tanks currently on-Site” (Hygienetics, 1991). USTs can leak from associated use activities including filling, dispensing, and storage through incidental and accidental spills, leaking piping and USTs from corrosion and compromise of seals and fittings. USTs are commonly associated with releases of VOCs to soil, soil vapor, and groundwater.

Records obtained from LACSD identify sewer lines between Building 5 and the sewer outfall identified as the "Industrial Water Manhole and Sampling Point" on the 1992 Plot Plan shown below (Exhibit 1-8). The sewer lines are shown to flow from the vicinity of Building 5 directly to the Industrial Water Manhole and Sampling Point.

HI-SHEAR CORPORATION SEWER LINE OUTLETS

INDUSTRIAL WATER MANHOLE & SAMPLING POINT

INDUSTRIAL WATER MANHOLE & SAMPLING POINT

MANUFACTURING (1)

INDUSTRIAL DEP 704 R

PLANT (5) DEPT

PARKING LOT A

PARKING LOT B

PARKING LOT C

PARKING LOT D

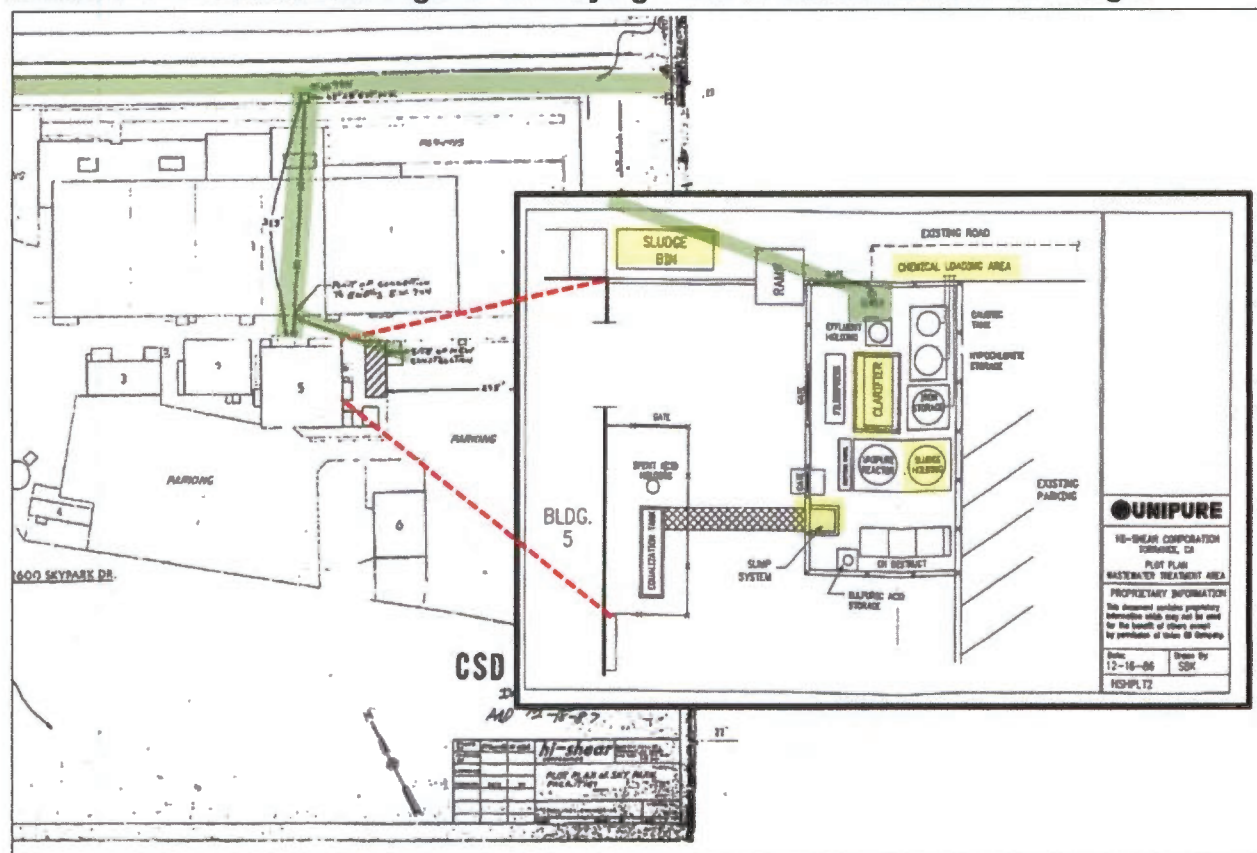
SKYPARK DRIVE

TORRANCE AIRPORT

6-30-93

Additional LACSD records from 1986 identify the area to the east of Building 5 as having a clarifier, sump, sludge bin, and chemical loading area near a sewer inlet. The maps below identify the above ground features in yellow and the general location of the sewer lines in green (Exhibit 1-9).

Exhibit 1-9. 1986 and 1987 Figures Identifying Detail of Eastern Side of Building 5



Notes: Above ground features = Yellow; Sewer Lines = Green

Building 5 also contained two large (50,000 and 75,000 gallon) in-ground plating pits and a degreasing operation. The Hygienetics report describes the degreasing operations at Building 5: "The southern part of Building #5 is dedicated to parts cleaning. Several degreasers are located here for removal of oil and grease with solvents" (Hygienetics, 1991). A plating pit and plating clarifier also were located at the southeast corner of Building 5 (Exhibit 1-5).

1.4 Historical records document the detection of TCE and PCE in discharge to the sewer system and degradation of sewer system due to Hi-Shear waste discharge

Hygienetics identified Hi-Shear had an Industrial Waste Water Discharge Permit since 1956 (Hygienetics, 1991). Plating operations at Hi-Shear generated two primary waste streams: (1) cyanide rinse water and (2) concentrated acid waste (Hygienetics, 1991). The Hygienetics report (1991) documented Hi-Shear acknowledged that discharges to the sewer by Hi-Shear degraded the main sewer line on Skypark Drive:

It appears that past discharges of acidic waste have dissolved the City of Torrance Skypark Drive sewer main in several places. Hi-Shear has agreed that this is most

probably due to their discharge. A preliminary study was performed to determine if the manhole deterioration has resulted in the release of heavy metal contaminants into the exposed earth. Soil samples taken below the dissolved manhole indicate that all possible metal contaminants levels are within regulatory limits.

Soil samples were not analyzed for VOCs. However, discharges to the sewer by Hi-Shear likely has resulted in the release of TCE and PCE to the subsurface along the sewer main on Skypark Drive, which flows east to Crenshaw Boulevard.

In 1987, Hi-Shear built a waste treatment plant located east of Building 5 (Hygienetics, 1991). Despite the construction of this plant, industrial water discharge sample records indicate VOCs were present in industrial water discharge from the Hi-Shear Site. Industrial water discharge sample (IWS) analytical results from sampling events that included analysis for VOCs were obtained from LACSD files for the years 1989 through 2012. Twelve events identified concentrations of either PCE, TCE, or 1,1,1-TCA in IWS. Twelve events did not identify PCE, TCE, or 1,1,1-TCA, but used laboratory reporting limits for VOCs that exceeded 10 µg/L and three additional events used reporting limits for VOCs that exceeded 20 µg/L. After six sampling events in 1991 that identified concentrations of 1,1,1-TCA ranging to 1,040 µg/L, 1,1,1-TCA was only reported intermittently and not reported on 13 analytical reports that identified VOCs. The sampling events with reported VOC concentrations are identified in the table below (Exhibit 1-10).

Exhibit 1-10. IWS Events with Documented VOCs in Wastewater

Sampling Date	PCE (µg/L)	TCE (µg/L)	1,1,1-TCA (µg/L)
23 Jan 1989	7.3	<5	110
2 Feb 1989	<5	<5	129
25 Apr 1991	<5	<5	220
11 Oct 1991	<5	<5	85
6 Nov 1991	<5	<5	370
7 Nov 1991	<5	<5	1040
17 Feb 2000	11	<10	<10
7 Nov 2000	1.5	<0.5	NR
40 Apr 2002	5.2	<0.5	NR
25 Sep 2002	<1.0	2.3	NR
30 Apr 2010	<0.5	2.9	<0.5
4 Jun 2010	<2.0	2.3	<2

NR = Not Reported

Based on the evidence presented above, Hi-Shear has discharged PCE and TCE to the sewer system as well as acidic waste that had degraded the sewer system. This is an area where additional investigation is warranted by Hi-Shear.

1.5 Historical records document poor handling and tracking practices of hazardous waste in 1991

Hygienetics indicated that poor compliance with hazardous waste labeling and tracking requirements were observed during its 1991 assessment:

Hygienetics investigated Hi-Shear's compliance with RCRA regulations concerning hazardous waste. Hygienetics' investigation revealed that labeling of containers is the biggest non-compliance issue. Hygienetics did not observe proper hazardous waste stickers applied to any hazardous waste on-Site

Additionally, accumulation dates were not provided on hazardous waste containers in the temporary storage areas. Hi-Shear representatives indicated that they have been cited for improper labeling of on-Site hazardous waste. (Hygienetics, 1991).

In summary, historical records describe an extensive manufacturing operation that involved significant quantities of solvents, including TCE and PCE, at the Hi-Shear Site. Multiple historical Site features are potential pathways for TCE and PCE to enter the subsurface, including at least 18 USTs and the sewer system that received industrial waste discharge. Finally, historical records also describe poor waste handling practices.

2.0 Soil, soil vapor, and groundwater data identify releases of TCE and PCE at historical at features Hi-Shear operational Site features, and these releases have caused a soil vapor and groundwater plume beneath the Hi-Shear Site, EA Properties, and residential properties.

Hi-Shear detected TCE and PCE in soil samples collected in 1990 as part of an investigation following the removal of a waste oil UST. Subsequent investigations identified the presence of dense nonaqueous phase liquid (DNAPL) and TCE beneath the Hi-Shear Site and indicated that TCE in groundwater associated with sources at the Hi-Shear Site was migrating east of the Hi-Shear Site to the EA Properties and Residential Properties. Soil sampling at the Hi-Shear Site identified eight areas of potential concern (AOPCs) for releases of total petroleum hydrocarbons (TPH), TCE and PCE. Both TCE and PCE were detected in soil samples collected at five of the eight AOPCs. Hi-Shear's soil and groundwater investigations have identified TCE and PCE source areas at the Hi-Shear Site, TCE and PCE in groundwater beneath the Hi-Shear Site and acknowledged that the groundwater plume has migrated from the Hi-Shear Site east to the EA Properties.

2.1 Groundwater monitoring reports prepared on behalf of Hi-Shear acknowledge migration of impacted groundwater off-site in the early 1990s

Groundwater monitoring was initiated at the Hi-Shear Site in 1991 with the installation of monitoring wells at the "oil yard" area southeast of Building 9 to evaluate groundwater impacts associated with a release at a waste oil UST (identified as Tank 1 in Exhibit 1-5). In December 1988, the 2,000 gallon capacity, steel UST that was used to store waste machine cutting and cooling oils was removed and TPH was detected in soil samples at concentrations of 22,040 and 125,130 milligrams per kilogram (mg/kg) (Camp, Dresser & McKee, Inc. [CDM], 1991). Subsequently, four soil borings (HS1 to HS4) were advanced to depths of 40 to 60 feet bgs using hollow stem augers in May 1991 (CDM, 1991). Two soil samples were collected from each boring and analyzed for TPH and VOCs:

- TCE was detected in all eight soil samples at concentrations ranging from 5,400 micrograms per kilogram ($\mu\text{g/kg}$) (HS1 at 61.5 feet bgs) to 5,500,000 $\mu\text{g/kg}$ (HS3 at 50.0 feet bgs).
- PCE was detected in all eight soil samples at concentrations ranging from 1,700 $\mu\text{g/kg}$ (HS1 at 61.5 feet bgs) to 1,600,000 $\mu\text{g/kg}$ (HS3 at 50.0 feet bgs) (CDM, 1991).

To evaluate if VOCs detected in soil had impacted groundwater, seven groundwater monitoring wells (MW-1 through MW-7) were installed at the Hi-Shear Site in 1991 and 1992 and one monitoring well (MW-8) was installed downgradient of the Hi-Shear facility at the Robinson Helicopter property in 1992. Groundwater monitoring was conducted in 1993 on behalf of Hi-Shear by Blasland, Bouck & Lee (BBL). BBL concluded a TCE plume was present in groundwater at the Hi-Shear Site, the flow of groundwater beneath the Hi-Shear Site was to the east, and the TCE plume extended off-Site to the east: *"The downgradient offsite well MW-8 contained 2,900 [$\mu\text{g/L}$] of TCE indicating that the contaminant plume has extended off-Site"* (BBL, 1993). For this sampling event, TCE was detected at a concentration of the 23,000 $\mu\text{g/L}$ in monitoring well MW-3, which is located south of Building 3. Thus, Hi-Shear acknowledged in 1993 that a release of TCE at the Hi-Shear Site had resulted in a groundwater plume that extended to the EA Properties.

The BBL figures showing the groundwater elevation contours and estimated TCE plume area are included as Exhibits 2-1 and 2-2. Note that MW-8 is located east of MW-5 (shown in Exhibit 2-5).

Exhibit 2-1. Groundwater Elevation Contour (BBL, 1993)

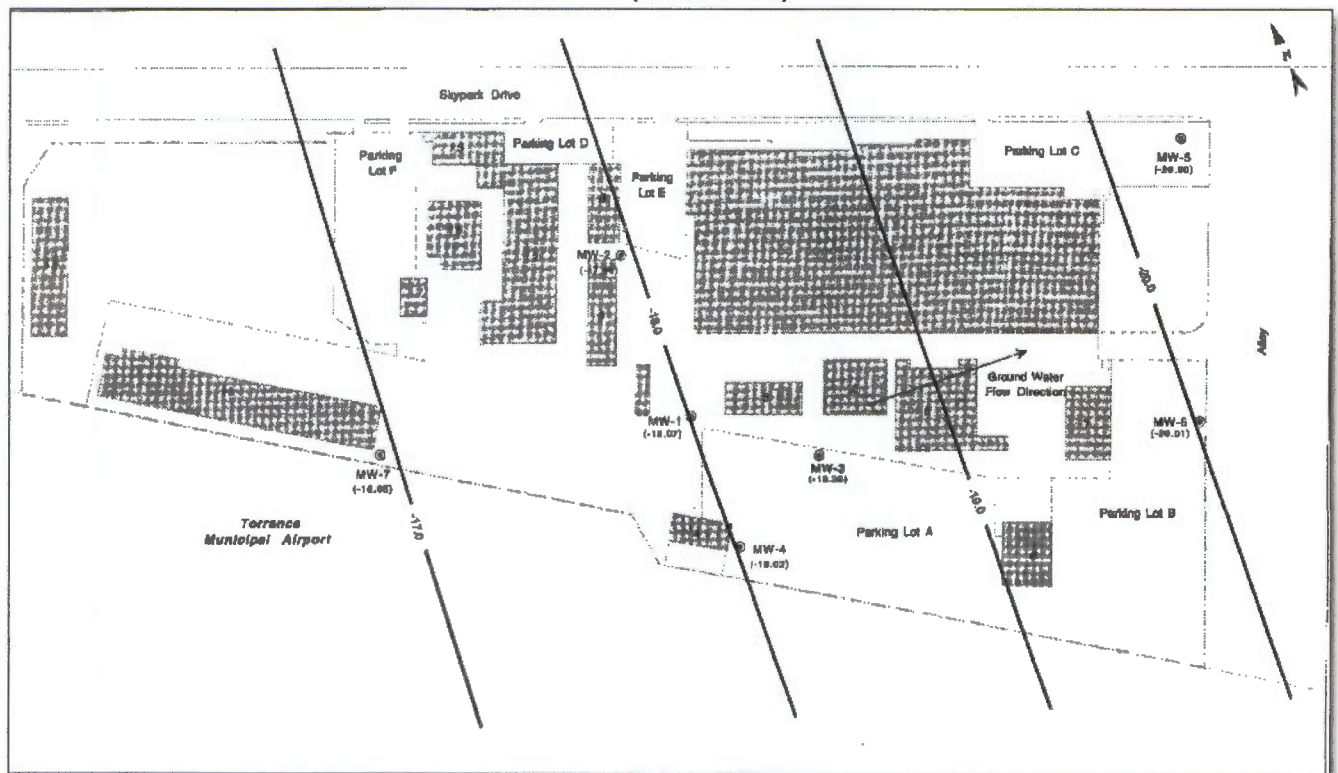
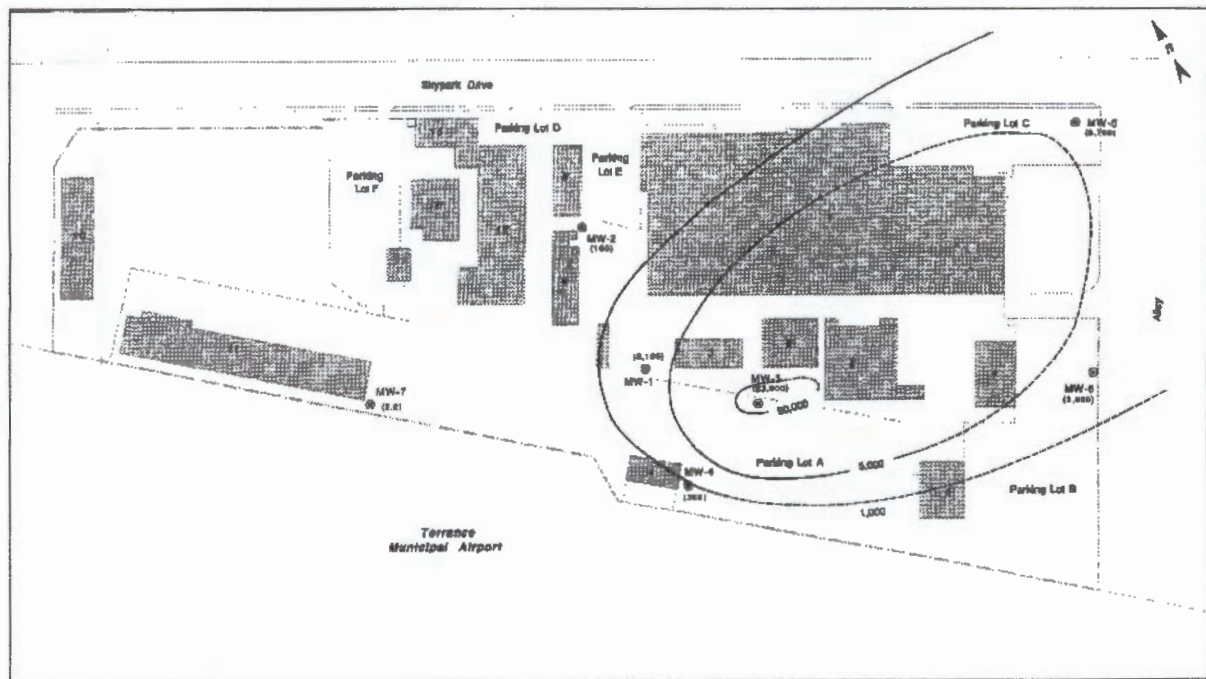
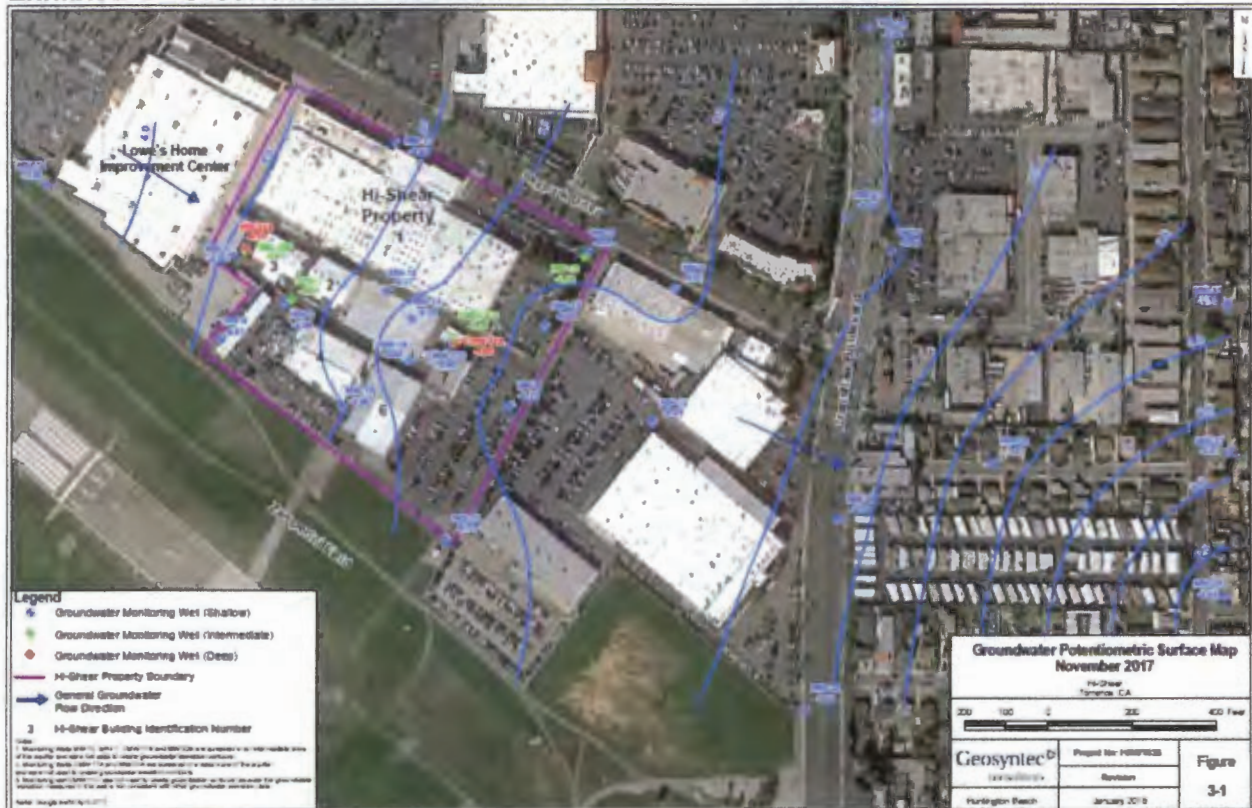


Exhibit 2-2. TCE Concentrations in Groundwater in 1993 (BBL, 1993)



Subsequent GW monitoring indicates the groundwater flow direction is generally toward the southeast perpendicular to the southeastern Hi-Shear Site boundary, resulting in groundwater moving from the Hi-Shear Site to the EA properties and residential properties, as shown on Exhibit 2-3 (Geosyntec Consultants, Inc. [Geosyntec], 2018).

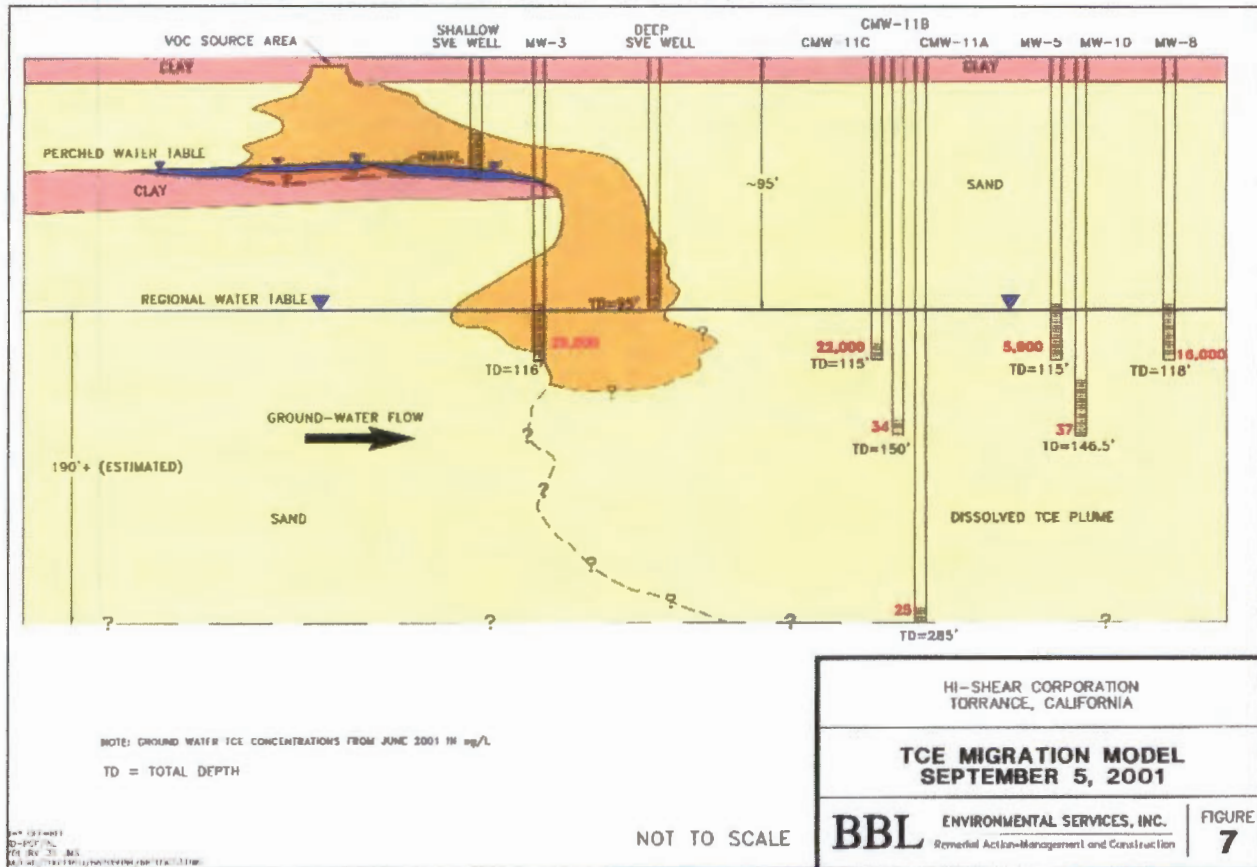
Exhibit 2-3. Groundwater Potentiometric Surfaces – November 2017



2.2 Hi-Shear site assessment reports acknowledge the presence of DNAPL beneath the Hi-Shear Site in 2001

In 2001, five soil borings were advanced to depths of 95 feet bgs to evaluate VOC concentrations and the presence of dense nonaqueous phase liquid (DNAPL; chlorinated solvents TCE and PCE are liquids that are denser than water) in deeper soils at depths of 60 feet bgs to groundwater (~95 feet bgs). In a progress report of the soil investigation, BBL included a figure depicting the presence of DNAPL within the on-Site TCE plume:

Exhibit 2-4. TCE Migration Model prepared by BBL (2001)



Hi-Shear acknowledged TCE and DNAPL associated with a "VOC Source Area" upgradient of MW-3 that resulted in a "dissolved TCE plume" moving offsite and impacted groundwater at the EA Properties (MW-8 at Robinson Helicopter) and further east. The BBL progress report also included a plan view depiction of the TCE plume migrating from the Hi-Shear Site east to the EA Properties and Residential Properties.

[illegible]

- At 44 feet bgs, 4,100,000 µg/kg of TCE and 190,000 µg/kg of PCE,
- At 65 feet bgs, 120,000 µg/kg of TCE and 120,000 µg/kg of PCE, and
- At 90 feet bgs, 15,000 µg/kg of TCE and 5,200 µg/kg of PCE (BBL, 2001).

The site investigation data indicate that the source area for VOCs at the Hi-Shear Site is associated with both PCE and TCE.

2.3 Hi-Shear's environmental site assessment reports identify TCE and PCE release areas at the Hi-Shear Site

In 2010, a Site Conceptual Model (SCM) report was prepared for the Hi-Shear Site by Winefield & Associates, Inc. (W&A). As part of the SCM, the existing site characterization data was compiled and AOPCs for the release of VOCs to the subsurface were identified. As shown in Exhibit 2-6, eight AOPCs were identified.

Exhibit 2-6. AOPCs Identified in 2010 at Hi-Shear Site (W&A, 2010)

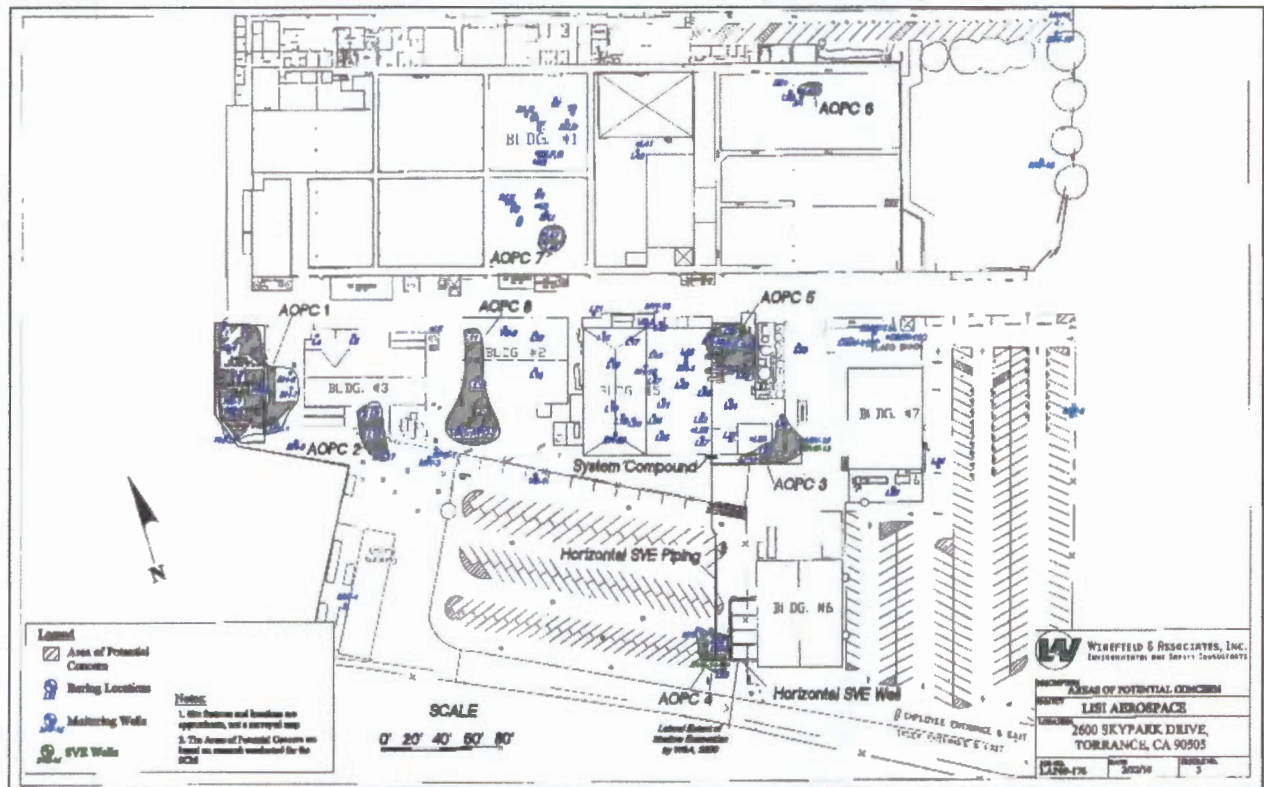


Exhibit 2-6 also shows that limited soil sampling was completed to investigate potential AOPCs and delineate areas associated with VOC release at the east portion of Building 1 (including areas around AOPC 8), Building 3 (where a dry-well was located and may still be present), exterior to Building 5 (south and east of AOPC 3; north and east of AOPC 5), Building 6, and Building 7.

A brief summary of soil data is presented in the 2010 SCM report for several AOPCs. Notably, the range of PCE, TCE, and TPH concentrations are presented by depth:

Exhibit 2-7. AOPC 1 Soil Data – Location of Former Waste Oil UST #1 (W&A 2010)

Contaminant	Depth found Below Grade	Concentration
PCE	5 to 10 feet & 25 to 50 Feet	11 to 840 (µg/kg)
TCE	5 to 70 feet	7 to 820 (µg/kg)
TPH	25 to 40 feet	84 to 1,034 (mg/kg)

Exhibit 2-8. AOPC 3 Soil Data – Southeast corner of Building 5 (W&A 2010)

Contaminant	Depth found Below Grade	Concentration
PCE	5 to 25 feet and 90 ft	30 to 1,600 µg/kg
TCE	5 to 45 feet and 60 to 90 ft	88 to 35,000 µg/kg
TPH	5 to 25 ft	380 to 2,372 mg/kg

Exhibit 2-9. AOPC 5 Soil Data – Northeast corner of Building 5 (W&A 2010)

Contaminant	Depth found Below Grade	Concentration
PCE	5 to 15 feet	12 to 150 µg/kg
TCE	5 to 15 feet	18 to 360 µg/kg

Exhibit 2-10. AOPC 7 Soil Data – Building 7 (W&A 2010)

Contaminant	Depth found Below Grade	Concentration
PCE	5 to 20 ft	50 to 250 µg/kg
TCE	5 to 20 ft	100 to 980 µg/kg
TPH	5 to 20 ft	230 to 9,461 mg/kg

The 2010 SCM Report summarizes significant concentrations of PCE and TCE in soil at multiple AOPCs across the Hi-Shear Site. PCE and TCE were detected in soil samples collected at depths from 5 feet to 90 feet bgs. Given the dates of operations at the Hi-Shear Site, these data indicate that a long-term source of both TCE and PCE was present that would impact groundwater at the Hi-Shear Site and migrate to downgradient off-Site properties.

3.0 The TCE and PCE soil vapor and groundwater plume represents a single plume emanating from the Hi-Shear Site

There is a single plume of TCE and PCE spread across the Hi-Shear Site, EA properties, and Residential Properties, which has emanated from the Hi-Shear Site. The current plume appearance of having “two lobes” is a result of incomplete remediation efforts along the Hi-Shear Site boundary. Groundwater monitoring data collected following completion of the Phase I remediation program indicate the current plume contains two areas of elevated TCE concentrations, separated by the area where the Phase I remediation program successfully reduced the contaminant mass. One high concentration area remains on the Hi-Shear Site in the vicinity of MW-18, and the other high concentration area is located on the EA properties in the vicinity of MW-12.

GSI conducted semi-analytical modeling of TCE fate and transport from the Hi-Shear source to downgradient properties, which showed that the observed groundwater conditions are indicative of a single source located in the vicinity of MW-18. Modeling of historical mass flux from the Hi-Shear Site to the EA properties indicates substantial mass loading of TCE to off-Site properties, with ongoing mass flux to downgradient properties. Furthermore, given the historical TCE and PCE concentrations, TCE is the remedy driver for groundwater impacts on the Hi-Shear Site and downgradient EA properties and Residential Properties.

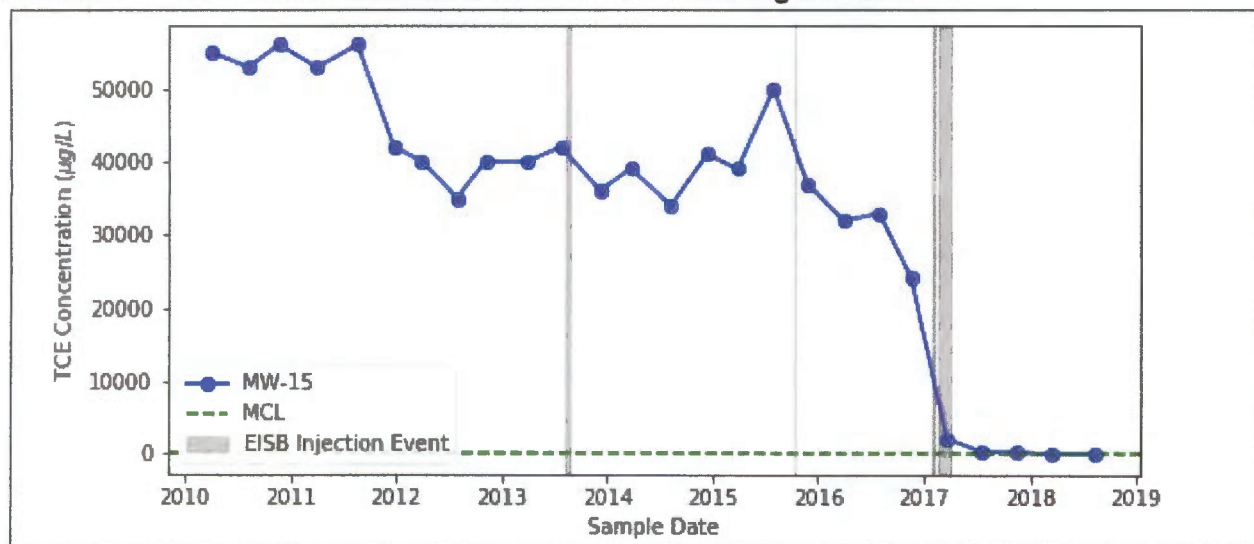
3.1 Groundwater Remedial Action Created the Current Groundwater Plume

Hi-Shear Corporation has implemented two pilot-scale and one full-scale remediation events. These events have included injection of bioremediation substrates (3DMe and HRC Primer), bioaugmentation culture (BDI Plus), and a chemical reductant (CRS). The dates of application and specific material injected were:

- August 12-22, 2013: Pilot-scale injections of 3DMe and HRC Primer through six injection wells (IW1 through IW6) screened from 87 to 112 feet below ground surface (bgs) and installed cross-gradient and upgradient of monitoring well MW-15 (Alta, 2014);
- October 13-15, 2015: Pilot-scale injections of 3DMe, CRS, and BDI Plus through the same six injection wells (IW1 through IW6) used in the August 2013 pilot test (Alta, 2016); and
- January 31 to April 5, 2017: Full-scale (Phase I) injections of 3DMe, CRS, and BDI Plus through 75 dual-nested injection wells (IW7 through IW81) screened from 88-98 feet bgs and 103-113 feet bgs and 2 previously installed single-cased wells IW3 and IW5 (Alta, 2017).

The results achieved at monitoring well MW-15, which is located downgradient of the source zone and along the Hi-Shear Site boundary, shows the success of the 2017 remedial action. Exhibit 3-1 summarizes the TCE concentrations measured over time at MW-15, along with the dates of remedial injections. As shown on Exhibit 3-1, TCE concentrations at MW-15 exhibited minimal response to the two pilot tests; however, significant reductions were achieved as a result of the more substantial remedial efforts of the full-scale Phase I program.

Exhibit 3-1. TCE concentrations over time in monitoring well MW-15.



The magnitude and extent of the TCE plume before treatment (2015) and after treatment (2018) are depicted on Exhibits 3-2 and 3-3, respectively. Exhibit 3-2 indicates a single plume emanating downgradient from a presumed source located in the vicinity of monitoring wells MW-3 and MW-18, which is the same area identified by BBL in 2001 with the highest concentrations of TCE in groundwater.

Exhibit 3-2. TCE groundwater plume in July 2015, before Hi-Shear Phase I remediation

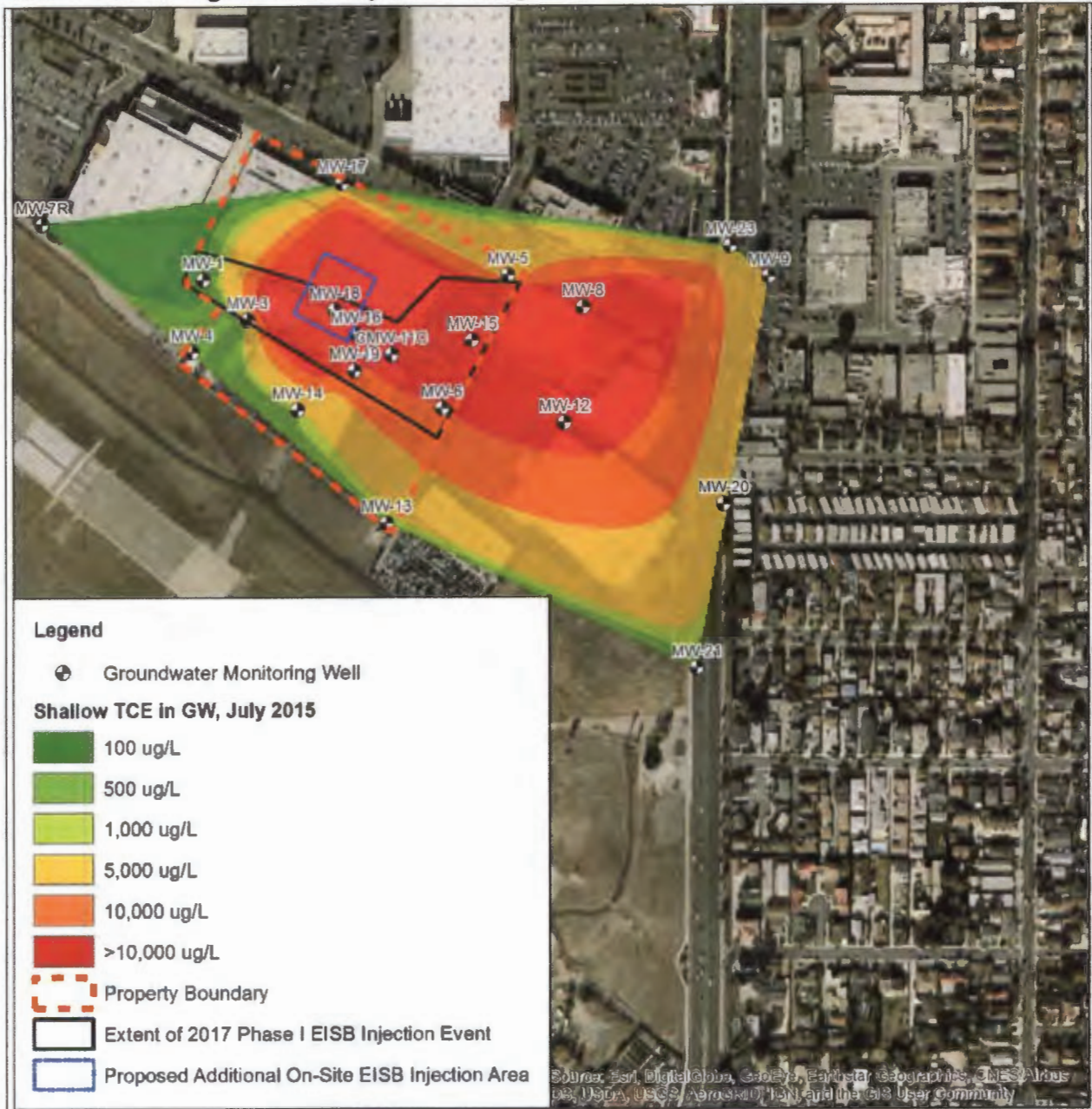
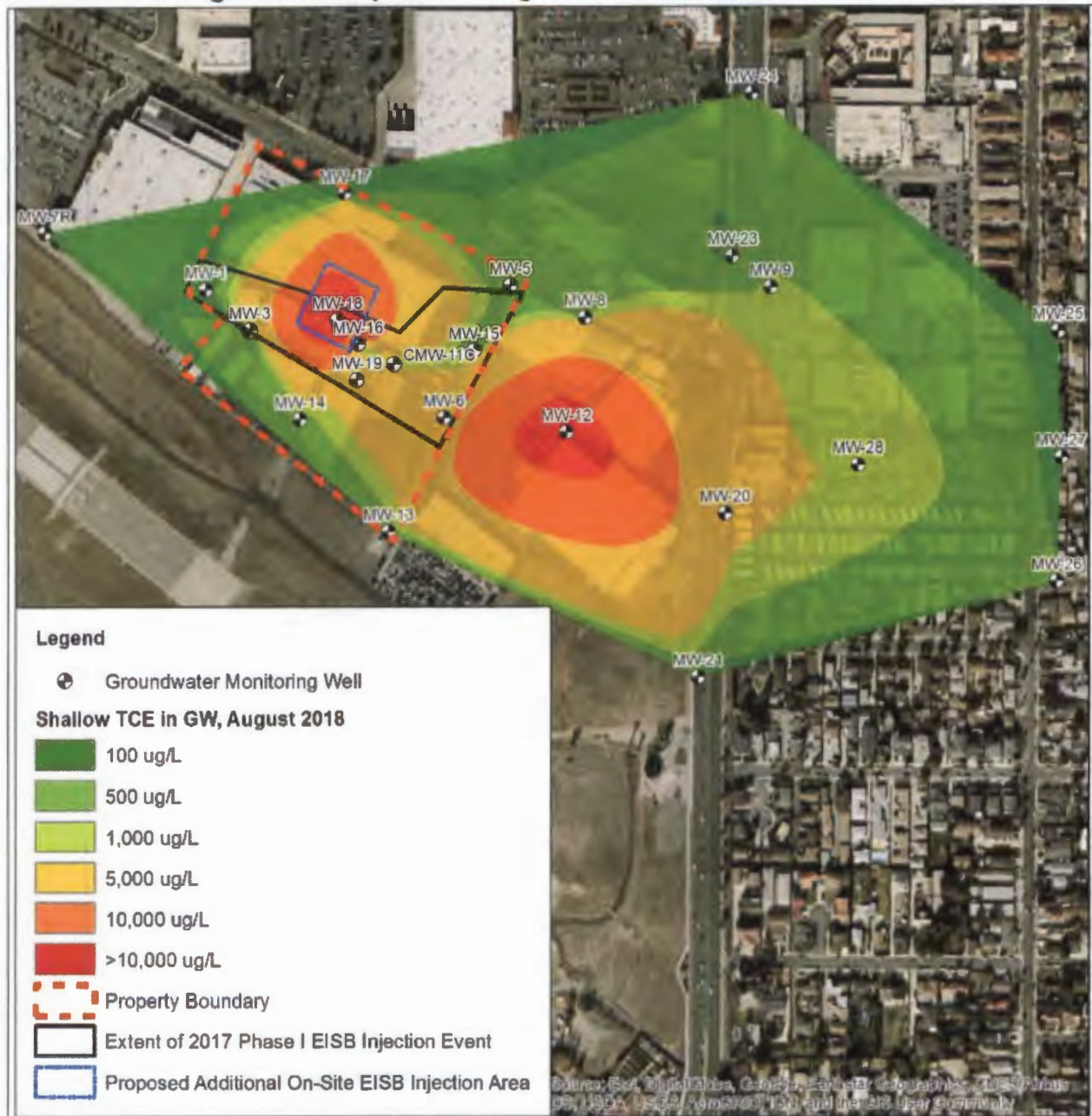


Exhibit 3-3 demonstrates that the 2017 full-scale Phase I injection program was effective in reducing TCE concentrations within the treatment zone, particularly in the area along and just upgradient of the Hi-Shear Site and EA properties boundary. As shown in this exhibit, the area of reduced concentrations in groundwater bisecting the former plume into two higher concentration lobes closely matches the shape of the injection area. Although not evident in this depiction, the density of the treatment injections along the eastern property boundary of the Hi-Shear Site was higher than other locations to the west. Combined with the higher source-area

initial concentrations in the MW-18 area, the resulting concentrations in groundwater correlate well with the completed injection program.

Two hot spots of elevated TCE concentrations exceeding 10,000 µg/L remain, one within the upgradient portion of the treatment zone near the MW-18 Hi-Shear source area; and one downgradient of the treatment zone in the vicinity of off-Site well MW-12. As discussed herein, the bifurcated plume is indicative of a single TCE plume with localized treatment and does not indicate the presence of a source around MW-12.

Exhibit 3-3. TCE groundwater plume in August 2018, after Hi-Shear Phase I remediation



3.2 TCE Plume Modeling of TCE shows a TCE source on the Hi-Shear Site in the vicinity of MW-18

The BIOCHLOR Natural Attenuation Decision Support System (Aziz et al., 2000) model (version 2.2) was utilized to simulate plume conditions based on Site-specific hydrogeologic and decay parameters. BIOCHLOR is a screening-level model that simulates natural attenuation of dissolved chlorinated solvents (e.g., TCE) and has the ability to simulate one-dimensional advection, three-dimensional dispersion, linear adsorption, and biotransformation via reductive dichlorination (the dominant biotransformation process at many chlorinated solvent sites). The model was originally designed to help answer questions like how far a dissolved chlorinated solvent plume will extend if no engineered controls or source area reduction measures are implemented.

Input parameters for BIOCHLOR were selected based on documented Site-specific conditions and historical analytical results from groundwater monitoring wells. An approximate groundwater seepage velocity of 130 feet per year was estimated based on a gradient of 0.001 to 0.002 foot/foot in the east-southeast direction in 2018, consistent with historical observations (Alta, 2017), a horizontal hydraulic conductivity of 50 feet per day (Genesis, 2018), and an assumed effective porosity of 0.2. The source thickness was assumed to be 25 feet thick and 200 feet wide. Representative historical concentrations of CVOCs in monitoring well MW-18, which was installed in the approximate area of a source zone, were used as source concentrations in groundwater.

First-order decay rates were calculated for each groundwater monitoring well following the approach described in Newell et al. (2002). Exhibit 3-4 presents the results for the 32 monitoring wells. As shown on Exhibit 3-4, 18 monitoring wells show a positive first-order decay rate, thus indicating decreasing concentrations, and seven monitoring wells indicate increasing concentrations (negative decay rate). First-order decay rates were not calculated for seven wells that had over 50% non-detect values. The median decay rate was approximately 0.1 per year, equating to a half-life of about 7 years, meaning that concentrations are expected to reduce by approximately half every 7 years. Based on the first-order decay rates presented in Exhibit 3-4, a biotransformation decay rate of 0.1 per year was used for TCE.

Exhibit 3-4. First-order decay rates calculated for monitoring wells

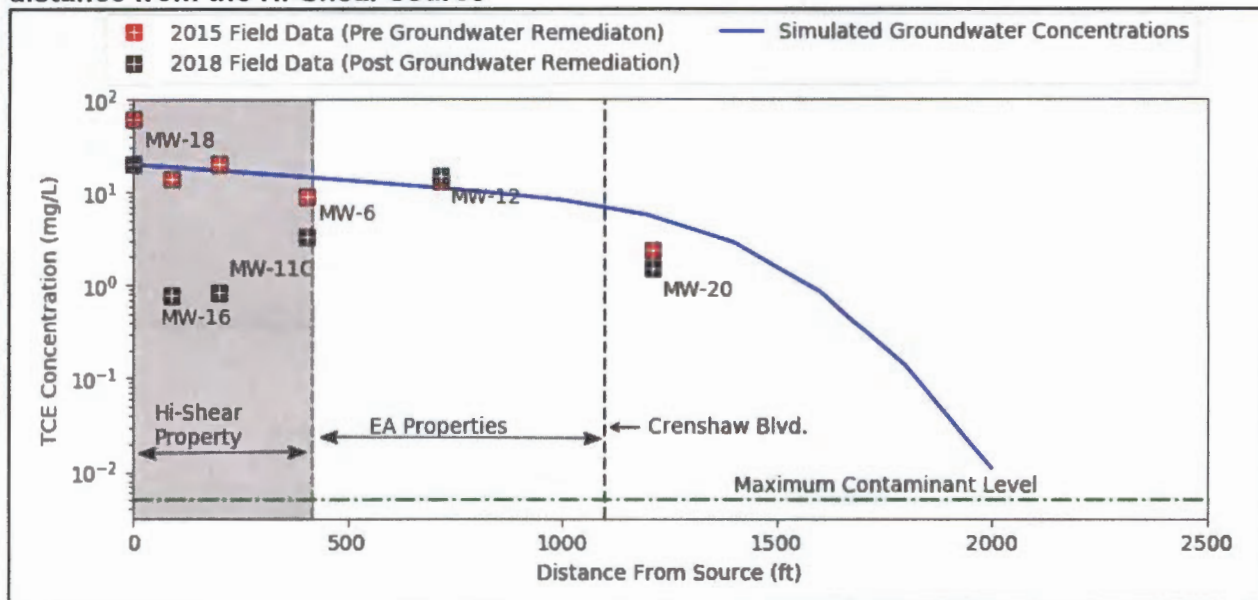
Well	K _{point} (1/yr)	Well	K _{point} (1/yr)
CMW-11A	ND	MW-15	0.667
CMW-11B	-0.0531	MW-16	0.183
CMW-11C	0.142	MW-17	0.303
MW-1	0.32	MW-18	0.126
MW-3	0.245	MW-19	0.128
MW-4	0.127	MW-20	0.0389
MW-5	0.0773	MW-21	-0.439
MW-6	-0.0929	MW-22A	ND
MW-7	0.146	MW-22B	ND
MW-7R	ND	MW-23	-0.234
MW-8	-0.0635	MW-24	ND
MW-9	-0.209	MW-25	ND
MW-10	0.176	MW-26	0.413
MW-12	-0.0725	MW-27	ND
MW-13	0.076	MW-28	0.127
MW-14	0.22	SPG-1	0.525

The simulated TCE profile shown in Exhibit 3-5, represents TCE concentrations in groundwater 30 years after a release on the Hi-Shear property near MW-18. This simulated TCE profile represents TCE concentrations with biodegradation, but without any remedial actions (i.e., without accounting for the recent 2017 enhanced in-situ bioremediation [EISB] injections). Exhibit 3-5 also shows measured TCE concentrations from before the full-scale injection event (July 2015 pre groundwater remediation; red) and after the full-scale injection event (August 2018 post groundwater remediation; black) measured in wells downgradient of MW-18 (presumed source), including MW-16, MW-11C, MW-6, MW-12, and MW-20.

Prior to the full-scale injection events in 2017, the historical TCE concentrations along the well transect (red squares) closely match the modeled TCE plume, indicating that the observed monitoring data are consistent with a single-source TCE plume migrating from the Hi-Shear property. Within the extent of the injections, the post groundwater remediation field data collected in 2018 (black squares) demonstrate a decrease in TCE concentrations below the simulated TCE profile, which highlights the effect the 2017 remedial action had on TCE concentrations within the injection area in groundwater. Downgradient of the property boundary and beyond the injection points, the TCE concentrations in 2018 (post groundwater remediation) more closely resemble the simulated TCE profile, with substantial TCE concentrations that exceed the MCL (extending approximately 1,000 feet downgradient of Crenshaw Boulevard). These findings support a single TCE plume that has emanated downgradient from the Hi-Shear property, with the observed bifurcation of the TCE plume (see Exhibit 3-3) resulting from the 2017 EISB injections and not

due to a second source of TCE downgradient of the Hi-Shear property. These modeling results indicate that a source of TCE in the vicinity of MW-18 has migrated downgradient at significant concentrations and was subsequently bifurcated from the limited Hi-Shear groundwater remediation efforts.

Exhibit 3-5. Simulated TCE concentrations without groundwater remediation shown as distance from the Hi-Shear source



3.3 TCE Mass Flux is leaving the Hi-Shear Site across the EA Properties Boundary

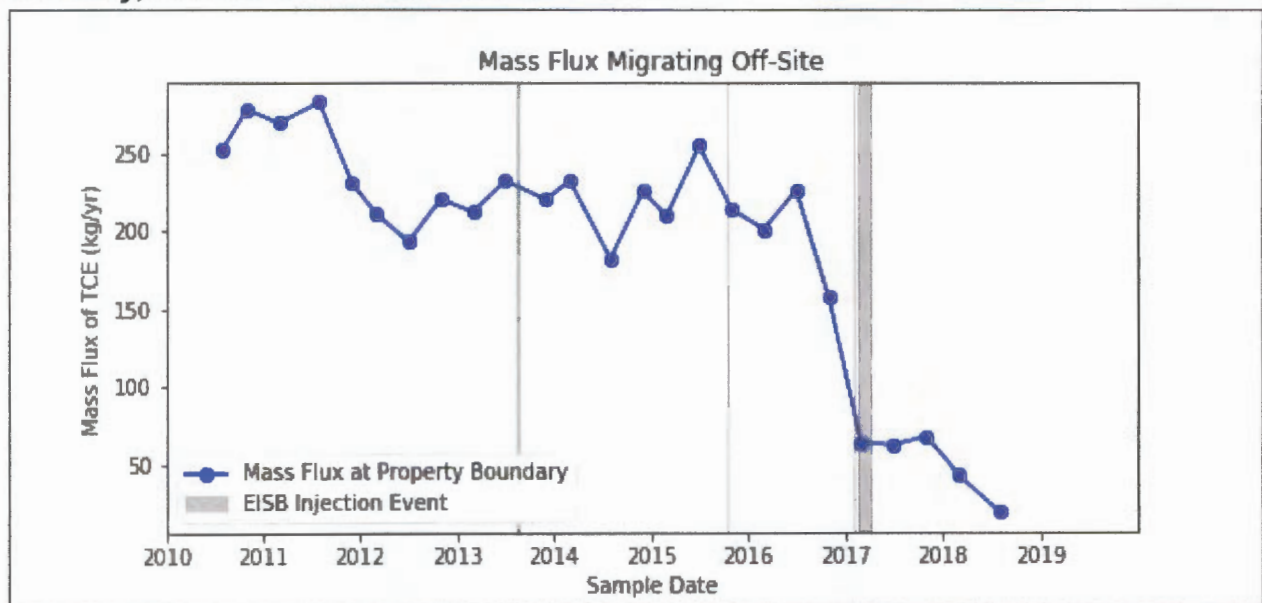
The GSI Mass Flux Toolkit (Farhat et al., 2011), which was developed for the Department of Defense ESTCP program, was utilized to estimate the mass flux currently leaving the Hi-Shear Site across the eastern property boundary, which is generally oriented perpendicular to groundwater flow. This mass flux represents the historical and ongoing loading of TCE (and other Site constituents) from the Hi-Shear Site to downgradient EA properties and Residential Properties.

A transect of monitoring wells across the eastern property boundary, generally oriented perpendicular to the predominant groundwater flow direction, was selected: MW-5, MW-15, MW-6, and MW-13. The Mass Flux Toolkit assumes that the ends of the transect are clean (i.e., contain a constituent concentration of 0 µg/L). Since the objective of this analysis was to estimate the mass flux of TCE across the eastern property boundary, not the width of the entire plume, the transect was truncated 1 foot beyond either terminal monitoring well (i.e., MW-5 to the north and MW-13 to the south). This assumption implies that the mass flux across the entire TCE plume is greater than the mass flux reported here. MW-10, which is located approximately 18 feet south of MW-5, was not used in this analysis because it is screened approximately 30 feet deeper than the other four monitoring wells utilized in this transect. Additional input parameters to the Mass Flux Toolkit include a representative hydraulic gradient of 0.0015 foot/foot and a horizontal hydraulic conductivity of 50 feet per day (Genesis, 2018). While the vertical extent of groundwater impacts has not been fully delineated, a 25-foot thickness was assumed here and represents the interval over which EISB injections were implemented (i.e., 88 to 113 feet bgs). The mass flux

was calculated for the time period for which monitoring data were collected from each of the four wells (i.e., August 2010 through August 2018).

Exhibit 3-6 illustrates the estimated mass flux across the eastern property boundary between wells MW-5 and MW-13. Approximately 230 kilogram (kg) of TCE per year migrated from the Hi-Shear Site to the EA properties between 2010 and 2017, with an unknown quantity having migrated prior to 2010. The 2017 full-scale Phase I EISB injections appear to have substantially reduced the mass flux across the eastern property boundary, but approximately 20 to 70 kg of TCE continue to migrate from the Hi-Shear Site to the EA properties annually, contributing to an ongoing release of TCE from the Hi-Shear to downgradient EA properties. Without additional significant groundwater remediation on the Hi-Shear Site, the rate of TCE migrating off-Site will continue to increase as the high TCE concentrations upgradient at a source, near MW-18, move downgradient and across the eastern property boundary.

Exhibit 3-6. Mass flux of TCE migrating from the Hi-Shear Site across the eastern property boundary, as calculated in the Mass Flux Toolkit



While monitoring data along Crenshaw Boulevard are more limited temporally, the mass flux of TCE was estimated across Crenshaw Boulevard with the following transect: MW-24, MW-23, MW-9, MW-20, and MW-21, with 100 feet included on either end of the transect to an assumed concentration of 0 µg/L TCE. Input concentrations were based on data collected between July 2016 and August 2018 from transect monitoring wells, which represents the period for which concentrations were measured in each of the monitoring wells. The total mass flux of TCE across Crenshaw Blvd. ranges from approximately 20 to 50 kg TCE per year, which represents the additional mass of TCE that continues to migrate across Crenshaw Blvd. each year.

4.0 TCE is the remedy driver for groundwater impacts both on the Hi-Shear Site and downgradient on the EA Properties and the Residential properties.

A review of available groundwater monitoring data indicates that TCE is the remedy driver for groundwater impacts on the Hi-Shear Site, EA Properties, and Residential Properties. For example, the maximum historical measured TCE concentration on the Hi-Shear Site (190,000 µg/L in MW-3) is almost 12 times greater than the maximum measured historical concentration of PCE (16,000 µg/L) in MW-3.

TCE has also in most sample locations been detected at concentrations exceeding PCE on the EA properties:

- MW-20: TCE is 5 to 34 times greater than PCE;
- MW-9 and MW-23: TCE is 3 to over 475 times greater than PCE; and
- MW-21: PCE concentrations typically exceed TCE concentrations, but both concentrations are relatively low (within 1 OoM of the MCL).

Downgradient of Crenshaw Boulevard within the Residential Properties:

- MW-28: TCE is 11 to 38 times greater than PCE; and
- MW-22A, MW-22B, MW-24, MW-25, MW-26, and MW-27: PCE has not been detected.

These data clearly identify that potential sources of PCE are not contributing significantly to the primary TCE plume migrating downgradient from documented Hi-Shear sources.

5.0 References

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EXHIBIT 3



EDMUND G. BROWN JR.
GOVERNOR



MATTHEW RODRIGUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Los Angeles Regional Water Quality Control Board

August 28, 2018

Mr. Thomas P. Schmidt
Hamrick & Evans, LLP
2600 West Olive Avenue, Suite 1020
Burbank, CA 90266

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
CLAIM NO. 7017 2400 0000 3753 7431

SUBJECT: REGIONAL BOARD COMMENTS ON INTERIM OFFSITE ASSESSMENT REPORT, AND REQUIREMENT TO UPDATE CONCEPTUAL SITE MODEL UNDER THE 13267 ORDER DATED OCTOBER 29, 2009

SITE: HI-SHEAR CORPORATION, 2600 SKYPARK DRIVE, TORRANCE, CALIFORNIA (SCP CASE NO. 218, SITE ID NO. 2042300)

Dear Mr. Schmidt:

The California Water Code (CWC) section 13267 Order dated October 29, 2009, and issued by the California Regional Water Quality Control Board, Los Angeles Region (Regional Board) required Hi-Shear to submit a conceptual site model (CSM) by March 15, 2010 (attached). According to the Order:

"The CSM must show complete lateral and vertical extent of soil, soil gas, and groundwater contamination in the impacted onsite and offsite areas of the site by all the chemicals of concern including TPH, VOCs, and Title 22 metals including hexavalent chromium. The CSM must include a 3-dimensional illustration of the potential pollutant pathways through different types of lithologies, relationship of lithologies to contaminant concentrations, cross-sections, groundwater flow directions, isoconcentration maps for significant contaminants, groundwater plume maps, and locations of all the water supply wells within one mile radius of the site as well as other receptors that may be affected by the release and migration of the contaminants to the subsurface environment."

The Regional Board received the *Site Conceptual Model* dated March 15, 2010 from Hi-Shear. The SCM, which was based on results of the previous subsurface investigations conducted up to 2010, identified eight onsite areas of potential concerns (AOPCs) in soil, described as AOPC 1 through AOPC 8, for future investigation and remediation. Based on the review of the *Soil Gas Survey Report* dated September 12, 2011, the Regional Board, in its letter dated December 12, 2011, did not require any soil and soil gas remediation in AOPC 6 and AOPC 7 at that time.

The SCM is a progressive document that must be updated to incorporate results of all subsequent onsite and offsite soil, soil vapor, and groundwater investigations. To date, Hi-Shear has conducted a significant amount of onsite soil, soil vapor, and groundwater investigations; continues to remediate the volatile organic compounds (VOCs) contaminated onsite soil using soil vapor extraction (SVE); conducted onsite enhanced in-situ bioremediation (EISB) to remediate groundwater; and conducted an interim offsite assessment. However, Hi-Shear has not updated the SCM to determine the complete lateral and vertical

MADEIRA GLOFFELD, CHAIR | DEBORAH J. SMITH, EXECUTIVE OFFICER

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Groundwater IRAP - RTC - 0053

extent of contamination originating from the Site, and has not achieved the Regional Board approved cleanup goals for onsite and offsite soil, soil vapor, and groundwater. Continued offsite migration of VOCs in the Hi-Shear groundwater plume and ongoing emission of VOCs in the vadose zone toward the ground surface poses significant potential risk to the receptors located above and adjacent to the footprint of Hi-Shear's VOC plume.

The Regional Board has reviewed the Interim Offsite Assessment Report (IOAR) dated September 9, 2016 submitted by Alta Environmental (Alta) on behalf of Hi-Shear Corporation. A summary of findings presented by Hi-Shear followed by the Regional Board's comments and requirements are included below:

Summary of Interim Offsite Assessment Report

The IOAR documented the installation of seven offsite groundwater monitoring wells and installation of 10 additional multi-depth offsite soil gas probes. The attached Figure 2 from the IOAR shows the onsite and offsite locations of the groundwater monitoring wells, vapor extraction wells, and soil gas probes installed by Hi-Shear during the previous and the subject investigations. In the IOAR, Hi-Shear also included offsite isoconcentration contours for tetrachloroethylene (PCE) in Figures 6a through 6f, and for trichloroethylene (TCE) in Figures 7a through 7f. The following are the key findings presented by Hi-Shear in the IOAR:

- 1. PCE concentrations in soil matrix and soil gas at VP-49, VP-50, and VP-25:** Hi-Shear concluded that based on 24.7 micrograms per kilogram ($\mu\text{g/kg}$) of PCE, 202 $\mu\text{g/kg}$ of PCE, and 11.4 $\mu\text{g/kg}$ of PCE in the soil matrix samples from soil vapor probes VP-49, VP-25 and VP-50; and 17,700 micrograms per liter ($\mu\text{g/L}$) of PCE in the shallow soil gas sample collected from soil vapor probe VP-49 at 5 feet below ground surface (bgs) to the 35,900 $\mu\text{g/L}$ of PCE in the deepest 85-foot sample from VP-49, on the SBL property, a local surficial or near surface release of PCE not associated with the Hi-Shear Site has occurred in the vicinity of VP-49, and that a continuous downward profile of PCE impact is present on the SBL property. Other sources of VOC contamination are likely present near the vicinities of VP-25 and VP-50.
- 2. Comparison of 2016 offsite soil gas concentrations with 2011 onsite Hi-Shear soil gas concentrations:** Hi-Shear also suggested that the May-June 2016 PCE concentrations in soil gas from VP-49 are higher than in the 2011 soil gas samples collected from soil gas probes VP1 through VP-18, VP-22, and VP-24 locations on the Hi-Shear Site, indicating that PCE releases on the SBL property are likely of greater scope and concentration than the releases on the Hi-Shear Site. Hi-Shear suggested the presence of a similar continuous downward profile of TCE impact, which originated from the SBL property at VP-49, and consisted of 791 $\mu\text{g/L}$ in the soil gas sample at 5 feet bgs to 1,100 $\mu\text{g/L}$ in the soil gas sample at 85 feet bgs, as shown in Figures 7a through 7f in the IOAR.
- 3. Potential additional source of downgradient solvent contamination in the Regional Water Table aquifer (RWTA):** Hi-Shear also suggested that the elevated PCE, TCE, and 1,1-dichloroethylene (1,1-DCE) concentrations in soil gas and soil matrix from 5 feet bgs to the water table at the SBL property, particularly at VP-49 and VP-50, are an offsite source of solvent contamination within the RWTA, and may be a source of PCE and TCE moving downgradient across Crenshaw Boulevard.
- 4. PCE concentration in perched groundwater at VP-50:** Hi-Shear suggested that the source of elevated concentrations of PCE (36,600 $\mu\text{g/L}$), TCE (2,870 $\mu\text{g/L}$), and 1,1-DCE (56,000 $\mu\text{g/L}$) in the perched groundwater encountered at 58 feet bgs from VP-50, and 3,390 $\mu\text{g/kg}$ of PCE in the soil matrix sample at 55 feet bgs from VP-50, did not originate at the Hi-Shear Site but is likely to

have originated at the SBL property, or at the adjoining Torrance Municipal Airport property just south of VP-50, where a former Nike Missile site is located.

Regional Board Comments on the Interim Offsite Assessment Report

Following are the Regional Board comments to the findings presented by Hi-Shear:

1. **PCE and TCE concentrations in soil matrix and soil gas at VP-49, VP-50, and VP-25:** The absence of the highest PCE concentrations in the 5-foot soil samples at VP-49 and VP-50 indicates that the PCE may not have been released at these two locations. However, a detection of 202 µg/kg in the 5-foot soil sample at VP-25 indicates that a release of PCE may have occurred near VP-25, and additional data needs to be collected to confirm the location and extent of the PCE source area.

The detection of the highest PCE in soil gas at 85 feet bgs (above the water table) in VP-49 and its decrease to 17.700 µg/L at 5 feet bgs indicates upward migration of PCE vapors from the underlying groundwater plume and lateral migration of PCE vapors in the vadose zone.

Absence of the highest TCE concentration in the 5-foot soil samples collected from VP-49, VP-50, and VP-25 indicates that TCE may not have been released at these locations. Similarly, the detections of the highest TCE concentration of 1,100 µg/L in the 85-foot soil gas sample collected from VP-49; 893 µg/L in the 53-foot sample from VP-50; and 874 µg/L in the 65-foot sample also indicates upward migration of TCE vapors from the underlying groundwater plume. The offsite extent of the Hi-Shear soil gas VOC plume in the vadose zone has not been fully delineated.

2. **Comparison of 2016 offsite soil gas concentrations with 2011 onsite Hi-Shear soil gas concentrations:** Considering the facts that Hi-Shear has been conducting onsite soil vapor extraction (SVE) during the last several years which has reduced the onsite PCE and TCE concentrations, it will not be appropriate to compare these reduced 2011 onsite concentrations to the un-remediated PCE and TCE soil gas hot spots detected during the May-June 2016 offsite investigation and sampling on the SBL property.

3. **Potential additional source of downgradient solvent contamination in the Regional Water Table Aquifer:**

As seen on Figure 8 of the IOAR, and on Figure 3-3 of the Triannual Groundwater Monitoring Report dated January 31, 2018, the onsite groundwater monitoring wells MW-18, MW-16, and MW-6, and the offsite groundwater monitoring wells MW-12, MW-20, and MW-26 are aligned along the east-southeastward trending axis of the TCE plume originating from the Hi-Shear Site. The TCE plume, which originated from the Hi-Shear Site, continues to migrate offsite and downgradient from the Site east-southeastward since 1992, and has crossed past Crenshaw Boulevard and Pennsylvania Avenue. The offsite extent of this Hi-Shear VOC groundwater plume has not been fully delineated.

As noted in the Regional Board's October 6, 2016 and February 4, 2016 letters, Hi-Shear is responsible for cleanup of not only the onsite but also offsite portions of the TCE and other VOC plumes that originated from the Hi-Shear Site such that the approved cleanup goals [maximum contaminant levels (MCLs) and notification levels (NLs)] are met in a reasonable amount of time as required in State Water Resources Control Board Resolution No. 92-49.

4. **PCE concentration in perched groundwater at VP-50:** This perched groundwater PCE, TCE, and 1,1-DCE hot spot, as shown on Figure 8 of the IOAR, appears to be a separate plume which is

located at the southeastern margin of the Hi-Shear TCE and PCE plumes. Additional delineation of the extent of the perched groundwater VOCs hot spot is needed to locate its VOC source.

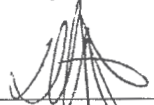
Based on the above and review of the IOAR and reports of previous investigations, the onsite and offsite lateral and vertical extent of soil, soil vapor, and groundwater contamination originating from the Hi-Shear Site as required in the 13267 Order dated October 29, 2009 has not been fully delineated, therefore, Hi-Shear is required to submit the following to the Regional Board:

- a. A complete chemical storage and use questionnaire (attached) by **September 30, 2018** in order to assess the potential for additional onsite sources of soil, soil gas, and groundwater contamination.
- b. A work plan by **September 30, 2018** to completely determine the lateral and vertical extent of soil, soil gas, and groundwater contamination in all the onsite and offsite areas of the Site impacted by the chemicals of concern. The work plan shall include an offsite vapor intrusion risk assessment.

The requirements for submittal of technical reports including (a) a complete chemical storage and use questionnaire by **September 30, 2018**, and (b) a work plan by **September 30, 2018**, constitute an amendment to the requirements of the California Water Code section 13267 Order originally dated October 29, 2009. All other aspects of the Order originally dated October 29, 2009, and amendments thereto, remain in full force and effect. The required technical reports are necessary to investigate the characteristics of and extent of the discharges of waste at the site and to evaluate cleanup alternatives. Therefore, the burden, including costs, of the report bears a reasonable relationship to the need for the report and benefits to be obtained. Pursuant to section 13268 of the California Water Code, failure to submit the required technical reports by the specified due dates may result in civil liability administratively imposed by the Regional Board in an amount up to one thousand dollars (\$1000) for each day each technical report is not received.

If you have any questions, please contact Mr. Mohammad Zaidi, Project Manager, at (213)576-6732 or (Mohammad.Zaidi@waterboards.ca.gov), or Ms. Jillian Ly, unit chief, at (213) 576-6664 or (Jillian.Ly@waterboards.ca.gov).

Sincerely,



Deborah J. Smith
Executive Officer

Attachments:

1. Figure 2: Groundwater Well and Soil Gas Probe Location Map
2. Figure 8: VOC Concentrations in Groundwater
3. Chemical Storage and Use Questionnaire
4. October 29, 2009 Order

Electronic copies:

Mr. Christian Darville, Lisi Aerospace/Hi-Shear Corporation
Ms. Lynze Franklin, Lisi Aerospace
Mr. Stephen Van der Hoven, Genesis Engineering and Redevelopment

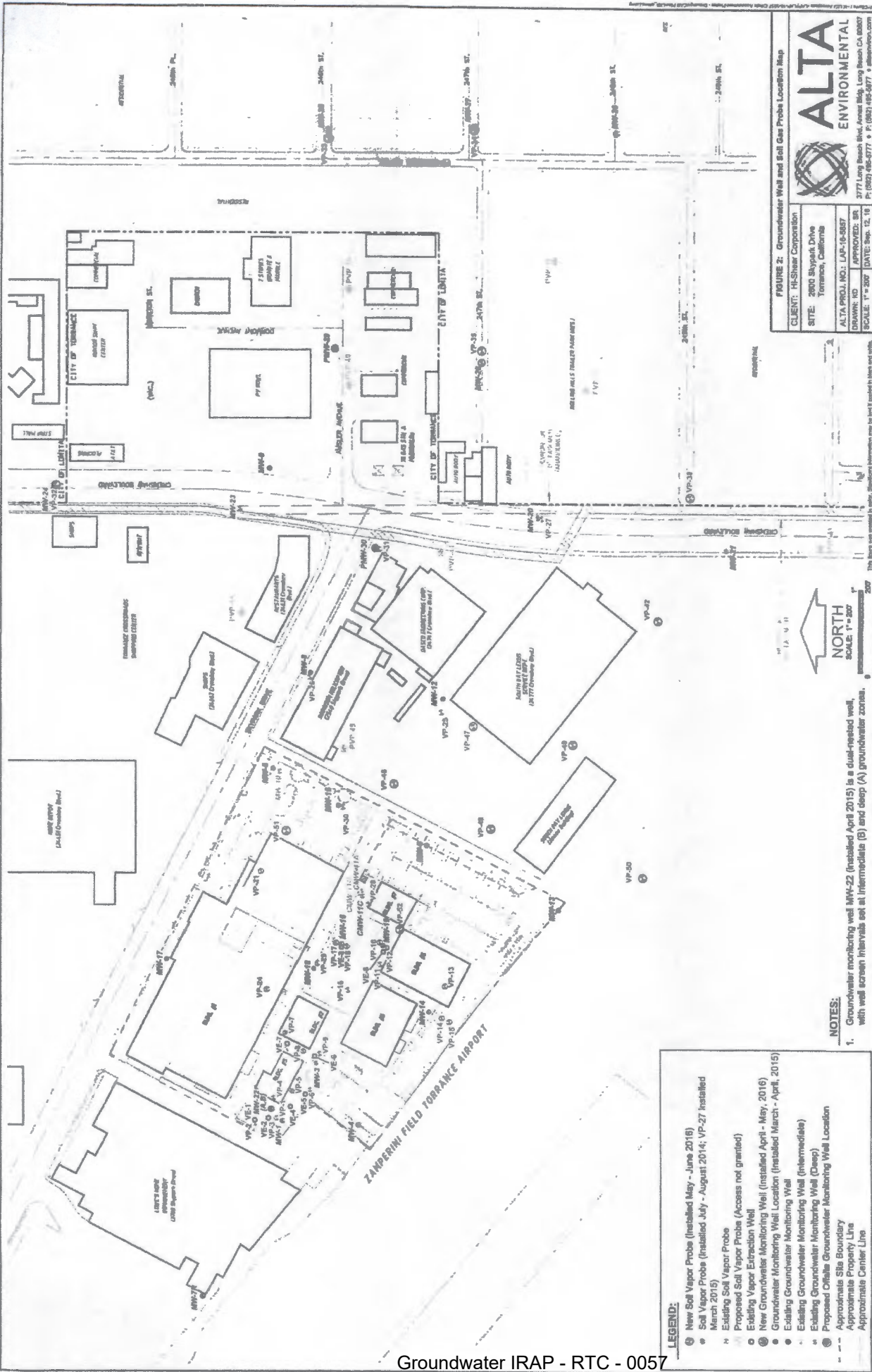


FIGURE 2: Groundwater Well and Soil Gas Probe Location Map

CLIENT: H-Shear Corporation
 SITE: 2800 Skyway Drive
 Torrance, California

ALTA PROJ. NO.: LAP-16-0857
 DRAWING NO.: APPROVED: BR
 SCALE: 1" = 200' (DATE: Sept. 12, 16)

ALTA
 ENVIRONMENTAL

3777 Long Beach Blvd., Suite 100, Long Beach, CA 90807
 P: (562) 485-2777 • F: (562) 485-2777 • info@altaenv.com

NOTES:

1. Groundwater monitoring well MW-22 (installed April 2015) is a dual-nested well, with well screen intervals set at Intermediate (B) and deep (A) groundwater zones.

- LEGEND:**
- New Soil Vapor Probe (Installed May - June 2016)
 - Soil Vapor Probe (Installed July - August 2014; VP-27 installed March 2016)
 - Existing Soil Vapor Probe
 - Proposed Soil Vapor Probe (Access not granted)
 - Existing Vapor Extraction Well
 - New Groundwater Monitoring Well (Installed April - May, 2016)
 - Groundwater Monitoring Well Location (Installed March - April, 2015)
 - Existing Groundwater Monitoring Well
 - Existing Groundwater Monitoring Well (Intermediate)
 - Existing Groundwater Monitoring Well (Deep)
 - Proposed Offsite Groundwater Monitoring Well Location
 - - - Approximate Site Boundary
 - - - Approximate Property Line
 - - - Approximate Center Line

EXHIBIT 4

MARCH 22, 1976 AERIAL

24751/24777 Crenshaw Boulevard

LARRY D GURROLA, PHD, PG, CEG, INC

Aerial Photograph:
Flight TG-7600
Frame 3-15

Hi Shear

Cylindrical tank

Drainage ditch; erosion caused
by drainage down slope

Brow drainage ditch;
high point of ditch; drains
to northwest and southeast



Road access/probable drainage ditch/swale

Drainage ditch

Nike Missile Site



Scale in Feet
0 420

-  Approximate Property Limits of Subject Property
-  Approximate Property Limits

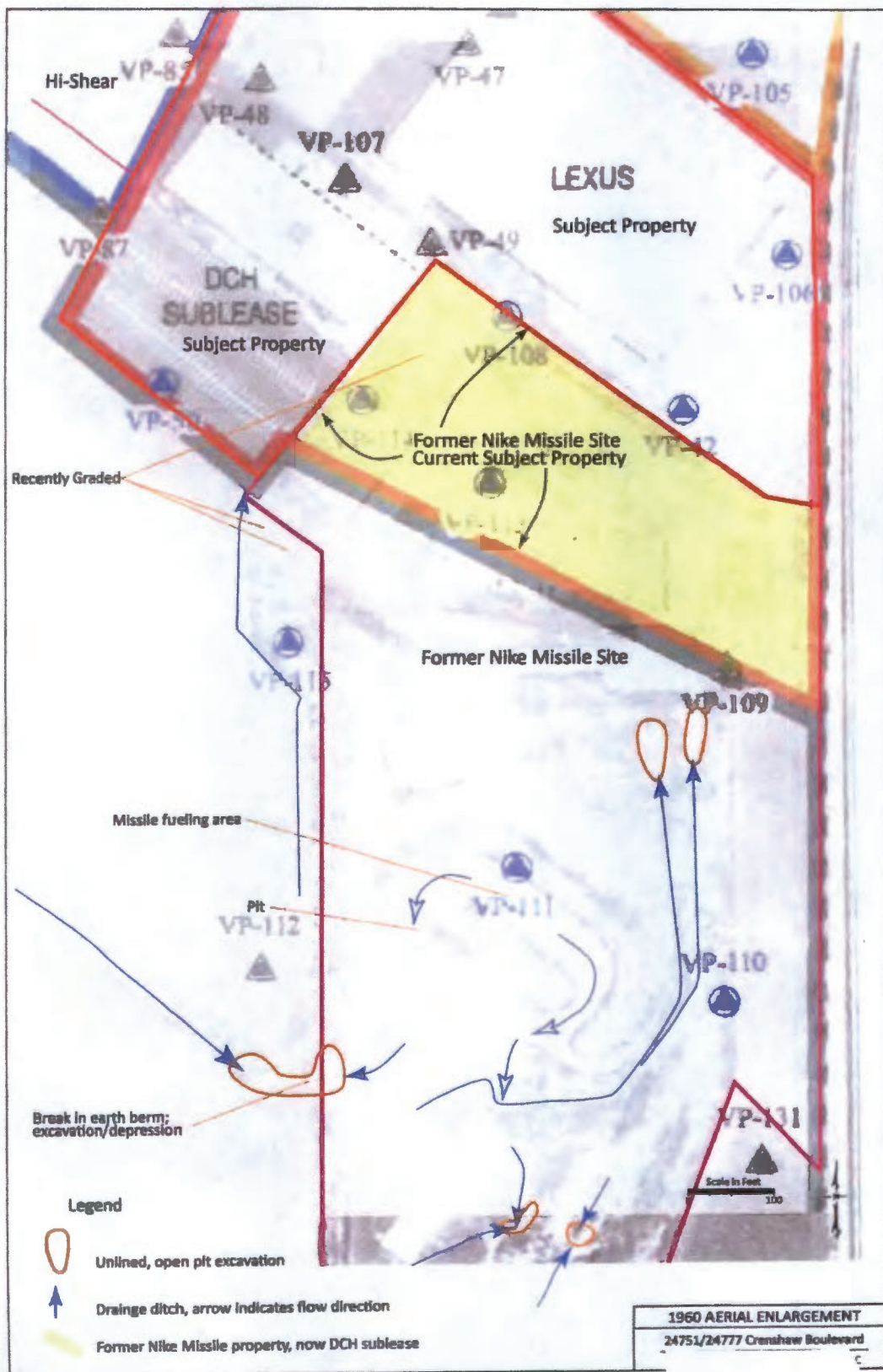
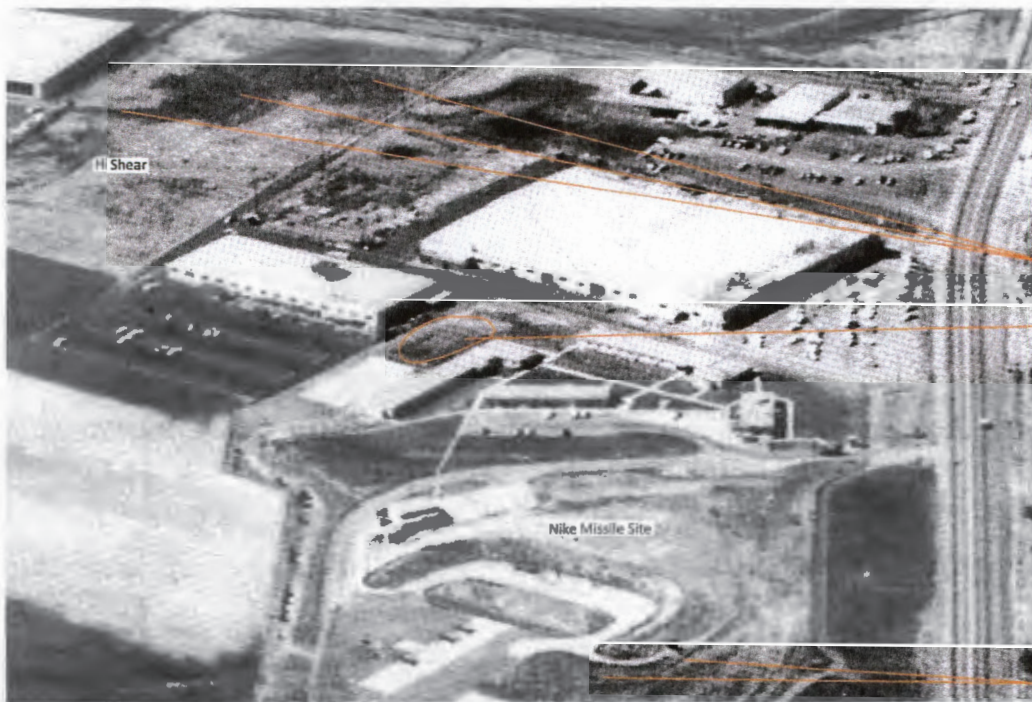


EXHIBIT 5



June 28, 1960 –
UCLA Department
of Geography,
Benjamin and
Gladys Thomas Air
photo Archives,
Spence Air Photo
Collection

spot trench drainage directs surface
water to area of darker vegetation

cylindrical barrels or drums

drainage ditch

June 28, 1960 AERIAL

24751/24777 Crenshaw Boulevard

LARRY D GURROLA, PHD, PG, CEG, INC


Aerial Photograph:
USDA 1989



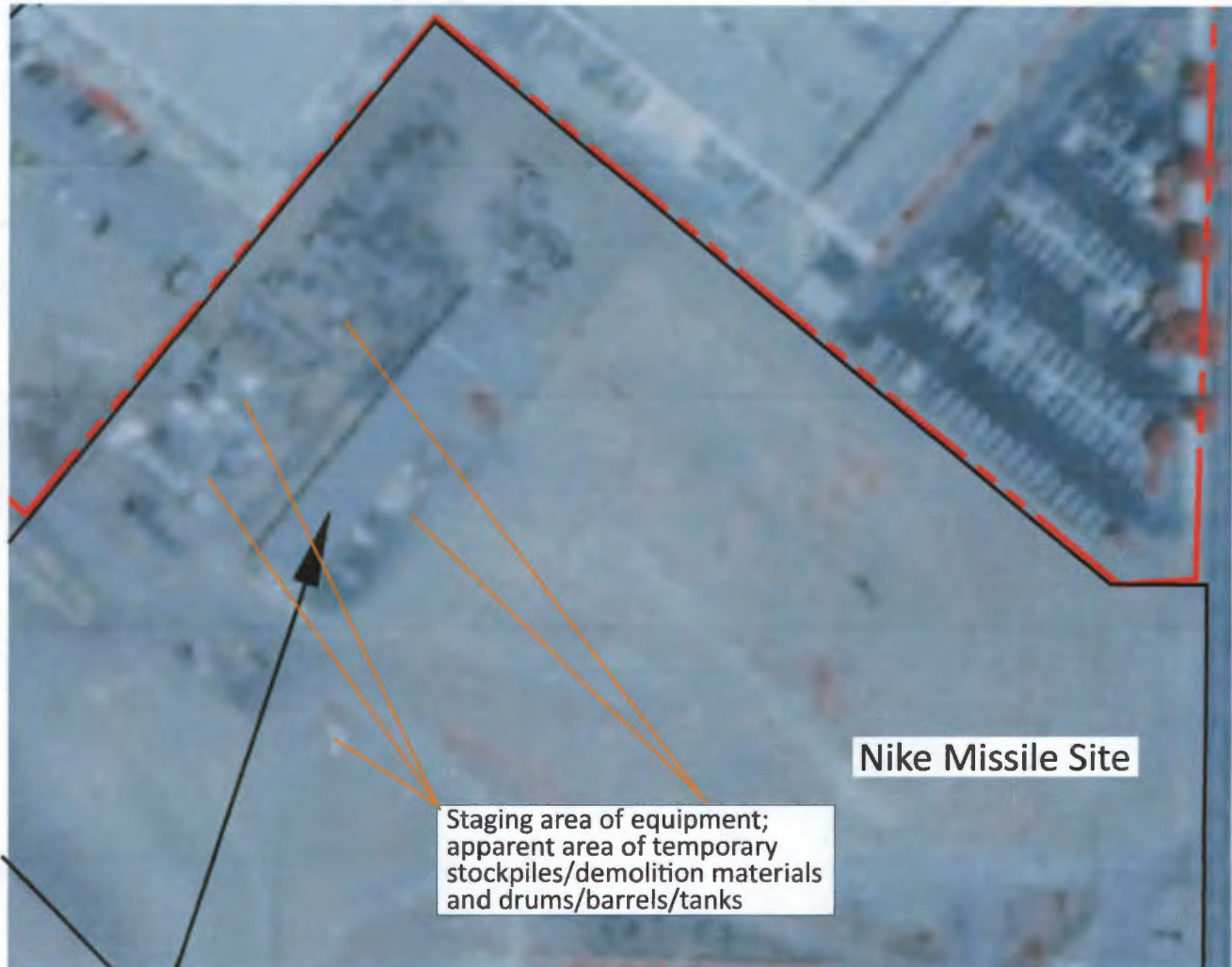
Scale in Feet
0 100

This aerial photograph depicts the demolition in-progress of two buildings on the former Nike Missile site. An apparent staging area is being used for equipment and for temporary storage of demolition materials and stockpiles, and tanks, barrels, and/or drums. Note that the two buildings are no longer present in the 1990 aerial photograph.

 Approximate Property Limits of Subject Property

 Approximate Property Limits

Aerial Photograph:
USDA 1990

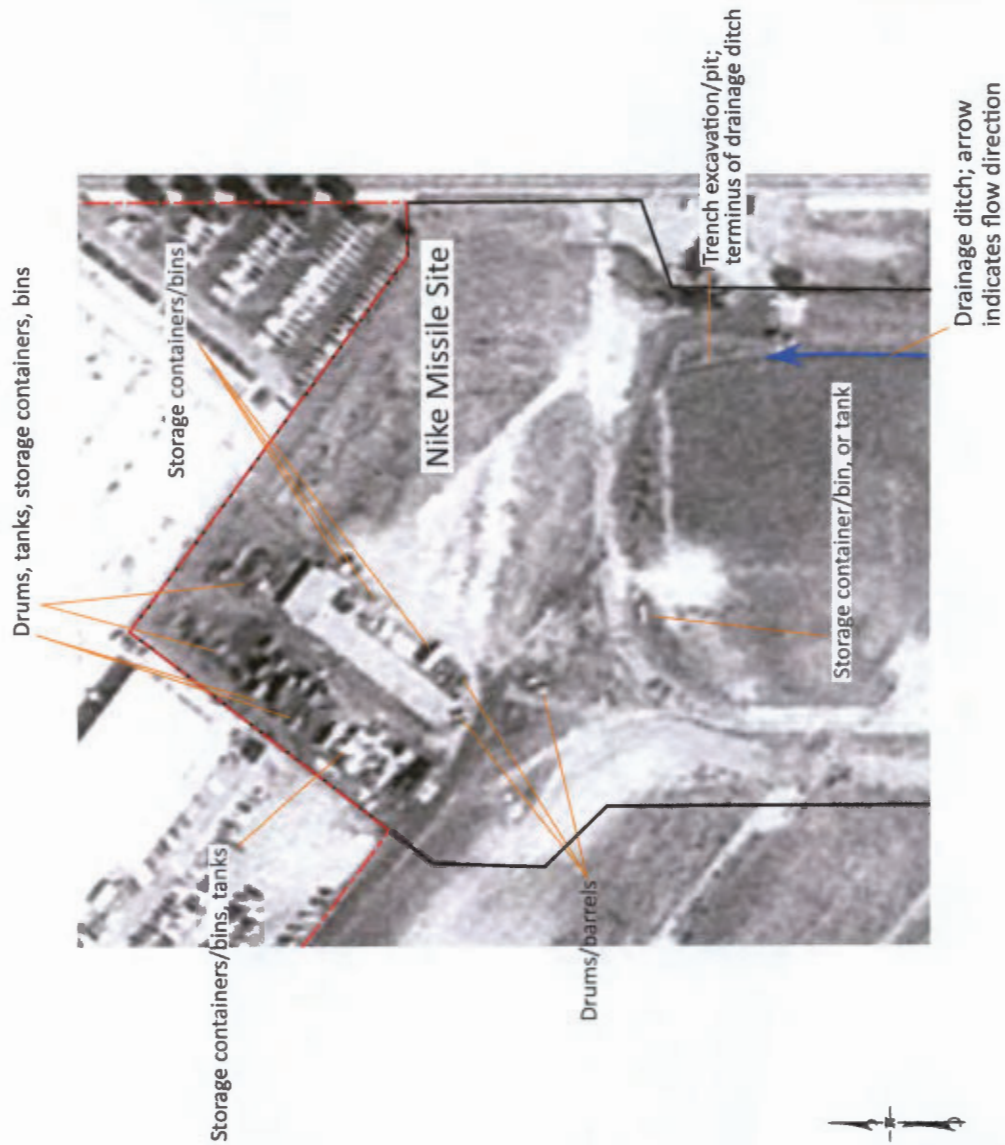


This aerial photograph depicts the demolition in-progress and removal of two buildings that are no longer on the former Nike Missile site. The apparent staging area observed in the 1989 aerial is being used for temporary storage of demolition materials and stockpiles, and tanks, barrels, and drums.

Scale in Feet
0 100

 Approximate Property Limits of Subject Property

 Approximate Property Limits



- Approximate Property Limits of Subject Property
- Approximate Property Limits

EXHIBIT 6



GENESIS ENGINEERING & REDEVELOPMENT

Table 5B

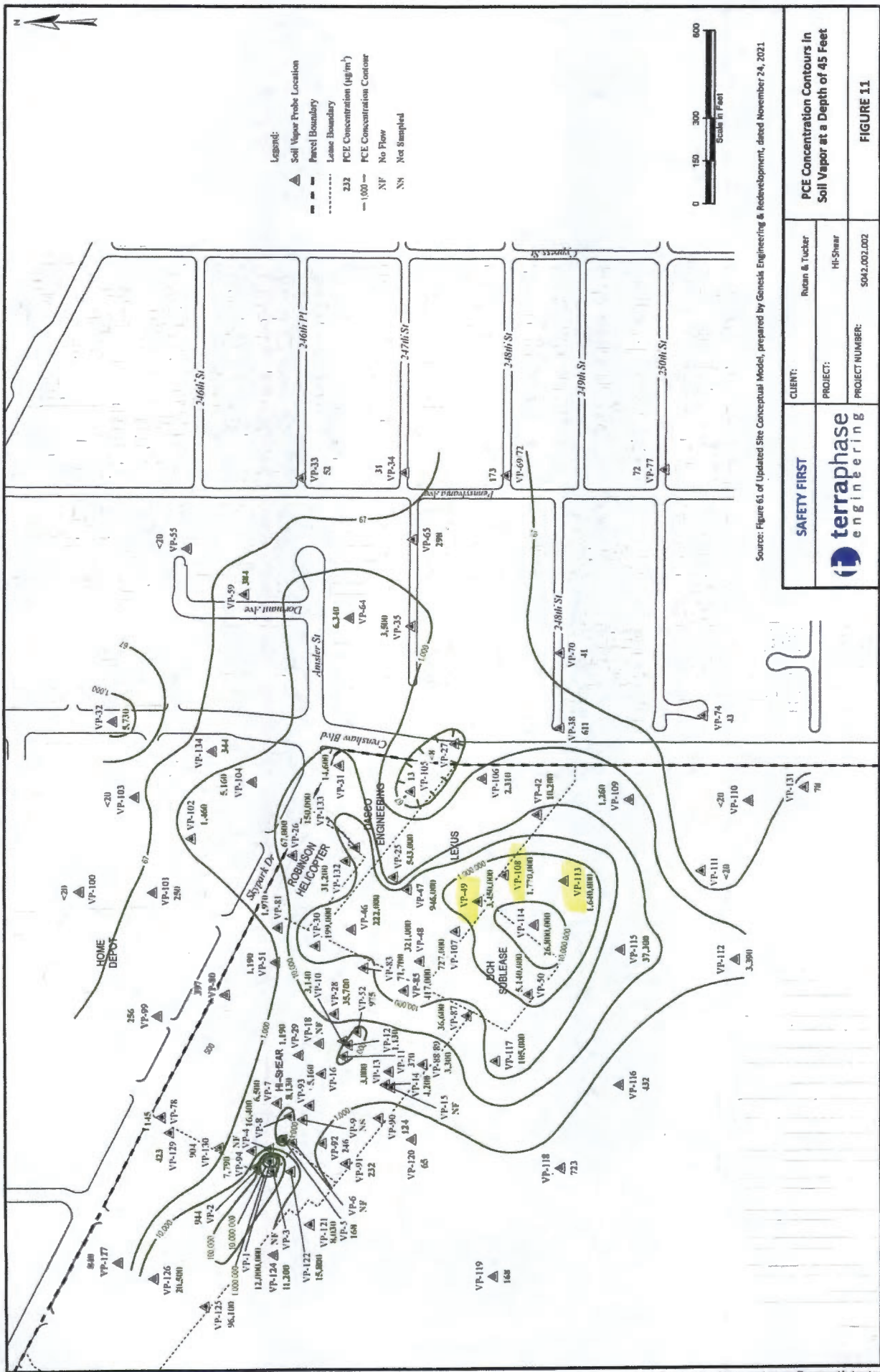
Skypark Commercial Properties Project Updated Site Conceptual Model

COPC Concentration in Perched Groundwater

Well ID	Sampling Date	Concentration (µg/L)					
		PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	1,1-DCE	Vinyl Chloride
MCL		5	5	6	10	6	0.5
2700 Skypark Drive - Former HSC Property							
VP-122-GW	7/16/20	110	5,100	3,400	52	51	0.48
24747 Crenshaw Boulevard - Property 2							
VP-105-GW	-	-	-	-	-	-	-
24751-24777 Crenshaw Boulevard - Property 1							
HP-1	4/9/01	12	14	2.9	<2.0	13	<5.0
VP-42-GW	5/19/16	2,550	90	<50	<50	1,680	<150
VP-50-GW	5/11/16	36,600	2,870	<500	<500	56,000	<1,500
VP-106-GW	1/14/20	<0.13	1.0	<0.085	<0.15	1.0	<0.12
VP-108-GW	1/8/20	1,900	110	10	0.87	2,400	0.2
VP-109-GW	1/2/20	0.39	<0.085	<0.085	<0.15	0.52	<0.12
VP-113-GW	1/6/20	5,200	600	67	4.6	4,800	1.3
VP-114-GW	1/8/20	15,000	1,000	59	5.9	16,000	0.51
East of Crenshaw Boulevard							
MW-29-GW	11/21/19	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
VP-63-GW	11/1/19	7.3	812	94	<0.5	10	<0.5
VP-70-GW	11/1/19	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
VP-74-GW	11/1/19	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Torrance Airport							
VP-110-GW	1/19/21	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
VP-111-GW	1/25/21	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
VP-115-GW	2/2/21	51.1	4.98	<1.00	<1.00	194	<1.00
VP-116-GW	2/4/21	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
VP-131-GW	1/21/21	0.550	<1.00	<1.00	<1.00	<1.00	<1.00

NOTES:

- "PCE" - tetrachloroethene
- "TCE" - trichloroethene
- "cis-1,2-DCE" - cis-1,2-dichloroethene
- "trans-1,2-DCE" - trans-1,2-dichloroethene
- "1,1-DCE" - 1,1-dichloroethene
- "µg/L" - microgram per liter
- "Bold" - concentration exceeds the residential screening level
- "MCL" - State Water Resources Control Board Maximum Contaminant Level (Feb. 2016)
- "ND" - Not Detected



SAFETY FIRST terr engineering	CLIENT:	Rutan & Tucker	PCE Concentration Contours in Soil Vapor at a Depth of 45 Feet FIGURE 11
	PROJECT:	HS-Shear	
	PROJECT NUMBER:	S042.002.002	

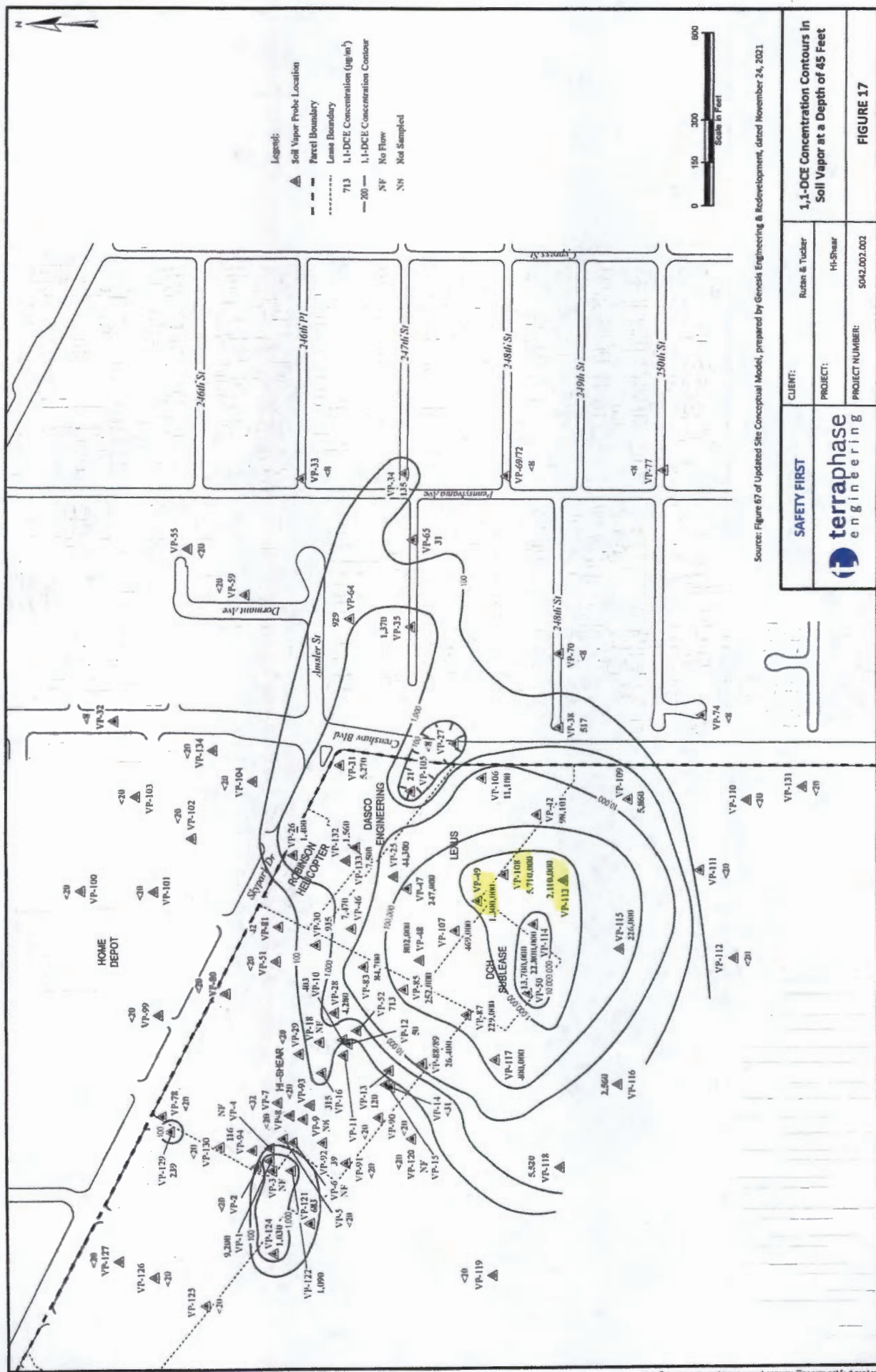
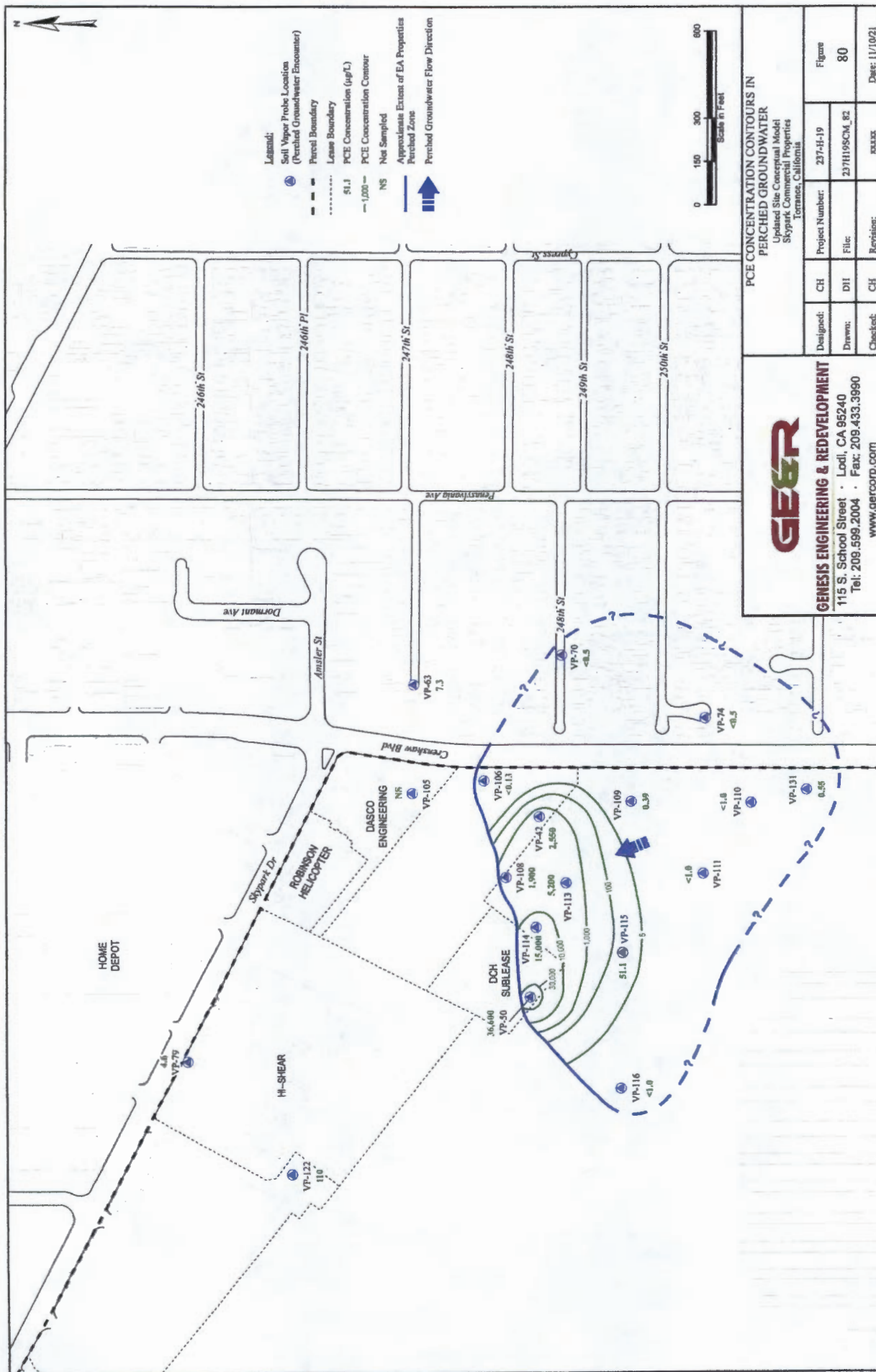


EXHIBIT 7



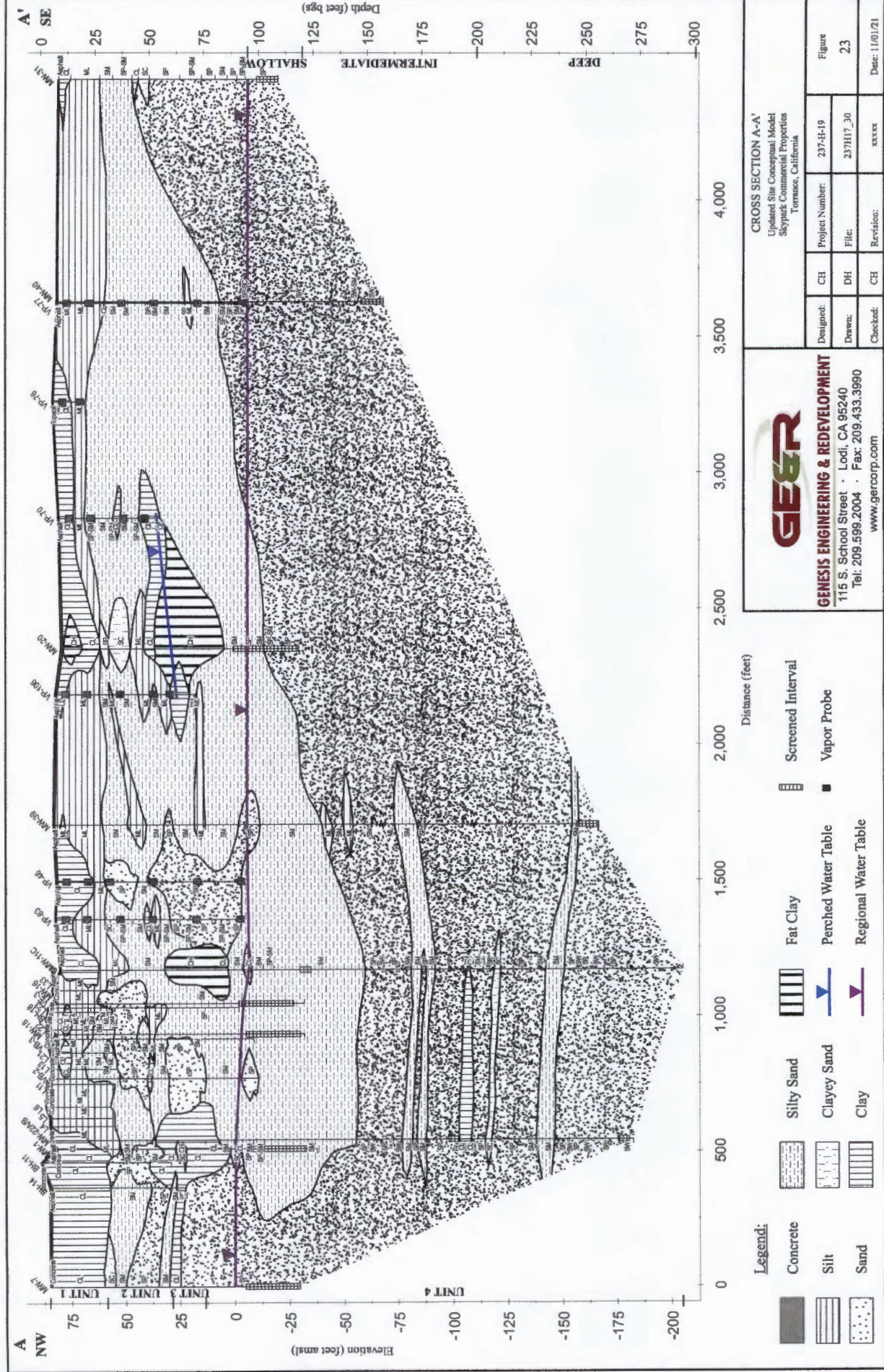
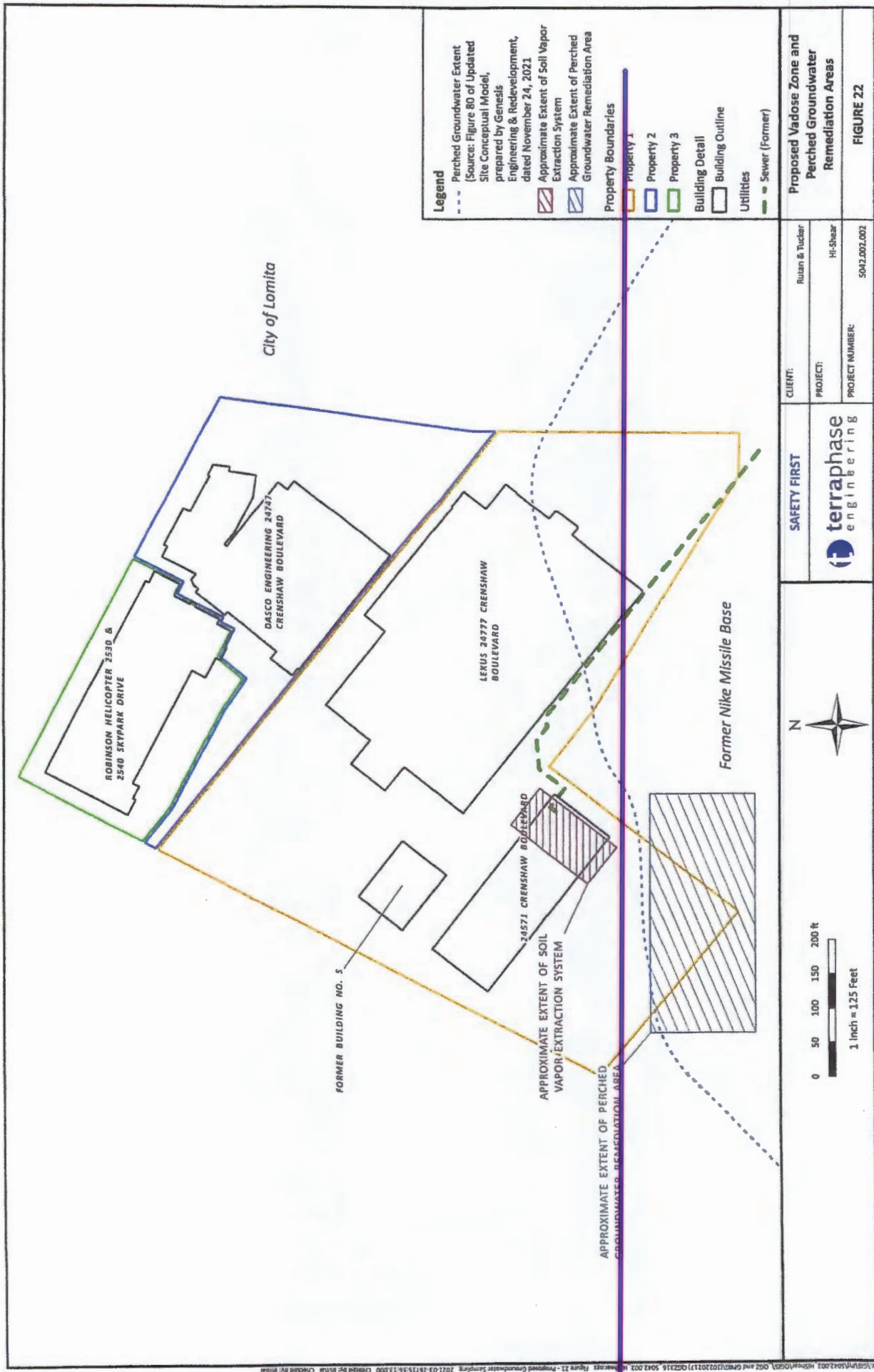


EXHIBIT 8



City of Torrance (in response to Middletown), 4/5/2022

05 April 2022

Ms. Rene Purdy
Executive Officer
Los Angeles Regional Water Quality Control Board
Site Cleanup Program Unit IV
320 West 4th Street, Suite 200
Los Angeles, CA 90013

Transmitted via email: rene.purdy@waterboards.ca.gov

Re: Response to Lamb and Kawakami LLP Letter regarding the Cleanup & Abatement Order No. R4-2021-0079 and Response to City of Torrance Removal Action Workplan

Skypark Commercial Properties (portion of Assessor Parcel No. 7377-006-906)
24701 – 24777 Crenshaw Boulevard and 2530, 2540, and 2600 Skypark Drive
Torrance, California (SCP NO. 1499)

B.1 Dear Ms. Purdy:

On behalf of the City of Torrance (City), GSI Environmental Inc. (GSI) has prepared this letter responding to comments provided by Lamb and Kawakami LLP (L&K) on behalf of Magellan Aerospace, Middleton, Inc. ("Middletown") in a letter to you, dated 21 March 2022 (L&K Letter). The L&K Letter provided Middletown's comments to the Removal Action Workplan (RAW) for the East Adjacent Properties (EA RAW) prepared by Terraphase Engineering, Inc. (Terraphase) on behalf of the City and dated 28 February 2022, and included in the letter various comments on prior submissions made by GSI to the Los Angeles Regional Water Quality Control Board (Regional Board). GSI has prepared this letter to respond to L&K's characterizations/mischaracterizations of prior GSI's technical evaluations submitted to the Regional Board, and to address L&K's inaccurate comments regarding the conceptual site model.

On 28 June 2021, the Regional Board issued Cleanup and Abatement Order No. R4-2021-0079 for the Skypark Commercial Properties, located at 24701 – 24777 Crenshaw Boulevard and 2530, 2540, and 2600 Skypark Drive, Torrance, California (the Order). The Skypark Commercial Properties are owned by the City of Torrance and have been leased to various commercial entities since approximately 1954. The Regional Board Order named the Hi-Shear Corporation (Hi-Shear) as a responsible party, along with certain existing and prior operators of properties referenced in the Order as the East Adjacent Properties or "EA Properties," along with the City of Torrance because of the City's ownership interest in the referenced properties.

Middletown is the corporate successor of an entity (Aeronca) that leased 24751 and 24777 Crenshaw Boulevard, Torrance, CA, referred to as "Property 1" in the Order, from 1954 to 1987, and that leased 24707, 24747 and 24701 Crenshaw Boulevard, Torrance, CA, referred to as "Property 2" in the Order, from approximately 1966 to 1973.

On 31 January 2022, the City, through Terraphase, submitted a Groundwater RAW to the Regional Board for its review and approval. On 28 February 2022, the City submitted the EA RAW to the Regional Board, for its review and approval. On 21 March 2022, the L&K Letter was submitted to the Regional Board on behalf of Magellan.

In its letter providing comments to the EA RAW, L&K has mischaracterized certain technical information that were provided by GSI to the Regional Board in a 9 June 2020 Technical

Memorandum submitted to the Regional Board (referred to herein as the “Technical Memorandum”) concerning the Hi-Shear site located at 2600 Skypark Drive, Torrance, California. In addition, L&K has advanced an inaccurate conceptual site model for the source and extent of chlorinated volatile organic compounds (CVOCs) within the EA Properties that is not supported by the existing subsurface data or historical site information.

We also note that L&K is incorrect in its understanding of the City’s technical consulting team. GSI has not been “replaced” by Terraphase. GSI continues to support the City in its review of technical reports, development of an effective approach to remediate CVOCs in the subsurface, and collaboration with the Regional Board and the parties named in the Order. GSI and Terraphase are working together in these capacities, and GSI concurs with the conceptual site model presented by Terraphase in the EA RAW.

L&K Mischaracterizes GSI’s Prior Statements Regarding Groundwater Contamination

In its letter, L&K claims that GSI and Terraphase have reached “diverging conclusions on the source of the perched water contamination.” L&K’s evidence for this assertion is a quotation from GSI’s 9 June 2020 Technical Memorandum regarding the “Review and Analysis of Current Data on Historical Site Use and Environmental Conditions at the **Hi-Shear Site**, 2600 Skypark Drive, Torrance, California” (emphasis added). As is clear from the title, the focus of the Technical Memorandum was an analysis of the available site characterization data and historical site use information for the Hi-Shear Site, not Properties 1 or 2, and our evaluation concluded that the regional trichloroethene (TCE) and tetrachloroethene (PCE) groundwater plume, which extends from the Hi-Shear Site, beneath the EA Properties, and to the residential neighborhood east of Crenshaw Boulevard, is a single plume associated with releases at the Hi-Shear Site. Further, we identified known TCE and PCE release areas at the Hi-Shear Site that warranted immediate response actions. We did not evaluate the source or extent of CVOCs in perched groundwater at Property 1 or Property 2.¹ The identification of sources at the Hi-Shear Site and evaluation of regional groundwater conditions presented in the Technical Memorandum are consistent with the conceptual site model presented by Terraphase in the EA RAW.

L&K references the following statement in its letter from the Technical Memorandum, to inaccurately claim that it was/is GSI’s position that perched groundwater is not impacted by a release of CVOCs that occurred at Property 1: “[s]oil, soil vapor, and groundwater data identify releases of TCE and PCE at historical Hi-Shear operational Site features, and these releases have caused a soil vapor and groundwater plume beneath the Hi-Shear Site, EA Properties, and Residential Properties.” First, the fact that known release areas are present at the Hi-Shear Site does not imply or suggest that additional release areas are not present at other areas on the Hi-Shear Site, the EA Properties (including Property 1) or locations east of Crenshaw Boulevard. L&K takes out of context our statement regarding site characterization data collected at the Hi-Shear Site, and incorrectly applies it as an evaluation of data collected at Property 1 by GSI. This is a mischaracterization of GSI’s statements/position on the data collected at Property 1.

However, it is GSI’s position, as well as Terraphase’s position, that shallow CVOC contamination at Property 1 is seemingly constrained by the perched groundwater beneath Property 1, and that the clay area/perched groundwater is limiting the migration of CVOCs from Property 1 to regional groundwater and to the residential neighborhood east of Crenshaw Boulevard. (GSI staff indicated as much in a meeting with Regional Board on 12 August 2020.) In short, L&K has failed to recognize the distinction between the regional groundwater contamination and perched groundwater contamination beneath EA Property 1.

¹ The soil vapor investigation at the former Nike Facility located on the Torrance Airport was completed in January and February 2021, *after* GSI submitted its 9 June 2020 Technical Memorandum.

L&K Mischaracterizes Regional Board's Comments Regarding a VOC Potential Source to Perched Groundwater

In addition to mischaracterizing GSI's previous technical evaluation, L&K also misreads certain comments provided by the Regional Board regarding the delineation of contamination associated with the Hi-Shear Site, to an evaluation of potential VOC sources at EA Property 1, while at the same time ignoring the Regional Board's determination in the same comment letter that a "hot spot" is present at Property 1. L&K quotes the Regional Board's 28 August 2018 letter providing comments to the 9 September 2016 Interim Off-Site Assessment Report (IOAR) submitted by Alta Environmental (Alta) on behalf of Hi-Shear. Yet, a review of the Regional Board's letter easily shows that it believes there is a potential separate release(s) from prior operations on Property 1, as reflected in Comment 4 of the Regional Board's letter:

- 4. PCE concentration in perched groundwater at VP-50:** *This perched groundwater PCE, TCE, and 1,1-DCE hot spot, as shown on Figure 8 of the IOAR, appears to be a separate plume which is located at the southeastern margin of the Hi-Shear TCE and PCE plumes. Additional delineation of the extent of the perched groundwater VOCs hot spot is needed to locate its VOC source.*

The interpretation of the 2016 site characterization data by the Regional Board is consistent with both GSI's prior statements regarding the source and extent of VOC releases associated with the Hi-Shear Site and the conceptual site model presented by Terraphase in the EA RAW. The only "divergence" is L&K's portrayal of GSI's and the Regional Board's evaluations and the actual statements made by GSI and the Regional Board.

L&K's Conceptual Site Model for the Perched Groundwater Contamination Is Not Supported by Available Data

L&K's letter criticizes the identification of a potential release area at Property 1 as part of the conceptual site model provided by Terraphase in the EA RAW. Specifically, Terraphase states:

Four lines of evidence indicate that release[s] potentially occurred at EA Property 1. These lines of evidence include (1) use of PCE and 1,1,1-TCA in degreasing operations, (2) elevated detections of PCE and 1,1-DCE (degradation product of 1,1,1-TCA) in soil, (3) elevated detections of PCE and 1,1-DCE in soil vapor, and (4) elevated detections of PCE and 1,1-DCE in perched groundwater.

In its letter, L&K asserts that, "there are no historic records or witnesses supporting the leaking degreaser premise," and suggests that Terraphase's analysis suffers from outcome bias. Yet, L&K does not address the direct and compelling evidence presented by Terraphase. Historical records provided by Genesis Engineering & Redevelopment, Inc. (GE&R) in its 24 November 2021 Updated Site Conceptual Model document that PCE and 1,1,1-trichloroethane (1,1,1-TCA) were used by Aeronca Manufacturing, Inc. in degreasing operations.²

Further, PCE and 1,1-dichloroethene³ (1,1-DCE) have been detected in shallow soil and soil vapor samples at concentrations that provide strong evidence that a release occurred in the vicinity of the former degreasers on Property 1. Based on the delineation of PCE and 1,1-DCE in perched groundwater, the release(s) at Property 1 appear to have been significant. The conclusion reached by Terraphase, based on the lines of evidence it presented in the EA RAW, easily stand on their own without the need for corroborating eyewitness testimony. In sum, L&K's Letter does not address the fact that the same chemicals detected in soil, soil vapor and groundwater were used (or associated with the chemicals used) at Property 1.

² Middletown was formerly known as Aeronca Manufacturing, Inc.

³ 1,1-DCE is a breakdown product of 1,1,1-TCA, and is more persistent in soil and soil vapor than 1,1,1-TCA.
Groundwater IRAP - RTC - 0079

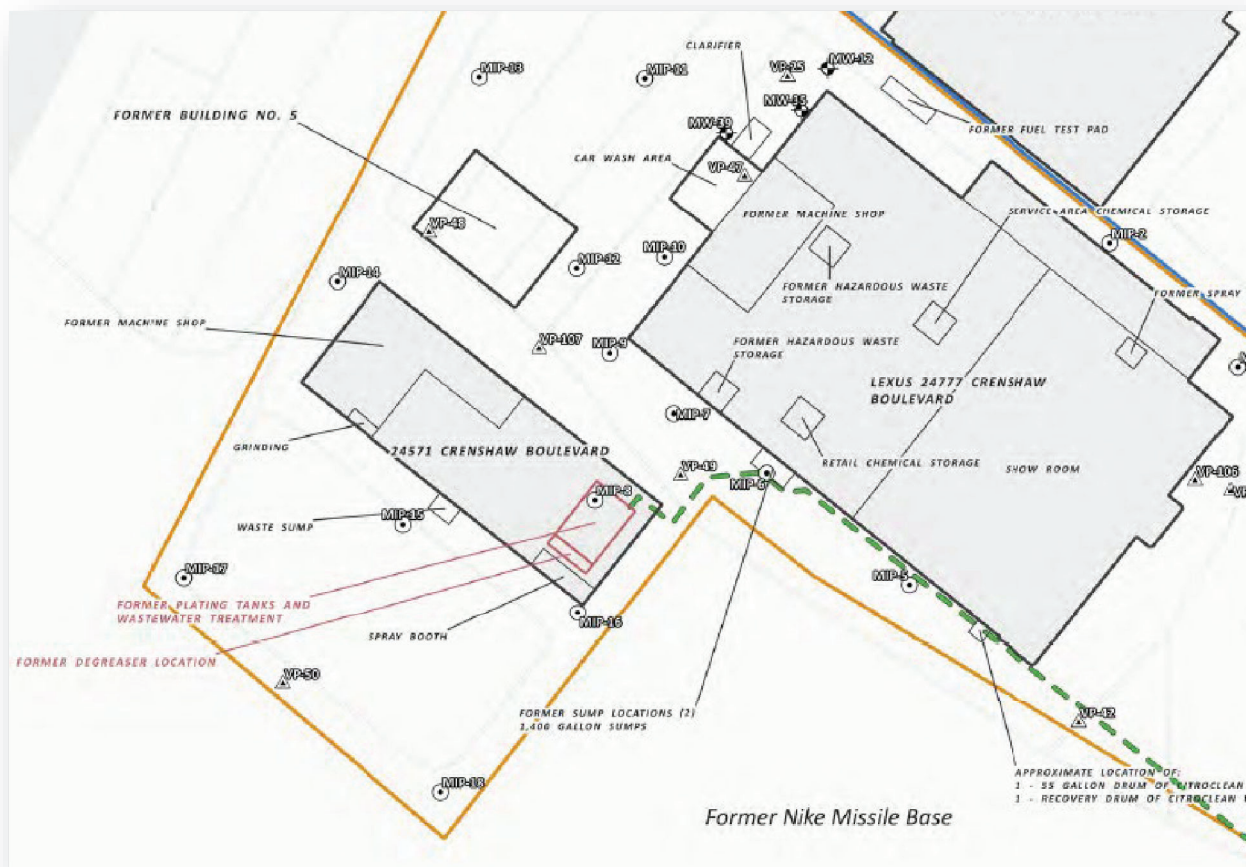
Rather than address the body of available site characterization data, L&K suggests Terraphase's evaluation is flawed because L&K considers data collected at MIP-7, MIP-8 and VP-49 as "anomalous." However, the shallow site characterization data collected at Property 1 and the former Nike Facility, which located south of EA Property 1, are consistent with the available site characterization data and Terraphase's conceptual site model that a release of PCE and 1,1,1-TCA occurred at Property 1 in the vicinity of the former degreasers. The shallow soil sampling and membrane interphase probe (MIP) investigation data collected at Property 1, show the highest PCE and 1,1,-DCE concentrations in soil samples, and the highest electron capture detector (ECD) and halogenated specific detector (XSD) responses in the vicinity of the former degreaser. Further, the shallow soil vapor data collected at Property 1 and on the former Nike Facility also show the highest PCE and 1,1,-DCE soil vapor concentrations in shallow soil vapor in the vicinity of the former degreasers. Attachment A includes the following figures from the Updated Site Conceptual Model prepared by Genesis Engineering & Redevelopment, Inc. (GE&R) on behalf of Hi-Shear:

- Figure 53 – Property 1 Maximum PCE Concentration in Soil in the Upper 20 Feet;
- Figure 54 – Property 1 Maximum 1,1-DCE Concentration in Soil in the Upper 20 Feet;
- Figure 55 – Property 1 Maximum EXD/XSD Response in Soil in the Upper 20 Feet;
- Figure 60 – Property 1 Maximum PCE Concentration in Soil Vapor at a Depth of 5 Feet; and
- Figure 61 – Property 1 Maximum 1,1-DCE Concentration in Soil Vapor at a Depth of 5 Feet.

While GSI does not agree with all of the assumptions and analysis of GE&R in these and other Figures, GSI does agree that the soil and soil vapor data presented in these Figures evidences PCE and 1,1,1-TCA releases at Property 1 in proximity to the former degreasers.

L&K indicates the elevated PCE concentrations in soil samples collected at MIP-8 are anomalous because PCE was detected at higher concentrations in soil samples collected at depths of 15 and 20 feet bgs (1,100 micrograms per kilogram [$\mu\text{g}/\text{mg}$] for both samples) than at 5 and 10 feet bgs (210 and 650 $\mu\text{g}/\text{mg}$, respectively). The available site characterization data indicates a release of PCE and 1,1,1-TCA occurred in the vicinity of MIP-8, but not that MIP-8 was the specific release location. As suggested by Terraphase, additional sampling is warranted to further delineate the area of elevated PCE and 1,1-DCE concentrations in shallow soil to determine the specific location or locations of the release(s). MIP-8 is the only boring advanced within the 24751 Crenshaw Boulevard property and MIP-8 was not located at the former degreaser:

Figure 3 of Terraphase, 2022, EA RAW



As such, the lack of shallow site characterization at Property 1 was correctly identified by Terraphase in the EA RAW as a data gap.

Finally, L&K advances an alternative conceptual site model that is not supported by the available data. L&K presumes that the source of CVOCs in perched groundwater is the former Nike Facility located south of EA Property 1, and that additional data collection is necessary to demonstrate this conceptual site model. Although we support L&K's desire to collect more data, the available site characterization data does not lend credence to L&K's hypothesis. Soil vapor samples were collected at 13 locations at the former Nike Facility. The highest PCE and 1,1-DCE concentrations detected in shallow soil vapor at the former Nike facility are the samples collected in closest proximity to Property 1. This data alone tends to disprove L&K's assertion.

In support of its hypothesis, L&K provides interpretations of aerial photographs of the former Nike Facility and suggests that there were trenches on the former Nike facility that could have conveyed solvents to Property 1. Again, however, the current soil vapor data does not provide evidence of a CVOC release at the former Nike Facility. Attachment B presents a side-by-side comparison of the PCE concentration contour for 5 feet bgs, and the 8 May 1960 aerial photograph provided by L&K. CVOCs were not detected or detected at low concentrations in soil vapor samples collected at the "drainage ditch," "pit," and fueling areas. L&K's suggested conceptual site model is clearly flawed.

L&K also indicates that a work plan for more soil and soil vapor sampling will be submitted on behalf of Middletown. GSI agrees that additional sampling is needed, but suggests that the



sampling be broader than proposed by L&K, and that it address all of the soil, soil vapor and perched groundwater data gaps identified by Terraphase in the EA RAW.

Should you have any questions or comments regarding this letter, please contact either of the undersigned at 949.679.1070.

Sincerely,

GSI Environmental Inc.

A handwritten signature in blue ink, appearing to read 'Timothy F. Wood'.

Timothy F. Wood, PG, CHG
Vice President & Principal Hydrogeologist

A handwritten signature in blue ink, appearing to read 'Peter Scaramella'.

Peter Scaramella
Senior Risk Assessor

Attachments:

Attachment A – Figures from GE&R 24 November 2021 Site Conceptual Model

Attachment B – Comparison of the PCE concentrations at 5 feet bgs and the 8 May 1960 aerial photograph for the former Nike Facility

cc:

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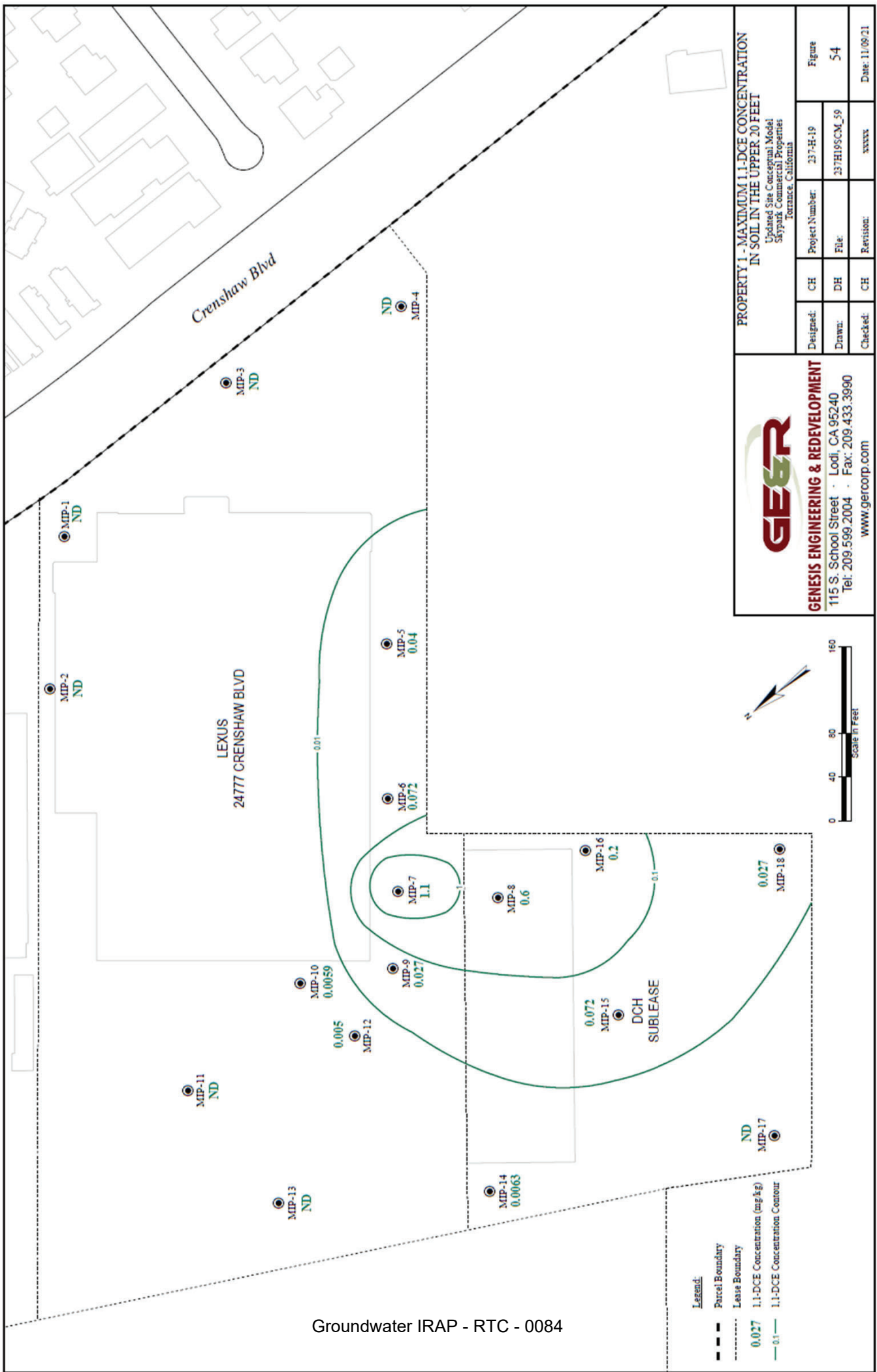
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Groundwater IRAP - RTC - 0083

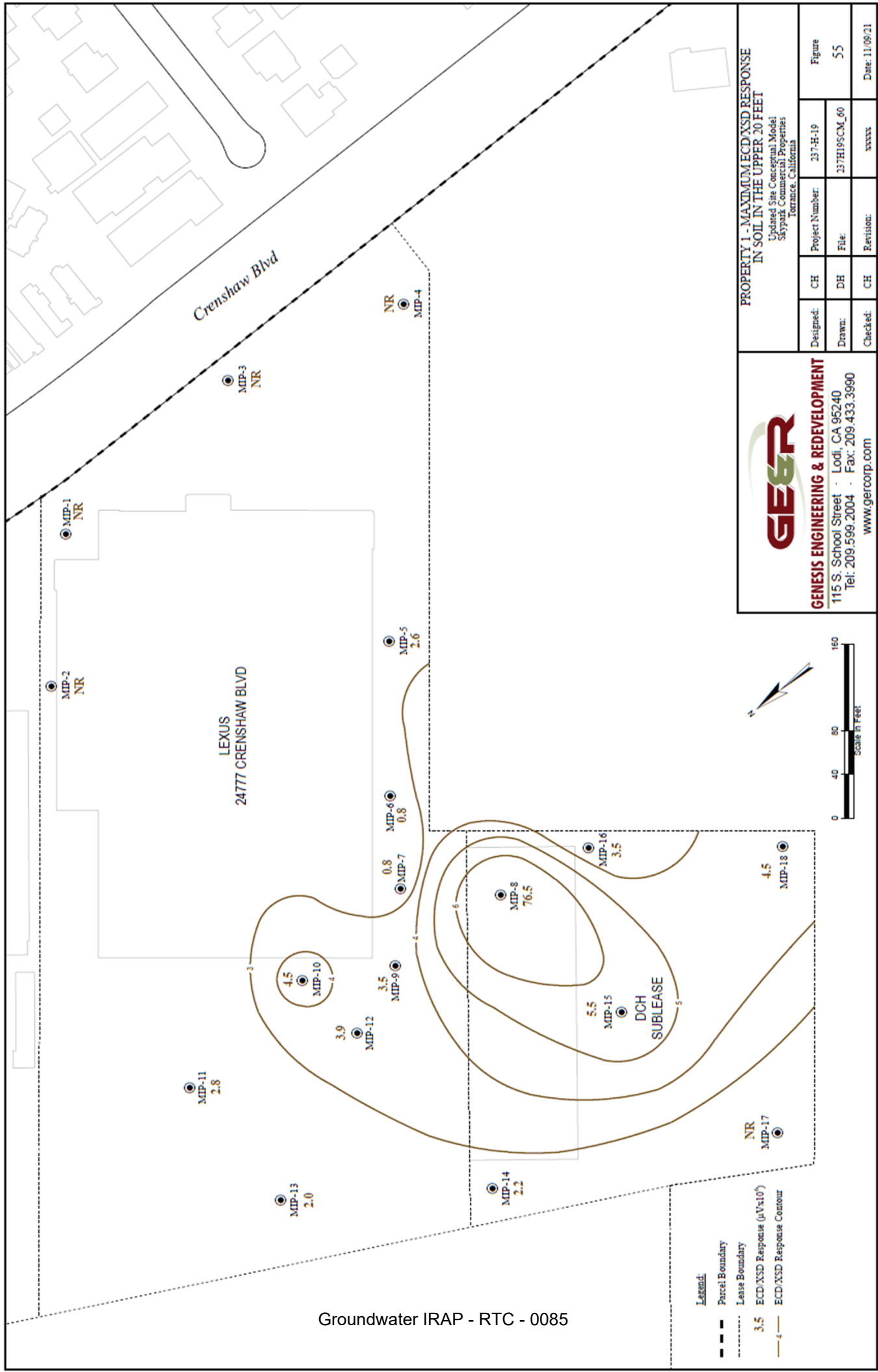


ATTACHMENT A-2



Source: Genesis Engineering & Redevelopment, Inc., 2021, Updated Site Conceptual Model, Skypark Commercial Properties, November 24.

ATTACHMENT A-3



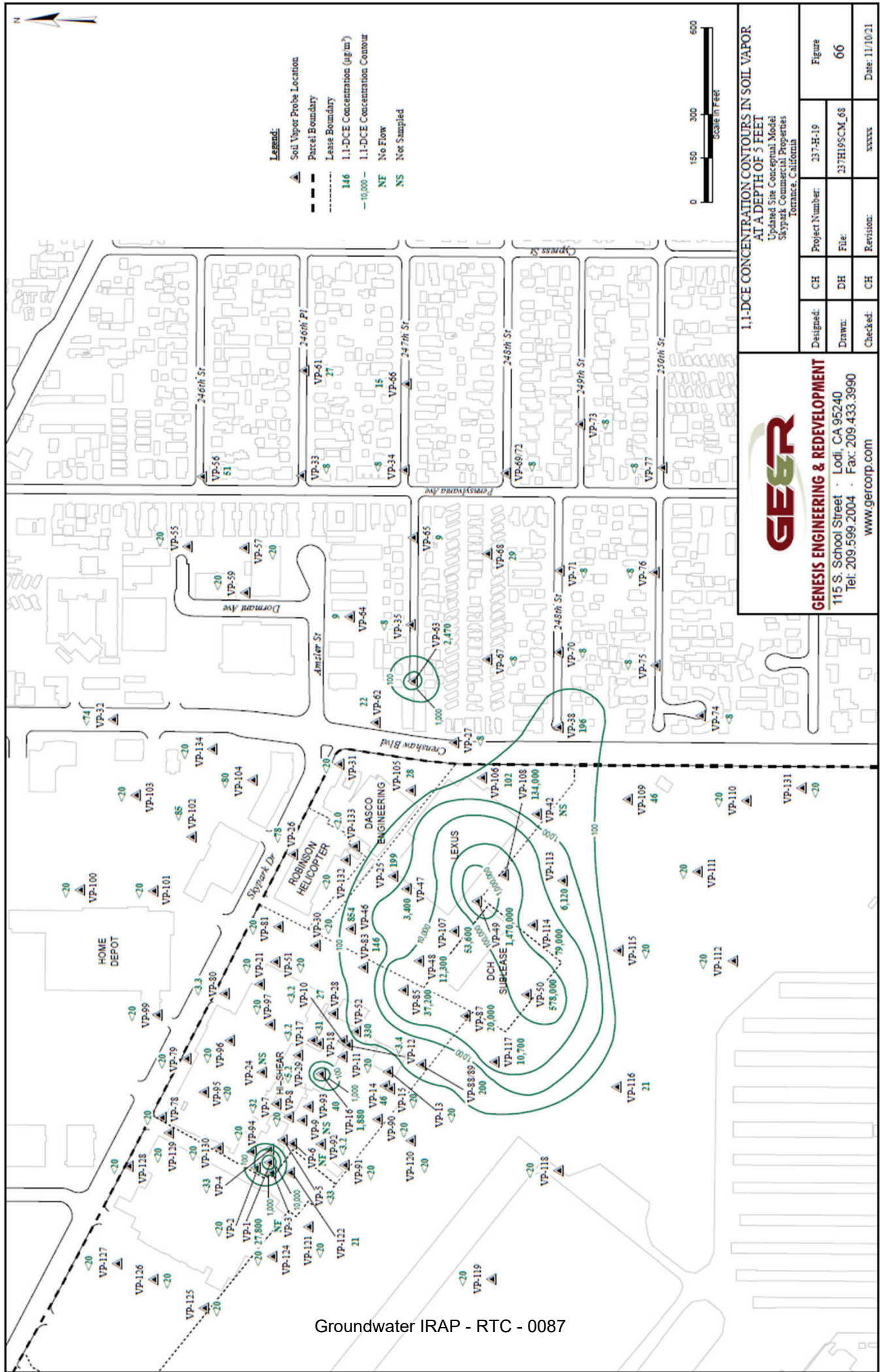
Source: Genesis Engineering & Redevelopment, Inc., 2021, Updated Site Conceptual Model, Skypark Commercial Properties, November 24.

ATTACHMENT A-4



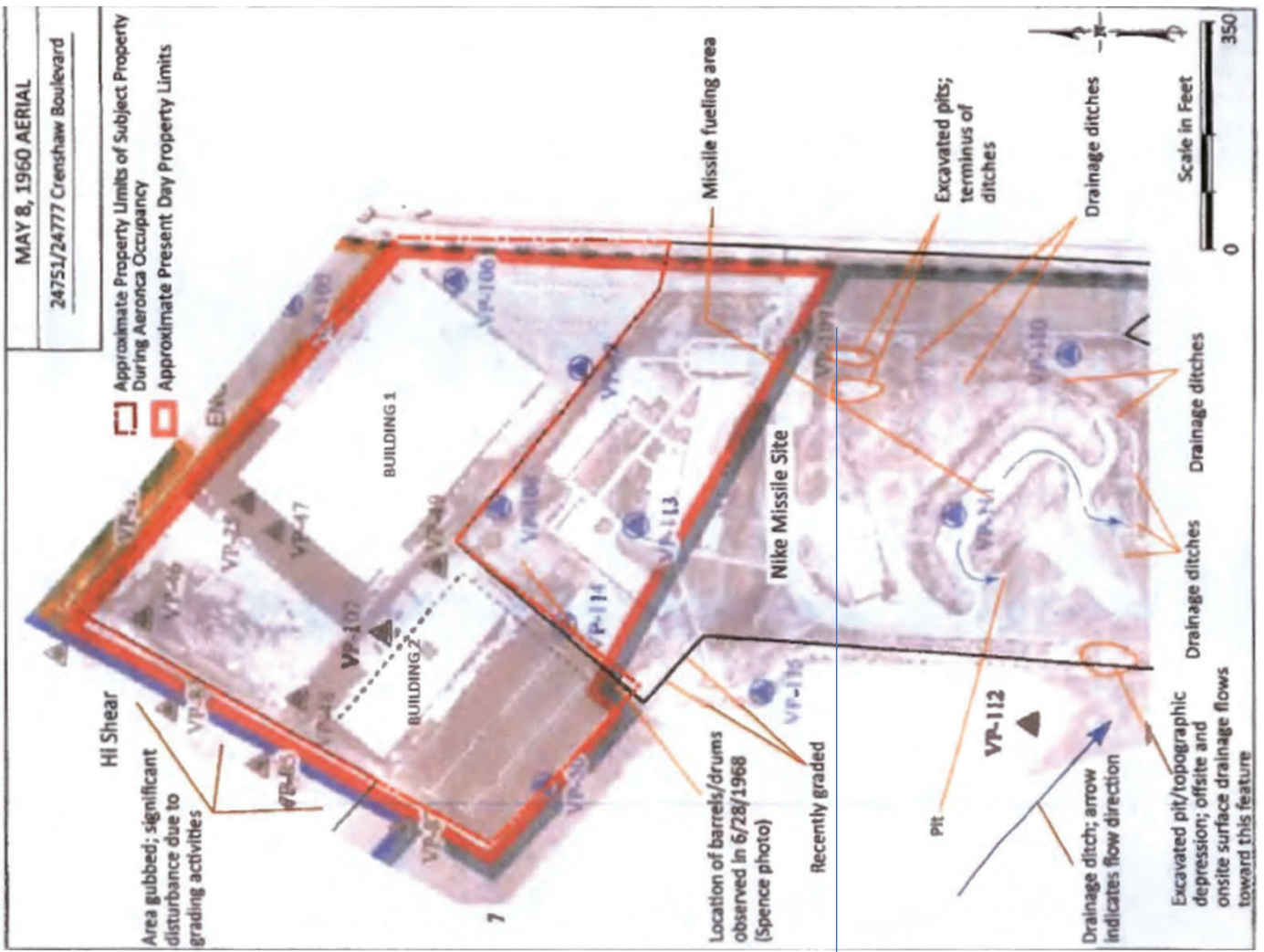
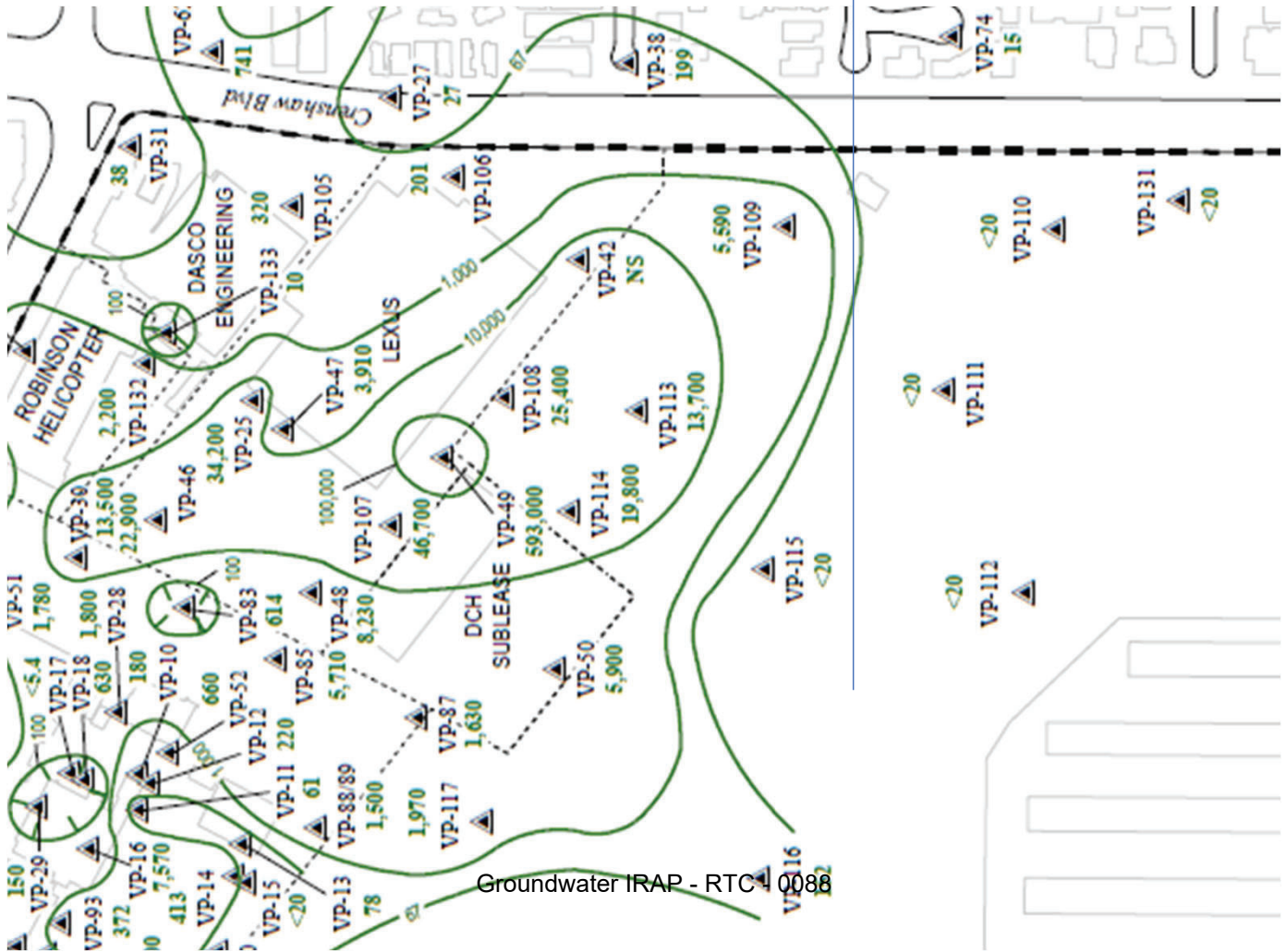
Source: Genesis Engineering & Redevelopment, Inc., 2021, Updated Site Conceptual Model, Skypark Commercial Properties, November 24.

ATTACHMENT A-5



Source: Genesis Engineering & Redevelopment, Inc., 2021, Updated Site Conceptual Model, Skypark Commercial Properties, November 24.

ATTACHMENT B



Source: Figure 60 from Genesis Engineering & Redevelopment, Inc., 2021, Updated Site Conceptual Model, Skypark Commercial Properties, November 24.

Source: Lamb and Kawakami LLP, 2022, Letter regarding Cleanup & Abatement Order No. R4-2021-0079, Response to City of Torrance Removal Action Workplan, March 21.

Hi-Shear Corporation, 4/25/2022

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April 25, 2022

VIA E-MAIL ONLY

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Email: Jillian.Ly@waterboards.ca.gov
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**Re: Skypark Commercial Properties
SCP Case No. 1499; CAO No. R4-2021-0079
H&E File No.: 8360.01**

Dear Ms. Ly and Mr. Lin:

C.1

On behalf of Hi-Shear Corporation (“Hi-Shear”), this correspondence will serve to set forth Hi-Shear’s comments to the City of Torrance’s (“Torrance”) Groundwater Removal Action Workplan (“Groundwater RAW”) and Removal Action Workplan for the East Adjacent Properties (the “EA RAW”), which were prepared by Terraphase Engineering, Inc. (“Terraphase”) and submitted on January 31, 2022 and February 28, 2022 respectively.

Hi-Shear requests that the Los Angeles Regional Water Quality Control Board (“RWQCB”) convene a meeting between Hi-Shear, Torrance, and any other interested parties, including other Dischargers, to discuss the Groundwater RAW and the EA RAW.

General Comments to Torrance’s Groundwater RAW

As an initial comment, Hi-Shear takes issue with Terraphase’s characterization of the entire Skypark Commercial Properties contaminant plume, which extends east of Crenshaw

Ms. Jillian Ly; Mr. Kevin Lin

RE: Comments to Torrance RAWs
Skypark Commercial Properties
SCP Case No. 1499; CAO No. R4-2021-0079

April 25, 2022

Page 2

Boulevard, as the “Hi-Shear Plume.” This characterization is technically inaccurate, and unfairly prejudicial and inflammatory to Hi-Shear, since years of ongoing investigation have confirmed that a significant portion of the commingled plume is due to releases on and from properties other than the Hi-Shear Property. Nonetheless, Terraphase seeks to portray the commingled plume as being the sole responsibility of Hi-Shear, a position that is completely untenable and unsupported by the data.

Indeed, as the RWQCB recognized in its June 18, 2021 Cleanup and Abatement Order No. R4-2021-0079 (the “CAO”), the groundwater contamination at issue at the Skypark Commercial Properties is the result of multiple separate releases emanating from Property 1, Property 2, Property 3, and the Hi-Shear Property, all of which appear to have impacted regional groundwater. (CAO, p. 14-15.) This conclusion is further supported by Hi-Shear’s Updated Site Conceptual Model dated November 24, 2021 (the “Updated SCM”). Further, Terraphase even recognizes the separate and distinct releases on Properties 1, 2, and 3 in its separate EA RAW.

Interestingly, Terraphase appears to intentionally side step an analysis of the impact those releases have had on regional groundwater by limiting its discussion to the impacts of the releases to soil, soil vapor, and perched groundwater, while ignoring the elevated PCE and 1,1,-DCE detections in groundwater under the source area on Property 1. (EA RAW, section 5.1.2). As set forth in Hi-Shear’s Updated SCM, the releases from Property 1 have indeed had significant impacts on groundwater below the source area on Property 1. (Updated SCM section 8.2.1).

Definitions matter, especially in public record documents, and the comingled groundwater plume should not be defined in a way that advocates or attempts to assign blame for the plume to only a single party. Given the data and Terraphase’s acknowledgement of separate source areas on Properties 1, 2, and 3, a more accurate and appropriate title would be the “Skypark Commercial Properties Plume”.

1. Permeable Reactive Barrier Along Crenshaw

The Groundwater RAW has three stated objectives: 1) reduce the risk of vapor intrusion (“VI”) potential east of Crenshaw Boulevard; 2) reduce contaminant mass in groundwater at the Hi-Shear Property; and 3) achieve water quality objectives in groundwater east of Crenshaw Boulevard within a reasonable time frame.

Ms. Jillian Ly; Mr. Kevin Lin

RE: Comments to Torrance RAWs
Skypark Commercial Properties
SCP Case No. 1499; CAO No. R4-2021-0079

April 25, 2022

Page 3

To achieve these objectives, Torrance proposes two remedial options, one of which is the installation of a permeable reactive barrier along a portion of Crenshaw Boulevard that will inject zerovalent iron (“ZVI”) and a bioaugmentation solution into regional groundwater. While ZVI is an established technique that will likely degrade chlorinated VOC concentrations in groundwater along Crenshaw Boulevard, Hi-Shear’s experts do not believe that it will achieve the stated goal of reducing VI risk east of Crenshaw Boulevard, or of achieving water quality objectives in groundwater east of Crenshaw Boulevard in a reasonable time frame.

C.2

Specifically, a ZVI barrier along Crenshaw Boulevard leaves VOC untreated in the unsaturated zone on both sides of Crenshaw Boulevard and does not inhibit vapor phase migration of VOCs across Crenshaw Boulevard from Properties 1, 2, and 3. Further, a ZVI barrier along Crenshaw does not address the suspected VOC source area along Amsler Street, which remains under investigation (although private access problems have slowed the process). Neither of these issues are addressed by the proposed ZVI barrier. Moreover, Terraphase proposes operating the ZVI barrier for only fifteen (15) years. Since the Groundwater RAW does not propose any treatment of groundwater under Property 1 (and the EA RAW proposed only limited groundwater EISB injections), the contaminated groundwater located under Property 1 may not migrate through the ZVI barrier along Crenshaw Boulevard before the ZVI barrier is abandoned, leaving that contaminated groundwater free to cross Crenshaw Boulevard.

C.3

Additionally, the ZVI barrier does not address the leading edge of the plume to the east of Crenshaw Boulevard, in either groundwater or soil vapor. The Groundwater RAW does not propose any cleanup of soil vapor or groundwater east of Crenshaw Boulevard, meaning that the VI risk east of Crenshaw Boulevard will remain indefinitely. Since the Groundwater RAW rejects monitored natural attenuation, leaving the groundwater and soil vapor east of Crenshaw unaddressed, means that the Groundwater RAW fails to achieve two of its stated goals: to reduce VI risk east of Crenshaw Boulevard and achieve water quality objectives in groundwater east of Crenshaw Boulevard.

C.4

On a technical level, Terraphase proposes monitoring the effectiveness of the ZVI barrier through the use of two (2) existing monitoring wells, one of which is upgradient of the barrier. This is an insufficient network to monitor the effectiveness of the ZVI barrier. Moreover, the PRB does not extend far enough to the south along Crenshaw Boulevard to intercept impacts to regional groundwater originating from Property 1. Nor does the PBR extend far enough to the north along Crenshaw Boulevard to capture impacts beneath Property 3. The configuration of the PRB is also unclear. The Groundwater RAW references both 28

Ms. Jillian Ly; Mr. Kevin Lin

**RE: Comments to Torrance RAWs
Skypark Commercial Properties
SCP Case No. 1499; CAO No. R4-2021-0079**

April 25, 2022

Page 4

and 44 injection locations in the text and tables, and only 27 injection locations are shown on the attached figures.

2. EISB Injections at Hi-Shear Property

C.4 Hi-Shear agrees that further EISB injections at the Hi-Shear Property would meet the objective of further reductions of contaminant mass at the Hi-Shear Property. However, rather than simply utilizing the existing injection wells that were utilized in the past, Hi-Shear recommends that the injections focus on the highest concentrations of chlorinated VOCs remaining on the Hi-Shear Property, even if that requires installing new injection wells. These areas are identified in the recent groundwater monitoring reports submitted by Hi-Shear.

C.5 Moreover, as discussed below, Hi-Shear and its consultants believe a more comprehensive approach to the entire Skypark Commercial Properties, and the area east of Crenshaw Boulevard, would be the preferred strategy for ultimately remediating the entire site, rather than employing different remedial options at different areas of the site.

Furthermore, the Groundwater RAW alleges that DNAPL is currently present at the Hi-Shear Property. Terraphase and Torrance make this allegation based solely on a single line of evidence – VOC concentrations in groundwater. However, in contradiction, the guidance cited by the Groundwater RAW clearly states that the inference of the presence of DNAPL should not be made using a single line of evidence. Hi-Shear's Updated SCM contains a detailed explanation on this issue that relies on multiple lines of evidence to conclude that DNAPL is not present at the Hi-Shear Property. And, even if there is DNAPL present at the Hi-Shear Property (which there is not), the Groundwater RAW neither identifies the location of the DNAPL, nor proposes any plan to confirm its presences and subsequently remove it if found.

3. Terraphase Did Not Consider a Comprehensive Approach to Treating the Comingled Groundwater Plume

C.6 The Groundwater RAW fails to even consider groundwater extraction, amendment to treat the extracted groundwater, and reinjection at source areas on both the Hi-Shear Property and Properties 1, 2, and 3. While this remedial alternative was considered for the Hi-Shear Property (although it considered placing treated groundwater into the sewer rather than reinjecting it), it was not included as a consideration for a more comprehensive approach to remediating groundwater for the entire Skypark Commercial Properties. The creation of a recirculation cell where groundwater is extracted along the leading edge of the plume, treated,

Ms. Jillian Ly; Mr. Kevin Lin

RE: Comments to Torrance RAWs
Skypark Commercial Properties
SCP Case No. 1499; CAO No. R4-2021-0079

April 25, 2022

Page 5

and then reinjected at source areas would both assist in remediating those source areas and provide for greater protection east of Crenshaw Boulevard. A recirculation cell would also decrease the time necessary to cleanup the plume as it would increase the groundwater velocity rather than relying on the natural groundwater velocity as is the case with a ZVI barrier. Additionally, an amendment may also be incorporated into the reinjected groundwater to further enhance cleanup.

While such a recirculation cell may be initially more expensive than the ZVI barrier (although Hi-Shear believes that greater detail on estimated cost could have been provided in the Groundwater RAW), a recirculation cell may actually end up being of comparable cost. The initial capital cost for a recirculation cell would certainly be more expensive, but the operation and maintenance costs for the system could be less expensive over time than the continued ZVI barrier injections by increasing the groundwater flow velocity and decreasing the treatment time.

C.7

The Groundwater RAW should have considered a comprehensive approach to treat groundwater. This comprehensive approach should also have included, or at least considered, remedial options for treating soil and soil vapor at the Skypark Commercial Properties and east of Crenshaw Boulevard. The bifurcated approach proposed by the Groundwater RAW and the EA RAW fails to consider the potential time and cost savings that could result from the implementation of tandem remedial options at the entirety of the Skypark Commercial Properties and east of Crenshaw Boulevard.

C.8

General Comments to Torrance's EA RAW

As with the Groundwater RAW, the EA RAW inaccurately labels the entire comingled plume as the "Hi-Shear Plume," again ignoring data confirming source areas on other properties. To avoid misrepresentation and public confusion, any work plan submitted by Torrance, or any other Discharger, should refer to the comingled plume as the "Skypark Commercial Properties Plume." Moreover, the EA RAW avoids any analysis of impact to groundwater that the acknowledged releases on Properties 1, 2, and 3 have had. Instead, the EA RAW seems to limit its analysis to soil, soil vapor, and perched groundwater. The EA RAW should be revised to include an assessment of the impact (to both perched and regional groundwater) that the source areas located on Properties 1, 2, and 3 have had.

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Ms. Jillian Ly; Mr. Kevin Lin

RE: *Comments to Torrance RAWs*
Skypark Commercial Properties
SCP Case No. 1499; CAO No. R4-2021-0079

April 25, 2022

Page 6

1. Further Proposed Investigation

The EA RAW proposes additional investigation on Properties 1, 2, and 3 to fill in data gaps at those properties. In general, Hi-Shear believes that the investigation set forth in the EA RAW is adequate to fill those data gaps. However, Hi-Shear has several technical comments regarding the proposed scope of the investigation and the methods employed for the work.

Initially, the EA RAW proposed utilizing direct push drilling for several vapor monitoring probes, going to depths of 85-feet. It is Hi-Shear's experience that drilling refusal using a direct push rig is encountered at depths of 20 to 30 feet beneath the Skypark Commercial Properties. This could result in MIP profiling being incomplete in deeper soil. Other drilling methods such as hollow-stem auger or sonic drilling may need to be utilized to complete the investigation and gather the necessary data. Additionally, Hi-Shear believes that the perched, shallow, and intermediate wells should be co-located (i.e., clustered) to provide better data for evaluating and assessing the vertical extent and distribution of contamination.

Further, Hi-Shear believes that the proposed investigation should be expanded to provide additional data on known or suspected source areas on the properties. Specifically, shallow borings should be proposed to collect soil and soil vapor samples inside the building located at 24571 Crenshaw Boulevard to confirm the source area under the industrial chemical-using degreasers that were operated in the eastern side of that building. Hi-Shear understands that the building has sufficient clearance and is essentially empty, such that these drilling activities should pose no business interruption or permitting problems. Moreover, the additional investigation should include co-located wells and soil and soil vapor sample collections from Properties 2 and 3, centered around the spray booths and suspected source areas on those properties. Hi-Shear is willing to meet with Terraphase to discuss its suggestions as to the precise locations for these additional probes and wells.

Finally, the EA RAW states that one of its objectives is to quantify VOC mass flux from the Hi-Shear Property. However, there is no discussion about how this objective will be completed or what techniques will be used to calculate mass flux across the boundary between the Hi-Shear Property and Properties 1, 2, and 3. Nor does the EA RAW discuss why such a mass flux quantification is not proposed for Properties 1, 2, and 3. Investigation has of course confirmed that the Hi-Shear Property is not the lone source area, but rather just one of many, so this objective should be addressed by Torrance and Terraphase in greater detail.

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Ms. Jillian Ly; Mr. Kevin Lin

RE: *Comments to Torrance RAWs*
Skypark Commercial Properties
SCP Case No. 1499; CAO No. R4-2021-0079

April 25, 2022

Page 7

2. Operation of a SVE System

The EA RAW provides for the installation and operation of a limited SVE system at Property 1. While Hi-Shear agrees that SVE is the best technique for addressing chlorinated VOC in the unsaturated zone beneath Property 1, the SVE system proposed in the EA RAW is not sufficient to address the soil vapor contamination at Properties 1, 2, and 3, or the soil vapor contamination that extends off site across Crenshaw Boulevard.

Specifically, and as the EA RAW acknowledges, there are additional source areas on Properties 2 and 3 that have impacted soil vapor beneath those properties. Indeed, the EA RAW's figures show the data on soil vapor contamination at 5, 45, and 85 feet throughout the entire Skypark Commercial Properties and into the residential areas east of Crenshaw Boulevard. These figures demonstrate high levels of VOC contamination throughout Properties 1, 2, and 3.

However, the limited nature of the proposed SVE system under the former degreaser locations at Property 1 is insufficient to address the larger soil vapor contamination found at Properties 1, 2, and 3. The SVE system should be expanded to cover the entirety of Properties 1, 2, and 3 to reduce VOC concentrations throughout these properties and reduce the risk of VI. Further, the SVE system should likewise be extended to the west to at least just beyond Crenshaw Boulevard to reduce VOC contamination migrating through the unsaturated zone from the source areas on Properties 1, 2, and 3.

On a more technical note, the proposed SVE system only proposes wells going down 45-feet, while the data indicated high concentrations in soil vapor down to regional groundwater at 85-90-feet. The SVE system should extend further down to capture VOC contamination at depth. Additionally, the use of granular activated carbon in the SVE system will likely be prohibitively expensive given the very high VOC concentrations in soil vapor. The same situation was encountered at the Hi-Shear Property and the SVE system there was transitioned over to a catalytic oxidation system for removing VOC from vapor. Any comprehensive SVE system at Properties 1, 2, and 3 should utilize catalytic oxidation or applicable treatment system rather than granular activated carbon in order to save costs.

Further, the EA RAW proposes operating the limited SVE system for only four (4) years to achieve cleanup. This is not a realistic goal. Given the extremely high levels of VOCs, including PCE and 1,1-DCE at Properties 1, 2, and 3, any SVE system will need to be operated for a much longer period of time to achieve cleanup.

Ms. Jillian Ly; Mr. Kevin Lin

RE: Comments to Torrance RAWs
Skypark Commercial Properties
SCP Case No. 1499; CAO No. R4-2021-0079

April 25, 2022

Page 8

3. EISB Injections to Groundwater and ISCO Injections to Perched Groundwater

The EA RAW proposes EISB injections to groundwater under Property 1 and ISCO injections into the perched water zone underlying Property 1 and the former Nike Missile Base. While Hi-Shear agrees that EISB injections to the location proposed in the EA RAW would indeed reduce contamination at that area, the area outlined by the EA RAW for these injections does not seem to correspond to the location where VOC concentrations are highest in groundwater. The EA RAW should focus EISB injections in groundwater where the data, including from the additional investigation proposed by the EA RAW, shows the highest VOC concentrations are located.

Additionally, the EA RAW will leave untreated the remainder of groundwater under Properties 1, 2, and 3. As discussed above, Hi-Shear believes that a broader, more comprehensive approach should be taken to the entire Skypark Commercial Property and east of Crenshaw Boulevard. A recirculation cell may prove to be an effective approach to both treating groundwater under the Skypark Commercial Properties and preventing contaminated groundwater from migrating further downgradient.

Further, the ISCO injections proposed to treat the perched zone are an established technique for reducing chlorinated VOC in groundwater. However, they may not be effective when employed in the perched groundwater zone located under Property 1. The choice of injection compounds and low permeability of the sediments in the perched zone are not optimal for effectiveness. Specifically, the EA RAW proposes using hydrogen peroxide and ozone for the ISCO compounds, which should be consumed within a few hours of injection. This quick consumption will make it difficult for the compounds to come into contact with all the chlorinated VOCs that are dissolved in the perched groundwater. Further, the low permeability of the sediments in the perched zone will result in small radii of influence around each injection well and incomplete distribution of the ISCO compounds. And, the perched groundwater is likely to include organic matter and reduced mineral phases, which will consume the ISCO compounds and reduce the effectiveness of the injections.

The EA RAW fails to propose a pilot study despite these uncertainties as to the effectiveness of the ISCO injections. The EA RAW should propose such a study to see if ISCO injections using the proposed compounds would be effective at reducing chlorinated VOCs in the perched groundwater zone.

HAMRICK & EVANS, LLP

Ms. Jillian Ly; Mr. Kevin Lin

RE: *Comments to Torrance RAWs*

Skypark Commercial Properties

SCP Case No. 1499; CAO No. R4-2021-0079

April 25, 2022

Page 9

As a final note, while the Groundwater RAW does include an analysis of the presence of DNAPL at the Hi-Shear Property (based off a single line of evidence), the EA RAW does not contain a similar analysis of the potential presence of DNAPL in the perched groundwater zone. However, the data presented in Hi-Shear's Updated SCM indicates that PCE, 1,1-DCE, and 1,1,1-TCA are present in concentrations in the perched groundwater zones of 17.8, 2.3, and 1.8 percent of their relative solubilities in water. The EA RAW should be revised to include an analysis of the potential presence of DNAPL in the perched groundwater zone beneath Property 1.

Conclusion

Hi-Shear is optimistic that Torrance and Terraphase will voluntarily supplement or revise the Groundwater RAW and the EA RAW to take into account the above comments without the need for RWQCB intervention. In the event that Torrance and/or Terraphase do not do so, Hi-Shear requests that the RWQCB's comments to the Groundwater RAW and EA RAW take into account the comments herein and direct Torrance to submit revised workplans.

Again, Hi-Shear would like to work collaboratively with Torrance, Terraphase, the RWQCB, and the other Dischargers on the work that needs to be performed to move the Skypark Commercial Properties towards cleanup. As such, and again, Hi-Shear requests that the Los Angeles Regional Water Quality Control Board ("RWQCB") convene a meeting between Hi-Shear, Torrance, and the other Dischargers to discuss the Groundwater RAW and the EA RAW.

Very truly yours,

/s/ Thomas P. Schmidt

DAVID L. EVANS

THOMAS P. SCHMIDT

JEFF POOLE

cc: Hugh Marley
Arthur Heath
Tamarin Austin
Christian Darville
Holly Coates
Steve Van der Hoven; Chris Hammond

City of Lomita, 6/17/2022

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CITY MANAGER

CITY OF LOMITA

June 17, 2022

Mr. Kevin Lin, P.E.
320 West 4th St., Suite 200
Los Angeles, Ca. 90013
Kevin.Lin@waterboards.ca.gov

Dear Mr. Lin:

The City appreciates the efforts of the Los Angeles Regional Water Quality Control Board (Los Angeles Regional Board) related to the matter now referred to as Skypark Commercial Properties Site (Site). The City has reviewed the reports, Groundwater Removal Action Workplan (Groundwater RAW) prepared by Terraphase in 2022 and East Adjacent (EA) Properties Removal Action Workplan also by Terraphase in 2022.

The Groundwater Removal Action Workplan addresses groundwater beneath the Skypark Commercial Properties Site in the City of Torrance and proposes actions to address the Skypark Properties contamination/plumes. The East Adjacent (EA) Properties Removal Action Workplan addresses the plume margin within the Site. These removal actions are designed to achieve the remediation action objectives and the remedial goals, by abating further migration of the plume downgradient into the EA Properties and into the residential areas of Lomita, and reducing the vapor intrusion potential and VOC adverse impacts on water quality.

Following review of the two reports, while the proposed actions will have a positive effect, it does not appear the selected removal actions will adequately achieve the remediation action objectives, be protective of human health and the environment, and lower the observed soil and groundwater impacts to the community in Lomita. Further action is needed, particularly to address the contamination currently present in the City of Lomita.

D.1

The proposed removal method does not address risks posed by contamination (soil vapor and groundwater) already present in the City of Lomita. The most recent maximum TCE and PCE groundwater concentrations recorded beneath the City of Lomita in groundwater monitoring well MW-20 were 2,450 µg/L (490 times the MCL) and 433 µg/L (87 times the MCL), respectively. Also, the portion of the plume existing within the City of Lomita will continue to migrate and degrade the quality of regional groundwater as it moves into “cleaner” parts of the aquifer and away from the source.

D.2

D.3

Inconsistency as to the primary source of soil vapor east of Crenshaw Blvd. in the City of Lomita indicate the sources of VOC soil vapor have not been sufficiently characterized to support selected removal actions. Since characterization of the plume in the workplans are limited, the achievability of the remediation action objectives is questionable.

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D.4

While the Groundwater Removal Action Workplan is directed at regional groundwater impacts and the EA Removal Action Workplan is directed at the on-Site plume, neither the Groundwater Removal Action Workplan nor the EA Removal Action Workplan address the soil vapor impacts (notably PCE, TCE, and 1,1-DCE) that have been observed east of Crenshaw Boulevard, or for the perched groundwater system east-northeast of the EA Properties (i.e., TCE and PCE concentrations above their respective MCLs at monitoring well VP-63; Figure 6 and 7 in the EA Removal Action Workplan). A human health risk assessment (HHRA) should be conducted to identify whether the current soil vapor and perched groundwater conditions pose a potential risk to human health and/or require removal or treatment action.

D.5

While the City supports taking action to prevent further migration of the plume, more is needed to address the contamination at levels well above action levels already present within Lomita. In addition, Lomita has one drinking water production well located within a mile of the currently estimated boundary of the plume. This proximity warrants a greater level of action to address the contamination already in Lomita.

Again, the City appreciates the Los Angeles Regional Board's efforts. Should you have any questions, I can be contacted at (310) 325-7110.

Sincerely,



Ryan Smoot
City Manager

Magellan Aerospace, Middletown, Inc., 6/17/2022



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June 17, 2022

VIA E-MAIL

Mr. Kevin Lin, P.E.
Los Angeles Regional Water Quality Control Board
320 W. 4th Street, Suite 200
Los Angeles, CA 90013
E-Mail: Kevin.Lin@waterboards.ca.gov

Re: Response to Request for Public Comments
May 2022 Project Update and Notice of Opportunity to Comment
Groundwater IRAP

City of Torrance v. Hi-Shear, et al.
USDC Case No. 2:17-cv-07732-FWS-JPR

Dear Mr. Lin:

This letter and the attached memorandum from MK Environmental Consulting, Inc. ("MKECI") are submitted on behalf of Magellan Aerospace, Middletown, Inc. ("Middletown") in connection with the May 2022 request for public comments from the Los Angeles Board of the California Regional Water Quality Control Board ("RWQCB") in connection with the *Project Update and Notice of Opportunity to Comment* on the environmental investigation and the proposed *Groundwater Removal Action Workplan* associated with the Skypark Commercial Properties site, a commercial/industrial area located at 24701 – 24777 Crenshaw Boulevard and 2530, 2540, and 2600 Skypark Drive in the City of Torrance (the "Request for Public Comment on Workplan").

As requested by the RWQCB, these comments are directed at and limited to the "review and comment on the proposed Groundwater IRAP..."

Although this is done and Middletown complies with the requested scope and limit of the public comments, the RWQCB is reminded that Middletown continues to disagree with the conclusions and assumptions which the RWQCB has made, and continues to make, with respect to Middletown and others and with respect to the activities on, occupants at, and uses of the Skypark Commercial Properties site.

For more information on the foregoing, the RWQCB and others are directed to the following:

1. The Petitions and accompanying Memorandums of Points & Authority which Middletown submitted to the RWQCB including those submitted on (a) July 19, 2021 with respect to Cleanup and Abatement Order No. R4-2021-0079, (b) on June 11, 2020 with respect to Investigative Order No. R4-2020-0035, and (c) on February 12, 2020 with respect to Investigative Order No. R4-2020-0003;
2. The reports which MKECI submitted to the RWQCB including the (a) Site Conceptual Model dated September 10, 2021, (b) the Data Gap/Preliminary Site Assessment Workplans dated September 10, 2021 and March 22, 2022, and (c) the other MKECI reports referenced in the attached memorandum;
3. My correspondence to the RWQCB (i) dated January 11, 2021 addressed to Kevin Lin, and (ii) dated March 21, 2022 addressed to Rene Purdy; and
4. The Petitions, Memorandums of Points and Authority and reports submitted by others to the RWQCB.

The above-listed documents are part of the RWQCB's publicly available records, and they are incorporated herein by this reference and made a part of Middletown's public comments on the Request for Public Comments on Workplan.

Recently, it was also brought to our attention that the RWQCB created a different GeoTracker depository (ending with web address T10000014333) for matters pertaining to this Site; this is the only GeoTracker web address identified in the Request for Public Comment on Workplan. This raises concerns about the adequacy of the notice and the opportunity provided to comment. For example, the GeoTracker depository where Middletown posted uploads is at a GeoTracker web address ending with T10000010911. We understand that the RWQCB has not migrated or linked all of Middletown's past uploads to the GeoTracker web address ending in T10000014333. This may be the case for others as well.

Though Middletown is not responsible for the environmental matters which are the subject of the Request for Public Comment on Workplan and it continues to preserve its rights and remedies, it continues to cooperate and to respectfully request that the RWQCB carefully review and consider the comments which Middletown now submits along with the other reports which have been submitted to the RWQCB on behalf of Middletown.

Mr. Kevin Lin, P.E.
RWQCB
June 17, 2022
Page 3

Lamb and Kawakami LLP

Middletown firmly believes that considering the attached comments and the past submittals will help in the development of a cost and time effective solution.

Very truly yours,



Patrick L. Rendón, Esq.

Enclosure

cc: Jillian Ly, RWQCB (Via E-Mail only: jillian.ly@waterboards.ca.gov)
Kevin Lin, RWQCB (Via E-Mail only: Kevin.Lin@Waterboards.ca.gov)
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Steve Van der Hoven, Genesis Engineering & Redevelopment
(Via E-Mail only: svanderhoven@gercorp.com)
Service List for parties in *City of Torrance v. Hi-Shear Corporation*, Case 2:17-cv-07732-DSJ-JPR (Via Case Anywhere)



MEMO: RE: Comments on Groundwater Remedial Action Workplan

June 17, 2022

TO: Patrick Rendon, Partner
Lamb and Kawakami, LLP

FROM: Michael Kinworthy:
Managing Principal

A handwritten signature in black ink, appearing to read 'M. J. Kinworthy', is written over the printed name.

As requested, I have reviewed and am providing comments in response to (a) the May 2022 Project Update and Notice of Opportunity to Comment (“public comments”) from the Los Angeles Regional Water Quality Control Board (“RWQCB”) about the ongoing environmental investigation and the proposed Groundwater Removal Action Workplan associated with the Skypark Commercial Properties located at 24701 – 24777 Crenshaw Boulevard and 2530, 2540, and 2600 Skypark Drive in Torrance, and (b) Terraphase Engineering, Inc.’s (“Terraphase”) report entitled “Groundwater Removal Action Workplan” dated January 31, 2022 (collectively, the “Groundwater RAW”). The Groundwater RAW is currently in the public review process with comments due by June 18, 2022.

The Groundwater RAW proposes remedial actions to be implemented to address impacted regional groundwater emanating from the Hi-Shear Corporation (Hi-Shear) property located at 2600 Skypark Drive and impacting east adjacent properties including 24701-24777 Crenshaw Boulevard (Property 1), 2530 Skypark Drive (Property 2), and 2540 Skypark Drive (Property 3), along with the properties east of Crenshaw Boulevard in Lomita, California. These areas will be referred to as the Skypark Study Area.

As background, on behalf of Middletown, MK Environmental Consulting, Inc. (“MKECI”) submitted a “Preliminary Site Conceptual Model”, dated September 10, 2021, (the “SCM”) to the RWQCB that identified data gaps relevant to characterizing and evaluating the sources, fate, and transport of volatile organic compounds (“VOCs”) that are impacting subsurface conditions beneath Property 1. These data gaps include both gaps in field characterization and gaps in understanding the impacts of remedial activities that have taken place on the Hi-Shear Property on contaminant migration and distribution onto Property 1.

In order to address these issues, on behalf of Middletown, MKECI also submitted to the RWQCB a “Data Gap/Preliminary Site Assessment Workplan” on September 10, 2021 and a “Data Gap/Site Assessment Updated Workplan” on March 22, 2022 (the “Workplans”). The later workplan was updated to incorporate issues presented in the City of Torrance’s proposed “Removal Action Workplan for the East Adjacent Properties (EA RAW). The EA RAW was prepared by Terraphase on behalf of the City of Torrance and submitted to the RWQCB on February 28, 2022.

The only comments from the RWQCB were received yesterday, June 16, 2022, and these were limited to the March 22, 2022 Data Gap/Site Assessment Workplan. Other than yesterday’s comments, the RWQCB has not commented on or approved the documents referred to above or other documents¹ submitted to the RWQCB. The SCM, the Workplans, and other documents which have been submitted on behalf of Middletown discuss in more detail the prior work and data collected at the Skypark Study Area and these documents discuss in more detail various additional issues which continue to be applicable now. The RWQCB is asked to review these reports which have been submitted by Middletown as they form an important part of our public comments, provide valuable context to the additional comments that follow below, and those reports which are publicly available through GeoTracker are incorporated into our public comments by this reference.

E.1

As discussed in the SCM, the Workplans, and the other documents which MKECI submitted to the RWQCB, there are two key conditions which MKECI believes need to be focused on for the further site characterization of Property 1. First, Property 1 is located hydraulically down-gradient to the Hi-Shear Property with respect to the regional groundwater that occurs at a depth of approximately 85-feet below ground surface (“bgs”). Historical trends of chemicals found in the regional groundwater include VOCs and the inorganic ion perchlorate demonstrate a pattern of groundwater plume migration from the Hi-Shear Property to Property 1. A similar condition appears in the perched groundwater migrating from the former Nike Missile Site to Property 1.

Second, a wide-spread, fine-grained (i.e., composed of clay and silt) perching horizon at depths between approximately 50-feet and 60-feet bgs has been identified by numerous reports (BBL, 2001 and GE&R2021) to occur throughout the Skypark Study Area. This includes the area beneath the Hi-Shear Property which slopes towards Property 1 and which has a discontinuity or potential terminus beneath or adjacent to the southern portion of Property 1. Another location is beneath the Nike Missile Site located to the south and southeast of Property 1 which also slopes towards Property 1 and has a discontinuity or terminus beneath Property 1.

¹ Data Gap Workplan”, prepared by MK Environmental, Inc., dated August 21, 2020

“Indoor Air Quality Investigation and Sub-Slab Soil Vapor Sampling Report”, prepared by Frey Environmental, Inc., dated February 11, 2021

“Subsurface Soil and MIP Boring Report”, prepared by Frey environmental, Inc., dated March 19, 2021

“Human Health Risk Assessment Report”, prepared by Environmental Health Decisions, dated September 10, 2021

The EA RAW fails to appreciate and fully consider the two key conditions highlighted above and these are discussed in more detail in the SCM and this, in turn, affects the Groundwater RAW. Past work at the Skypark Study Area is also missing important data that is yet to be developed. The Workplans submitted in September 2021 and March 2022 should provide this important data.

E.2

The EA RAW proposes characterization activities and proposed remedies that affect the properties and similar subsurface media within and adjacent to the Skypark Study Area that are described by and are the focus of the Groundwater RAW. Because the programs and activities described in the EA RAW and in the Groundwater RAW are not mutually exclusive – the activities and potential actions would have direct influence over the entirety of the Skypark Study Area project. The unavoidable integration and effect that the EA RAW has on the Groundwater RAW (and vice-versa) also means that untested assumptions and conclusions in each RAW will likely have detrimental impacts on the Groundwater RAW and, therefore, rather than drawing lines around each RAW these should be integrated for completeness, efficiency, and technical appropriateness. There also is a likelihood that individual remedial actions proposed by each RAW may be synergistic or may be competitive with actions proposed by the other RAW.

E.3

The Groundwater RAW has three stated objectives: (1) reduce the risk of vapor intrusion potential in the residential and commercial properties east of Crenshaw Boulevard by addressing the principal cause of the soil vapor contamination in the area – the VOC-impacted regional groundwater that continues to migrate from the Hi-Shear property; (2) reduce contaminant mass and migration in groundwater at the Hi-Shear property source areas; and (3) achieve water quality objectives in groundwater east of Crenshaw boulevard within a reasonable time frame. In order to meet these objectives, the City of Torrance (“City”) proposes two groundwater remedial options. Based on the existing data, the remedial activities proposed by the Groundwater RAW are not likely to achieve the objectives for the following reasons:

The first remedial option focuses on the cleanup objectives for the properties east of Crenshaw Boulevard. Specifically, the City proposes to install injection points along a portion of Crenshaw Boulevard (approximately 500 feet) where zerovalent iron (“ZVI”) and a bioaugmentation solution will be added into the regional groundwater. Though this is a proven technology, it could degrade the VOC concentrations in groundwater along the area of Crenshaw Boulevard. Additional studies should first be considered to evaluate the effectiveness of this technology and ensure positive performance.

Several issues need to be addressed to evaluate whether this approach will be successful in meeting the water quality objectives east of Crenshaw.

E.4

- A comprehensive site conceptual model and hydraulic analysis of the Skypark Study Areas has not been completed. This is discussed in detail in the SCM submitted to the RWQCB in September 2021. Since the SCM focuses on Property 1, it provides an important base from which to develop an area wide site conceptual model. A hydraulic analysis of the groundwater systems must be performed so that there is an understanding of the estimate of travel time, fate and transport, and anticipated future extent of the impacted area that would be subject to remedial action. Further, the three specific remedies proposed in the Groundwater RAW –

enhanced bioremediation, permeable reactive barrier, and monitored natural attenuation (MNA) – require quantitative hydraulic data for proper design.

E.5

- Referring to the proposed ZVI and bioaugmentation solution as “barrier” may be an overstatement. This technique is in actuality a system of injection points which, in theory, are designed to create a biochemically enhanced zone. The injection points must be uniform in order to be effective and provide the bioremediation to last for the required period of time. If not uniformly constructed – there is a strong likelihood of discontinuities in performance. Specific site conditions also determine whether the proposed system will be effective and the degree of effectiveness. Without the required hydraulic analysis and pilot studies, the appropriate spacing of the injection points and the appropriate volume of ZVI to be injected cannot be determined. The substantial predesign and post monitoring approaches have not been described in the Groundwater RAW and this is an important issue that needs to be determined for the design, cost, and effectiveness of the proposed system.

The design proposes bioaugmentation with a commercial product and the ZVI. There has been no testing of these two components for the area subsurface and no indication of compatibility provided in the Groundwater RAW thus any performance is speculative

E.6

- The migration pathway remains uncertain. For example, the most recent Genesis Engineering and Redevelopment report (“First Triannual 2022 Groundwater Monitoring Report, May 13, 2022) indicates there is a southern perching horizon emanating from the former Nike Missile Site. As noted in the above-referenced MKECI reports, this perched zone should be further defined to determine if this area should be considered for the remedial action along with any areas further to the north of the proposed injection points.
- Further, the location of the injection points along Crenshaw Boulevard will not address the suspected VOC source areas along Amsler Street which are located further downgradient of the injection points.

E.7

- There are potential unanticipated impacts via the transformation of the contaminants and their migration to the residential areas. As recommended in our comments provided to the City on June 15, 2022 on the EA RAW, the geochemistry alteration should be examined prior to implementation the proposed remedial actions. This would entail evaluating the influence of remedial measures performed on the Hi-Shear property during the 2013-2017 time period including both vapor extraction and groundwater bioremediation, to assess the impact of these measures on the fate and transport of contaminants including transformation of primary constituents into degradation products found beneath the EA properties and other properties (further discussed below).

E.8

- This remedial technique will not address the VOC plume in groundwater, soil, and soil vapor that has already migrated to the east of Crenshaw Boulevard. The Groundwater RAW does not propose any cleanup of soil vapor or groundwater east of Crenshaw Boulevard which means that the vapor intrusion risk east of Crenshaw Boulevard will remain. There can be no reasonable projection of contaminant transport or the effectiveness of monitored natural

attenuation (MNA) on the downgradient plume without hydraulic analysis of the existing conditions or assessment of mass flux conditions crossing Crenshaw Boulevard.

The second remedial option proposed is to reinstitute the enhanced in-situ bioremediation (EISB) injections to the regional groundwater at the Hi-Shear property. Numerous groundwater monitoring reports on environmental conditions at the Hi-Shear Property have been published over the past 30 years (e.g., Blasland, Bouck & Lee (1992), Geosyntec Consultants (1995), GSI Environmental (2020), etc.) that have acknowledged the migration of impacted groundwater from the Hi-Shear Property to areas down-gradient including to areas beneath the rest of the Skypark Study Area.

A multi-year groundwater bioremediation program (2013, 2015, and 2017) performed in the central and eastern portion of the Hi-Shear Property eventually involved the use of approximately 77 injection wells for applying a liquid amendment to groundwater intended to promote reductive destruction of VOCs in groundwater beneath the Hi-Shear Property (Alta, 2017). The results of this application appear to have reduced some chemical mass on the Hi-Shear Property. However, the secondary impacts of the remedy application, including incomplete treatment leading to the creation of breakdown byproducts in both soil vapor and groundwater have not been assessed. Additionally, the reduction of concentrations that has been reported for groundwater along the Hi-Shear Property boundary with Property 1 has been characterized by Hi-Shear as indicating that a separate VOC source area exists beneath Property 1 rather than representing the bifurcation of the regional groundwater plume.

Prior to this phase of the project moving forward, it would be beneficial to perform a detailed analysis of the bioremediation pilot tests performed by Hi-Shear through the 2017 time period (see specific comments provided below in this document as to our review of Section 6.1.3 of the Groundwater RAW).

E.9

Middletown agrees that the EISB injections at the Hi-Shear property would meet the objective of further reduction of contaminant mass at the Hi-Shear property. However, the recent GR&E groundwater monitoring reports indicate that additional injection wells may be warranted in order to focus on the areas of the highest concentrations which continue to be at the Hi-Shear property.

The following are additional comments pertaining to specific sections in the Groundwater RAW and these, along with the other public comments that are submitted by others, will likely lead to additional comments which the RWQCB should also consider.

Section 5 – Removal Action Objectives and Goals

E.10

The Groundwater RAW has presented Removal Action Objectives (RAO) that focus on the vapor intrusion risk to the City of Lomita commercial/residential areas and not to the EA properties; however, none of the remedial activities address reducing the already existing subsurface impacts and vapor intrusion risk in the City of Lomita areas.

The RAO for reducing VOCs in the regional groundwater is to achieve maximum contaminant levels (MCLs) with no discussion about risk based or risk management in the Skypark Study Area.

Section 6.1 – Identification and Screening of Removal Alternatives to Address the Plume Margin

E.11

There is no background as to how the four different removal actions were selected and included in a short list. For example, there is no discussion as to why other traditional alternatives (i.e., pump and treat) were not considered or were not more viable options. Middletown suggests providing a more comprehensive discussion that explains the reasoning behind the chosen remedial alternatives; this discussion should include the disadvantages of the other alternatives which were considered.

Sections 6.1.1 and 6.1.2 – No Action Alternative and MNA

E.12

Additional discussion is required to fully explain the commonalities and differences between alternatives “No Action” and “MNA”. MNA is not an active remedy but is a monitoring plan that works to estimate the rate of contaminant reduction and time to regulatory goals. Also, MNA is not intended to be a specific vapor remedy but could be a groundwater remedy in parts of the Skypark Study Area. The RAW should more fully explain why MNA is not appropriate and should be looking at computing the current mass reduction that may be occurring in groundwater already (see discussion above). The final sentence in Section 6.1.2 states that MNA may be used in combination with other remedies; however, this should be discussed with clear detail.

Section 6.1.3 - EISB

The Groundwater RAW states “this technology typically can be maintained for 3 or more years after its application, depending on the geochemistry and substrate to establish EISB conditions.” The document should provide supporting information (i.e., quantitative analysis discussed below) to these claims as to duration of treatment and geochemical influence. A discussion of how the operation will maintain appropriate EISB/geochemical conditions after the injections should be presented.

E.13

The Groundwater RAW indicates that the EISB project on the Hi-Shear property found reasonable success. However, no technical analysis of the Hi-Shear EISB project conducted during the 2013 – 2017 time period has been performed. A quantitative analysis of mass reduction, geochemical conditioning, statistical monitoring, aquifer volume of impact, and impact on transformation product should be developed and presented.

The Groundwater RAW does not provide design details, calculations, quantification of whether an amendment is needed, information on hydraulics that are critical to a successful in-situ remedy application, or calculations of the mass reduction that may occur. Therefore, it is difficult for the public (and others including the RWQCB) to determine if this is an appropriate remedy until the potential benefits and negative impacts are understood.

Section 6.1.4 – ZVI

E.14

Based on the existing information, it is premature to select this remedial option and invest in developing a design based on this selection. The effectiveness of such a system has not been evaluated, including the costs. The site characterization data for the proposed location is incomplete. For example, the Groundwater RAW does not provide any hydraulic data and soil data that the combination of EISB and ZVI will be effective at this location based on its subsurface conditions.

Section 6.2.6 – EISB

E.15

The comments on this section are similar to those provided above pertaining to Section 6.1.3. The Groundwater RAW indicates that the existing 77 dual-nested wells on the Hi-Shear property will be utilized. After five years of being idle, there is no indication that any of the wells are in a usable condition. Also, there is no analysis on whether each of the 77 wells is necessary based on site conditions and there has been no critical analysis (e.g., hydraulic, geochemical, and biochemical) of the Hi-Shear program that ended in 2017. As in our discussion of the EISB proposal along Crenshaw Boulevard, without this information the proposed design, cost, and effectiveness is speculative.

Additionally, there is no discussion regarding how this alternative addresses the DNAPL found on the Hi-Shear site or migration of VOCs onto the site from the former Nike Missile Site.

Section 6.3 – NCP Analysis of Removal Action Alternatives

E.16

The National Contingency Plan (NCP) guidance requests specific analysis and not speculative alternatives. As discussed above, there has been a lack of technical analysis on the proposed alternatives; therefore, an accurate representation of potential effectiveness cannot be completed. A detailed site characterization program followed by technical analysis should be performed before the concepts discussed in the Groundwater RAW are implemented should be a prerequisite and is an important component of guidance with the NCP. A more reasonable and typical approach is to perform pilot/lab studies to assess the effectiveness of a selected remedy taking into account the costs and efficiencies associated with the selected remedy in the context of field data.

As to the discussion of the short- and long-term effectiveness, the Groundwater RAW contains no specific example or analysis to estimate the length of effectiveness of the proposed remedies. The document just states a 5-to-10-year duration without support and, therefore, this seems purely speculative. The discussion does not appear to fully understand effectiveness of ZVI, as ZVI performance and durability is based on numerous factors including ZVI size, aquifer geochemistry, hydrology, and application. ZVI has been shown useful for less than 1 year to over 25 years depending on conditions and design. The Groundwater RAW should complete the analysis before assessing potential effectiveness.

Section 8 – WDR Groundwater Monitoring Program

E.17

The Groundwater RAW proposed performance monitoring program should be enhanced. The WDR Program is insufficient to evaluate performance for the purpose of adjusting the remedy, assessing detailed performance, assessing longevity, and is not remedy specific. The reliance of standard groundwater monitoring for assuring success of the implementation is not sufficient. The Groundwater RAW should rely on the numerous technical guidance documents that have been produced over the years for these remedies.

Hi-Shear (Supplemental Comments), 6/17/2022

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June 17, 2022

VIA E-MAIL ONLY

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HI-SHEAR'S SUPPLEMENTAL COMMENTS TO TORRANCE'S GROUNDWATER REMOVAL ACTION WORK PLAN ("RAW")

**Re: Skypark Commercial Properties
SCP Case No. 1499; CAO No. R4-2021-0079
H&E File No.: 8360.01**

Dear Ms. Ly and Mr. Lin:

On behalf of Hi-Shear Corporation ("Hi-Shear"), this correspondence will serve to provide Hi-Shear's *supplemental* comments to the City of Torrance's ("Torrance") Groundwater Removal Action Workplan ("Groundwater RAW"), which was prepared by Terraphase Engineering, Inc. ("Terraphase") and submitted on January 31, 2022. Hi-Shear provided its initial comments to the Groundwater RAW in correspondence to the Los Angeles Regional Water Quality Control Board ("RWQCB") dated April 25, 2022.

However, since that time, the RWQCB held a telephonic meeting with Hi-Shear, Torrance, and the other Dischargers named in the June 18, 2021 Cleanup and Abatement Order No. R4-2021-0079 (the "CAO") to discuss technical comments to the Groundwater RAW and its implementation. Moreover, shortly thereafter, the RWQCB issued its May 2022 Project Updated

Mr. Kevin Lin
Ms. Jillian Ly
Los Angeles RWQCB

Re: Skypark Commercial – Supplemental Response to Torrance RAW

June 17, 2022

Page 2

and Notice of Opportunity to Comment (“Notice of Opportunity to Comment”), which requested comments on the Groundwater RAW.

Accordingly, for reasons discussed in more detail below, it is Hi-Shear’s continuing position that Torrance’s Groundwater RAW is inadequate, fails to achieve its own stated objectives, and should not be approved by the RWQCB. Instead, Hi-Shear submits that the RWQCB should order Torrance to conduct and submit a comprehensive Feasibility Study that adequately considers and analyzes all potential remedial options, including those discussed below and in Hi-Shear’s original April 25, 2022 comment letter. Only after evaluation of such a comprehensive feasibility study considering all remedial options should a remedial groundwater option be selected.

F.1 **The Groundwater RAW Fails to Consider Viable Alternative Remedial Options**

The Groundwater RAW fails to adequately consider the full range of remedial options available for remediating groundwater at the Skypark Commercial Properties (“SCP”). Indeed, the Groundwater RAW only considers EISB and a zero valent iron (“ZVI”) barrier along Crenshaw Boulevard¹ as remedial options for addressing the leading edge of the SCP plume and only considers pump and treat, thermal treatment, in-situ chemical oxidation, and EISB for remediating groundwater contamination at the Hi-Shear Property.

1. Groundwater Recirculation

As noted in Hi-Shear’s April 25, 2022 correspondence, Torrance’s Groundwater RAW fails to address or consider the installation and operation of a groundwater recirculation cell (extraction and reinjection system) for remediation of groundwater contamination at the SCP. This remedial option would entail the extraction of groundwater along Crenshaw Boulevard, amendment of that extracted groundwater, and reinjection into source areas on the SCP, including at the Hi-Shear Property and the East Adjacent (EA) properties. Hydraulic containment along Crenshaw Boulevard via a recirculation extraction system and reinjection system would not only stop the migration of contaminated groundwater past Crenshaw Boulevard, but would also address multiple source areas at the SCP via reinjection. Indeed, perhaps ironically, figure three of the RWQCB’s Notice of Opportunity to Comment shows a recirculation cell where

¹ As stated in Hi-Shear’s April 25, 2022 comments, the ZVI as proposed by Torrance in the Groundwater RAW does not extend far enough to the north or to the south to properly intercept the entirety of the groundwater plume migrating across Crenshaw Boulevard. Any ZVI barrier that is implemented should extend further north and south to at least MW-21.

Mr. Kevin Lin
Ms. Jillian Ly
Los Angeles RWQCB

Re: Skypark Commercial – Supplemental Response to Torrance RAW

June 17, 2022

Page 3

groundwater is extracted downgradient of the source area, treated, and is then reinjected upgradient of the source area.

While a recirculation cell may entail greater initial capital costs than the ZVI barrier selected by Torrance in the Groundwater RAW, its operation time would be less, resulting in long-term cost savings for maintenance, monitoring and oversight. However, Torrance’s RAW fails to consider a groundwater recirculation cell at all, let alone provide any cost estimate or analysis of the feasibility of such a remedial alternative.

2. Air Sparging

Another remedial option that Torrance’s Groundwater RAW fails to address is Air Sparging and Vapor Recovery (“ASVR”) at the SCP and along Amsler Street. This technique would involve the installation of several horizontal air sparging wells running from the western edge of the SCP groundwater plume to the eastern edge of the plume along with soil vapor extraction systems above those wells located on the SCP and at Amsler Street². These horizontal wells would originate at a single ASVR compound at the western end of the SCP that would house the necessary ASVR equipment, such as an air injection compressor, blower, and treatment vessels.

An ASVR remedial alternative would be well-suited to the SCP since the site’s aquifer and overlying capture zone contain ideal sediments (clean sand) for vapor transmissivity. Furthermore, an ASVR system would also treat the entire groundwater plume in a relatively short amount of time while having the dual benefit of also enhancing soil vapor extraction at the SCP.

Indeed, we note that ASVR has proven to be effective at a nearby site—the Former Honeywell Early Avenue Facility, located at 23215 Early Ave, Torrance, California, which is approximately 1 mile away from the SCP. In summary, the Honeywell ASVR was installed and operated for approximately 6.5 years, from 2015 to 2021. After that period, groundwater VOC concentrations were reduced by approximately 90% on average, with some monitoring wells showing 99% to 100% reductions in VOC concentrations. These reductions show that ASVR can be effective in similar subsurface conditions.

² Hi-Shear is already operating such an SVE system at the Hi-Shear Property and Torrance has proposed the installation and operation of an SVE system at the EA Properties.

Mr. Kevin Lin
Ms. Jillian Ly
Los Angeles RWQCB

Re: Skypark Commercial – Supplemental Response to Torrance RAW

June 17, 2022

Page 4

F.3

Additionally, Hi-Shear conducted a brief air sparge pilot test in 1998 over a 4-hour period. That pilot test resulted in PCE and TCE concentrations decreasing by almost an order of magnitude based on samples collected before and after the pilot study. It took several years for those concentrations to rise back to pre-pilot study levels, showing that even a short 4-hour pilot study could decrease VOC concentrations in groundwater for several years.

The Groundwater RAW fails to address air sparging as a remedial option, despite its successful implementation in a nearby site and a promising pilot study conducted at the Hi-Shear Property.

A Detailed Feasibility Study Is Needed Prior to Remedy Selection

F.4

As noted above and in Hi-Shear's April 25, 2022 comments, Torrance's Groundwater RAW fails to consider several alternative remedial options that are well known and have proven track records of success. As a result, the Groundwater RAW fails to take the steps necessary to insure that the appropriate remedial technology is selected, instead proposing flawed and incomplete remedial options. A comprehensive feasibility study is needed to consider all available remedial options, including a groundwater recirculation cell and air sparging. Such a study is needed not only to insure that the most efficient and effective remedy is selected, but also that the remedy selection process complies with the National Contingency Plan.

The flawed approach proposed by the Groundwater RAW will result in wasted costs, time, and resources, since the EISB injections at the Hi-Shear Property and the ZVI barrier along Crenshaw will not address the entirety of the SCP groundwater plume, meaning that further remedial options will need to be implemented to fully remediate groundwater at the SCP. Given the proposed alternatives discussed above and in Hi-Shear's April 25, 2022 comment letter, it is possible to implement a single remedial option that will comprehensively address the entire groundwater plume and the impacted soil vapor above the plume.

As such, Torrance should be ordered to conduct such a feasibility study prior to the RWQCB's approval of any remedial technology. Such a feasibility study must include, for each viable remedial technology, a detailed analysis of its short-term and long-term effectiveness, anticipated reduction of contamination, viability of implementation, identification of remaining data gaps, cost of operation, and overall impact on the entirety of the SCP Site in soil, soil vapor, and groundwater.

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HAMRICK & EVANS, LLP

Mr. Kevin Lin
Ms. Jillian Ly
Los Angeles RWQCB

Re: Skypark Commercial – Supplemental Response to Torrance RAW

June 17, 2022

Page 5

Conclusion

For all the reasons discussed herein, and in Hi-Shear's comments of April 25, 2022, it is respectfully submitted that the RWQCB should refrain from approving Torrance's Groundwater RAW, and should order Torrance to conduct a detailed feasibility study that properly considers all available remedial options. Hi-Shear continues to stand ready to work collaboratively with Torrance, Terraphase, and the other Dischargers to discuss the remedial options detailed above.

Very truly yours,

/s/ Thomas P. Schmidt

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THOMAS P. SCHMIDT

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Esterline Technologies Corporation, 6/20/2022



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June 20, 2022

BY EMAIL

Kevin, Lin, P.E.
Los Angeles Regional Quality Control Board
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Re: Project Update and Notice of Opportunity to Comment dated May 18, 2022 (“Public Notice”) - Skypark Commercial Properties, 24701–24777 Crenshaw Blvd and 2530, 2540 and 2600 Skypark Drive, Torrance, California (Skypark Study Area) - Comments of Esterline Technologies Corporation

Dear Mr. Lin:

This letter is submitted on behalf of Esterline Technologies Corporation (“Esterline”) in response to the above-referenced Public Notice.¹ It provides the Los Angeles Regional Water Quality Control Board (“RWQCB”) with comments on the Groundwater Removal Action Work Plan dated January 31, 2022, prepared by Terraphase Engineering on behalf of the City of Torrance (the “Groundwater RAW”).

The Groundwater RAW was submitted to the RWQCB pursuant to Cleanup and Abatement Order No. R4-2021-0079 (“Order”), which names the City of Torrance as well as others, including Esterline, as dischargers. Esterline disputes that it was properly named as a discharger in the Order and denies any liability or responsibility associated with groundwater contamination addressed in the Groundwater RAW or any other aspect of the Order.²

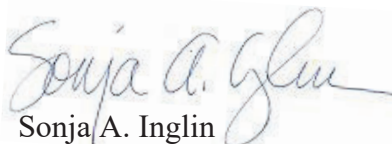
¹ As addressed in our email communications regarding the Public Notice, in that the date listed in the Public Notice for providing comments fell on Saturday, June 18, 2022, the deadline for submitting comments is today.

² Esterline has filed a Petition for Review of the Order which is pending before the State Water Resources Control Board. As addressed in that Petition and in submissions to the Regional Board, Esterline never occupied or conducted operations at any of the properties subject to the Order and denies that it can be named as a discharger based on the activities of a former long-dissolved subsidiary which operated at one of those properties (and whose activities in any event did not cause or contribute to the conditions addressed in the Order).

Notwithstanding the above, and reserving all of its rights and defenses, Esterline is providing the RWQCB with the attached memorandum prepared by Esterline's technical consultant, Scott Warner P.G., C.H.G., C.E.G. of the BBJ Group, LLC ("Memorandum"). The Memorandum contains comments on the remedial measures proposed in the Groundwater RAW and identifies additional data-gathering and analysis that Mr. Warner concludes is necessary to the success and cost-effectiveness of any such measures that the RWQCB adopts.³ As noted in Memorandum, Mr. Warner's comments draw on his specific knowledge and experience with both primary remedial technologies proposed in the Groundwater RAW – the application of groundwater treatment barrier using zero valent iron and the application of enhanced in-situ bioremediation to mitigate chemically affected groundwater.

Thank you for your consideration of Esterline's comments. Mr. Warner is available to meet with you and other RWQCB staff to discuss any questions regarding Esterline's comments.

Sincerely yours,



Sonja A. Inglin

Encl.

cc: Thomas Schmidt, Esq., Hi-Shear (tpjschmidt@gmail.com)
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³ Consistent with this focus, Esterline's comments do not address statements contained in the Public Notice and the Groundwater RAW with respect to Esterline's alleged liability or the operations of its former subsidiary, but that should not be viewed as an admission or acknowledgment that such statements are in fact correct.

Kevin Lin, P.E.

June 20, 2022

Page 3

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MEMORANDUM

TO: Kevin Lin, Los Angeles Regional Water Quality Control Board (LARWQCB)

FROM: Scott D. Warner, P.G., C.HG., C.EG., BBJ Group, LLC (BBJ Group)

SUBJECT: Comments on the Groundwater Removal Action Plan (Groundwater RAW) for the Skypark Project Site in Torrance, California

DATE: June 20, 2022

This memorandum provides comments, on behalf of Esterline Technologies Corporation (Esterline), in response to the Los Angeles Regional Water Quality Control Board's (LARWQCB's) *Project Update and Notice of Opportunity to Comment* dated May 18, 2022 (Public Notice). In the Public Notice, the LARWQCB seeks comments on the January 31, 2022 Groundwater Removal Action Plan (Groundwater RAW) submitted by Terraphase Engineering (Terraphase) on behalf of the City of Torrance (Groundwater RAW) for the Skypark Commercial Properties project located at 24701-24777 Crenshaw Boulevard and 2430, 2540, and 2600 Skypark Drive in Torrance California (collectively referred here to as "the Skypark project site").¹

The Skypark project site is bounded on the east by Crenshaw Boulevard and both residential and commercial property in the City of Lomita and on the south by the Torrance Municipal Airport, on which a Nike Missile Defense facility (not discussed in the Public Notice and known as Nike Missile Site Number LA-57) was located in the 1950s and 1960s. Esterline has been identified by the LARWQCB as a party associated with one of those properties, referred to as EA Property 1 (24777 and 24751 Crenshaw Boulevard).

My comments address the specific groundwater remedies described in the Groundwater RAW - the application of groundwater treatment barrier (sometimes referred to as a permeable reactive barrier, or PRB) using zero valent iron (ZVI) to be located over a 500-foot stretch of Crenshaw Boulevard, and the application of enhanced in-situ bioremediation (EISB) to mitigate chemically affected groundwater under portions of the Skypark project site. Based on the LARWQCB's statements in the Public Notice, I have evaluated these remedies as potential interim remedial measures even though the Terraphase report appears to consider these as final measures. My comments below focus on the additional data required - and not yet developed with respect to the Skypark project site - to understand site conditions and sources and to screen, design and evaluate the performance of interim groundwater remedies. This memorandum also includes comments specific to implementation of ZVI and EISB, as proposed in the Groundwater RAW. Additional comments on specific provisions of the Groundwater RAW are included in Appendix A.

As an initial comment, I want to emphasize that the remedies selected by the GW RAW require detailed analysis of the subsurface hydraulic and biogeochemical conditions to develop a technically effective and cost-efficient design as well as to properly locate the remedies for most effective application. If these

¹ These comments are to provide the LARWQCB with technical input to assist it in evaluating what action to take with respect the Groundwater RAW. It is not intended to comprehensively address those documents, including any specific statements or conclusions that may be in them related to responsibility of Esterline or others for conditions within the Skypark project site.

remedies identified by the GW RAW are selected and implemented without requiring the additional data and analysis, the remedies may fail and if so, certainly would not be cost effective.

Relevant to the comments in this memorandum, BBJ Group, under my technical lead, submitted two documents to the LARWCQB on behalf of Esterline in September 2021 that interpret historical and current site characteristics important to assessing the environmental conditions and identifying and proposing steps to fill data gaps in the understanding of site conditions. These documents were prepared specifically for evaluating conditions related to EA Property 1, but relate to the entire Skypark project area (referred to as the "Skypark Study Area" in the September 2021 reports) and include:

- Preliminary Site Conceptual Model Report, September 10, 2021(2021 pSCM)
- Data Gap and Preliminary Site Assessment Work Plan, September 10, 2021 (2021 Data Gap Work Plan)

Both documents were submitted to the LARWQCB and are available on the Geotracker website.² The information, analyses, and conclusions provided by the reports remain consistent with our current assessment and understanding of the subsurface conditions beneath the Skypark project site,³ including the need to investigate the adjacent former Nike missile property located on the southern boundary of EA Property 1 as a potential source of groundwater contamination within the Skypark project site as part of the data gap investigation proposed by Esterline.

In providing these comments, I have substantial technical background and experience related to the environmental contaminant conditions that affect soil, soil vapor, and groundwater beneath the Skypark project site. I have worked on numerous similar projects over the past 35 years, having designed and implemented a substantial number of site characterization and assessment projects, and having analyzed, selected, designed, implemented, and monitored the performance of remedial actions and technologies that are proposed by the Groundwater RAW. In fact, I have specific knowledge and experience related to both ZVI and EISB, including as a lead on the design and implementation of the very first system in California (and in the country) that used ZVI to treat groundwater, and as the technical lead for a second site that was one of the first in California to apply EISB; both of these sites were affected by the same type of organic contaminants as at the Skypark project site. A copy of my CV is attached.

Need for Additional Site Characterization

The specific "in situ" groundwater remedial actions proposed by the Groundwater RAW, including bioremediation using EISB and the use of a PRB system composed ZVI, require focused and detailed characterization information so they can be properly designed and assessed for their potential success in meeting water quality objectives.

From our review of the Groundwater RAW, the Skypark project site has **NOT** yet been characterized with sufficient detail to select remedies as proposed by the Groundwater RAW nor as consistent with the Water Board's own guidelines under the Site Cleanup Program process that lists as essential the requirement to

² https://geotracker.waterboards.ca.gov/profile_report?global_id=T10000013835

³ The LARWQCB has not yet responded to or provided comments on these reports. Esterline subsequently requested that the LARWQCB approve an updated data gap investigation plan submitted by Magellan Aerospace, Middletown, Inc, following submission of the Groundwater RAW that included the data gap investigation proposed in Esterline's Work Plan. That request remains under submission.

perform a “soil and water investigation to determine the source, nature, and extent of the discharge with sufficient detail to provide the basis for decisions regarding subsequent clean-up and abatement actions.”⁴

The gaps in site characterization data include an incomplete understanding of contaminant sources, including specifically the former Nike Missile site adjoining Property 1 (which is discussed below), and a lack of understanding of the hydraulic and geochemical conditions that affect the migration characteristics, including the direction, fate, and rate of transport, of the contaminants from all potential source areas beneath the Skypark Study site. Furthermore, if contaminant source areas are identified on the former Nike Missile property, the in situ remedies, specifically the PRB proposed for Crenshaw Boulevard, may be insufficiently located and designed for treating this source area.

G.1

Our comments in the following paragraphs highlight numerous reasons why the current level of characterization in a number of respects is not yet sufficient to select or design in situ remedies identified in the Groundwater RAW, in particular, the ZVI barrier. As an example, the success of both primary remedies identified, EISB and PRB – ZVI, are dependent on the hydraulic conditions of the aquifer being treated. There has been extremely limited, if any, reported specific characterization of the physical hydraulic flow conditions (e.g., groundwater velocity, site wide vertical hydraulic gradients, etc.) of the aquifer system in which these remedies would be applied. Additionally, there has been essentially no, or extremely limited reported characterization of the biogeochemical conditions of the aquifer in the areas proposed for the groundwater remedies. Both the bioremediation through EISB and the PRB technologies are geobiochemical remedies themselves and are strongly influenced by ambient conditions and even past remedial efforts (including, potentially, the past bioremediation program implemented at the Hi Shear property). Certain conditions may make selection of these remedies infeasible or uncertain, or may require a substantially different design that would add substantial additional time, more complex logistics, and significant cost to implement at the Skypark Study area. Selection of these remedies, or any remedy for that matter, should not be finalized until the appropriate hydraulic and geobiochemical conditions are more completely assessed. When sufficient site characterization is completed, which could be done expeditiously over just a few months, remedy selection would be substantially improved to the point that interim remedies could be selected and efficiently tested at the Skypark project site to assure performance needs prior to potential full-scale implementation

Another element of the additional site characterization is to require consistent and more comprehensive monitoring of soil, soil vapor and groundwater, as addressed below.

Also, regarding the soil vapor extraction system on the HSC property, as noted in the Public Notice,⁵ as part of a more comprehensive site characterization program, that system should be evaluated not only for “optimization” of its mechanical system but should be subject to additional site characterization to identify potential additional contaminant source areas on the HSC property. The data from the February 2022 SVE Monitoring Report indicates a higher than anticipated mass of contaminants in the influent to the SVE was detected by the monitoring program as reported in the February 2022 report for the 4th Quarter 2021 SVE monitoring program.⁶ No explanation supported by technically defensible characterization data has been provided by HSC as to the source of the higher than anticipated mass. This work should be paramount to assessing efficacy of the system and whether expansion of vapor extraction wells to other areas of the

⁴ https://www.waterboards.ca.gov/losangeles/water_issues/programs/remediation/

⁵ Public notice at page 2, paragraph 2.

⁶ https://www.waterboards.ca.gov/losangeles/water_issues/programs/remediation/

project site should occur. There also has been no evaluation as to the potential additional vapor phase that may have been produced through transformation of contaminants associated with the HSC bioremediation program performed from 2013 to 2017; the LARWQCB should require that a technical evaluation of these actions be performed in concert with the RAW.⁷

Investigation of Former Nike Missile Base as a Potential Source of Groundwater Contaminants⁸

The Public Notice does not mention that the adjacent Torrance Municipal Airport also formerly housed a Nike Missile Defense Site (Site Number LA-57) – located both immediately to the south of EA Property 1 and in part, on property that today is part of South Bay Lexus operations. Based on available records, Nike Missile Sites, in general, included activities that involved the use of chemicals, including chlorinated solvents like trichloroethylene, petroleum fuel compounds, and possibly energetic compounds such as perchlorate⁹ – these are the same list of contaminants that are also being investigated in relation to the Skypark Study area. The further investigation of the former Nike Missile site is being addressed in connection the separate East Adjacent Properties Removal Action Plan (EA RAW), also submitted by Terraphase on behalf of the City, but it is noted here because of the impact that the results of that investigation for purposes of developing interim groundwater remedies.

Historical aerial photographs, including those provided in the Esterline September 2021 Preliminary Conceptual Site Model report, with two examples attached to this memorandum (**Appendix B**) for convenience, show facility use, the location of construction or related debris, storage containers, and missile silos located immediately adjacent and south of the Skypark project site. The Groundwater RAW needs to acknowledge the historical use of the former Nike Missile site (this use is not even identified in Section 2.2 “Adjacent Properties” of the Groundwater RAW) and take into account the information that is observable on the historical aerial photographs as well as in historical documents that are available on the use of the former Nike Missile site and the common practices that the United States implemented for operating these missile defense sites including use of organic solvents, energetics used in fuel for the missile systems, and other materials that are known environmental contaminants.

Even though the Groundwater RAW states that its focus is primarily on the “Hi Shear” source to groundwater and the so-called “Plume Margin”, without completing characterization of the former Nike Missile site to the extent that potential chemical sources, and the conditions that affect the chemical occurrence and migration are evaluated, selection and assessment of interim or final groundwater remedies may not be successful. Further discussion of the former Nike Missile site is included within the 2021 pCSM beginning on page 12, section 2.5.¹⁰

Need for Consistent Monitoring of Soil Vapor, the Soil Vapor Extraction System, and Groundwater¹¹

The Public Notice briefly summarizes the assessment of on-site soil vapor intrusion potential, off-site soil vapor intrusion, and the combined consideration of soil vapor and groundwater monitoring. The LARWQCB states that some vapor intrusion and human health risk assessments have shown that some properties

⁷ Esterline proposed such an evaluation take place in its 2021 Data Gap Work Plan, which is still pending comments by the LARWQCB.

⁸ Public Notice at Page 1, Paragraph 4.

⁹ U.S. Army Corps of Engineers (USACE). 2003. Final Report, Nike Missile Battery Environmental Conditions Assessment Guide. Defense Environmental Restoration Program Formerly Used Defense Sites (DERP-FUDS). July.

¹⁰ https://documents.geotracker.waterboards.ca.gov/esi/uploads/geo_report/4629703104/T10000013835.PDF

¹¹ Public Notice, Page 1, Paragraphs 7 -9.

(e.g., the current South Bay Lexus site) have been shown to have no indoor air issues related to subsurface conditions (see Frey, 2021).¹² However, in the very brief paragraph related to Soil Vapor and Groundwater Monitoring (Paragraph 9 of the Public Notice), it is apparent that consistent monitoring has not taken place, which limits the ability to develop a technically successful and cost-effective approaches to remediation.

G.2

Regular, consistent, and comprehensive monitoring will allow the development of a technically representative site-wide conceptual model, as well as to the identification of data gaps (including complete characterization of the adjacent former Nike defense site) necessary to implement appropriate investigation and remediation plans. Furthermore, the report for recent monitoring of the soil vapor extraction (SVE) system operating on the HSC property¹³ shows an increase in the influent concentrations to the SVE system. This suggests that trends are dynamic and the characterization program should consider such data in evaluating the site and selecting potential remedial approaches. In addition, as discussed below, monitoring specific to evaluate the effectiveness of ZVI or a similar barrier system, as well as for an EISB remedy and other potential in situ groundwater remedies, should also be required.

Perchlorate Should be Included as a Key Constituent¹⁴

G.3

Perchlorate, in addition to being a contaminant, is reported to have been used by HSC as part of its manufacturing activities and is found on HSC property (upgradient of EA Property 1). Perchlorate also is useful as a tracer for characterizing groundwater flow conditions including flow direction and can be useful as a tool in determining potential sources of chemical release to the ground. Perchlorate has also been identified as an issue with respect to former Nike Missile defense site. Therefore, future monitoring and investigation should be required to include identification of perchlorate as a contaminant of concern.

Need to Develop Interim Remedial Goals Supporting the IRAP

The objectives of the Groundwater RAW are stated in Section 1.2, Page 6 of the Terraphase document and include:

1. Reduce the potential for VI risk into the City of Lomita's residential community east of Crenshaw Boulevard by addressing the principal cause of the soil vapor contamination in the area – the VOC-impacted regional groundwater that continues to migrate from the Hi-Shear property;
2. Further reduce contaminant mass and migration at the Hi-Shear Source area to diminish the VOC source, longevity, and on-going growth of the Hi-Shear Plume to achieve water quality objectives within a reasonable time frame; and,
3. Achieve water quality objectives in the regional groundwater (i.e., MCLs) east of Crenshaw Boulevard within a reasonable time frame.

These objectives, which are conventional for managing a site area of this type, are more consistent with **final**, rather than **interim**, remedial objectives, but may not be appropriate at this stage of the project. Rather, we recommend adoption of interim remedial objectives that are achievable in an expeditious

¹² Frey Environmental 2021)

¹³ https://geotracker.waterboards.ca.gov/esi/uploads/geo_report/4841128766/SL204231523.PDF

¹⁴ Page 1, Paragraph 6 of the Public Notice

timeframe and will promote effective progress toward selecting and implementing final management and remedial measures. These recommendations for interim objectives include:

G.4

- Complete site characterization of the Skypark project site, including the former Nike Missile site on the Torrance Airport.
 - Characterization should include both a detailed hydraulic analysis and geochemical analysis of the Skypark Study area and HSC areas. Without performing these activities, there can be no reasonable estimate of contaminant time of travel, fate, and transport; anticipated future extent of the impacted area; and any prediction of success, and the design process itself, cannot be achieved with confidence.
- Complete a site conceptual model for the entire Skypark project site, including off-site areas east of Crenshaw Boulevard to best identify and select remedial alternatives that can meet regulatory objectives for managing and mitigating contaminants in the subsurface. As of now, there has been no regulatory-approved complete site conceptual model for the entirety of the Skypark Study area, including the potential contribution from the former Nike Missile site.

Need for Integration with RAW for the East Adjacent Properties of the Skypark Project Area (EA RAW)¹⁵

G.5

The Groundwater RAW (or IRAP as noted by the LARWQCB) notes that the “Groundwater IRAP does not address the soil, soil vapor or Groundwater at, or beneath” the East Adjacent Properties, that include the Lexus, Dasco Engineering and Robinson Helicopter properties and these items are addressed in a separate plan (the “EA RAW” identified previously in this memorandum) currently under review by the LARWQCB. The two remedial action programs should be integrated, as there are numerous common issues concerning the properties, the contaminants and their distribution, the groundwater hydraulic characteristics, and the eventual remedial alternatives that should be developed together. As noted above, the investigation of the former Nike Missile site is an example of an activity under one plan that impact the other. Separating these programs and addressing them two different plans has the potential to leave one or more remedies vulnerable to inefficient characterization, excessive costs, and more importantly, remedies that may be negatively impacted by opposing technical processes (e.g., a bioremediation solution injected within proximity to a ZVI-based system could result in excessive fouling or hydraulic interference; or a chemical oxidation injection within proximity to an EISB remedy may interfere with each other’s performance). Technical design can avoid potential issues, but the risk is greater if the remedial programs are not integrated. Furthermore, the source areas and contaminant distribution under the entirety of the Skypark Study area has related characteristics and should be evaluated as a single conceptual model and not under separate programs.

Specific Comments on the Proposed Remedies

Below are technical comments about the two remedies described in the Groundwater RAW – PRB – ZVI along Crenshaw Boulevard and the EISB program for “regional Groundwater.” As noted above, additional detailed comments regarding the proposed remedies are provided in Appendix A.

1. The lateral hydraulic gradient has not been defined within the Groundwater RAW with sufficient

¹⁵ Public Notice at [Page 2, Paragraph 1](#)

detail to locate a passive groundwater remedy such as a PRB (for example, the shallow hydraulic gradient shown in Figure 3 of the RAW is shown to be in a direction that is nearly parallel (e.g., North-South) to the proposed alignment of the PRB as shown in Figure 4 of the RAW. A design of this type is more prone to failure because of the insufficient capture of the contaminated groundwater as well as the potential for insufficient contact time with the implemented treatment.

G.6

2. The Groundwater RAW has not calculated, nor reasonably estimated, a groundwater velocity for determining the appropriate spacing, alignment, and composition of either the PRB-ZVI system or the EISB system flow.
3. The Groundwater RAW should provide for completion of a conceptual hydrogeologic model that integrates specific technical information regarding the perching horizons and their potential impact to the EISB and PRB remedies; the stratigraphic cross-sections are provided, but the detailed descriptions of the remedies do not investigate the effect of this geologic structure on the remedy design or performance.
4. The Groundwater RAW only discusses two applied remedies – PRB-ZVI and EISB, with secondary MNA – but does not identify the potential use of in-situ oxidation as a remedy as presented by the EA RAW. The mixing of different remedies needs to be integrated into an overall plan to avoid competition among the remedies where residual or areal impact may affect neighboring remedies and preclude necessary treatment. This also could exacerbate the occurrence and distribution of contaminants that also would degrade the overall system and increase both complexity and cost of the remedial program.
5. The proposed EISB Program for so-called “regional Groundwater” notes the pilot testing of this related technology on the HSC property but does not include a detailed analysis of that program’s impact, effect on adjacent groundwater conditions, or rebound. Such an analysis should be required as a step in implementing it as an interim remedy.

G.7

6. The Groundwater RAW proposes that EISB on the HSC property portion of the Skypark project site in the vicinity of the past 2013-2017 pilot bioremediation program conducted by HSC. Reporting indicates EISB was tested from 2013 to 2017 only on portions of the HSC property and involved the use of over 75 injection wells that applied a bioremediation enhancement solution to the underlying Groundwater. The Public Notice¹⁶ notes that the testing was “successful” but does not clarify that contaminated groundwater had already migrated downgradient from HSC to the EA properties and east of Crenshaw Boulevard and could not be treated by this groundwater remedy. Also, there is a strong indication that the EISB program may have: (1) bifurcated the large groundwater plume into two “apparent” but related plume areas – one beneath HSC and one beneath the EA Properties; and (2) created transformation (i.e., degradation contaminants from the primary contaminants including PCE and TCE) that have also migrated to the EA Properties and beyond affecting groundwater and soil vapor. Furthermore, there is some indication that rebound of the program has occurred with noted increases in target chemicals including TCE. The groundwater monitoring program and analysis, as reported most often by HSC (e.g., see the Geotracker list of available, but infrequent monitoring reports¹⁷) have not addressed these trends with sufficient technical detail or explanation. In particular, increases have been noted in chlorinated VOCs and perchlorate followed

¹⁶ Public Notice at page 2, paragraphs 3 and 4.

¹⁷ https://geotracker.waterboards.ca.gov/profile_report?global_id=SL204231523

G.7

by decrease, and subsequent rebound of concentration levels. Furthermore, the groundwater monitoring reports do not include an analysis of other potential groundwater parameters (e.g., geochemical and biochemical constituents including pH, redox potential and redox-sensitive inorganic constituents, microbial counts in groundwater, etc.) that are typical for assessing bioremediation project performance. If EISB using the same injection wells as during the 2013-2017 program, but an expanded area of application (according the “still in review” EA RAW), a fully comprehensive geochemical and hydraulic evaluation of the 2013-2017 program should be required prior to designing and implementing that program.

G.8

7. The use of ZVI within a PRB is a developed technology that has nearly 30 years of application in treating similar VOCs in groundwater at sites both throughout California, nationally, and globally. Successful and durable performance of the technology requires comprehensive site characterization and design considerations. The ZVI system proposed by the IRAP is **NOT** a continuous barrier but is proposed to be installed using a series of injection wells that would inject a ZVI-based solution to emplace the treatment media.¹⁸

8. The Groundwater RAW also proposes integrating ZVI with EISB and possibly with an augmented bio-culture to increase microbial activity. These latter additions to the ZVI system are design matters that require sufficient background evaluation and testing for successful application and should be first tested in a laboratory or as a small-scale, well monitored field test. ZVI sites that fail do so primarily due to: (1) insufficient hydraulic characterization; (2) insufficient ZVI emplacement (e.g., not enough, wrong location, insufficient vertical or lateral placement), and (3) biofouling or aging that can limit both short-and long-term viability of the system. Also, the proposed design appears to extend from an area where more shallow perched Groundwater and fine-grained sediments may occur (in the south) compared to the northern extent of the proposed alignment along Crenshaw Boulevard, and also from where the level of contamination in the subsurface in the south is not well understood. While the concept of the ZVI barrier system has merit, the site characterization details are insufficient for completing this design, and the Groundwater RAW is not currently comprehensive or targeted enough to provide such detail based on our experience.

G.9

9. For the PRB-ZVI remedy, the Groundwater RAW should also:
 - Develop a multi-level monitoring well network with locations upgradient, downgradient, cross-gradient and within (to the extent practicable) the PRB.
 - Analyze groundwater samples, in addition to the target contaminants, for parameters that can assess PRB performance related to potential mineralization (e.g., general anions and cations), the progress of the treatment process (e.g., dissolved hydrocarbon gases plus dissolved hydrogen) and the standard water quality parameters including dissolved oxygen, redox potential, and pH.
10. Finally, the Groundwater RAW indicates that the two groundwater treatment systems – EISB and the ZVI system - will provide remediation in a reasonable time frame. The Groundwater RAW does not include the results of hydraulic characterization or projected performance information by which such a declaration can be technically defended; we thus request that such analysis be provided. An

¹⁸ Comment 8, Page 2, Paragraph 5.

estimate of projected mass flux reduction through the PRB over time using numerical modeling and the results of hydraulic testing and biogeochemical analysis should be proposed by the Groundwater RAW to help accomplish this objective.

To summarize my comments, the Groundwater RAW's proposed selection of remedial actions for groundwater is premature without completing additional detailed characterization of the project area (i.e., the Skypark project site and adjacent potential source areas including the adjacent former Nike Missile property). The characterization necessary, could be performed expeditiously, and would provide critical information for determining the occurrence, distribution, and characteristics of groundwater contaminants including potential source areas not yet identified. Additionally, the specific "in situ" groundwater remedial actions proposed by the Groundwater RAW require focused and detailed characterization information so they can be properly assessed for their potential success in meeting water quality objectives. Without completing appropriate site characterization activities, remedies could be selected that either are not appropriate for the site, are located incorrectly, or are inadequately designed – each issue would lead to further delays in implementing appropriate remedies and likely significant additional costs. These issues need to be addressed if the LARWQCB is to select cost- and technically-effective interim remedies.

Thank you for your consideration of these comments. I would be happy to answer questions you may have and have a discussion with LARWQCB staff assigned to this project on the issues provided herein. I reserve the right to provide additional comments on these or other project topics at a later date.

Sincerely,



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Appendices

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| Appendix A. | Additional Detailed Comments on the Groundwater RAW (IRAP) |
| Appendix B. | Selected Historical Aerial Photographs for the Skypark Project Area Site |
| Appendix C. | Curriculum Vitae for Scott Warner |

Appendix A: Additional Detailed Comments on the GROUNDWATER RAW (IRAP)

The following are specific comments on the Groundwater RAW document itself. The following specific comments address the Sections that focus on the proposed remedial plans beginning with Section 5, Removal Action Objectives and Goals.

Comment A1. Page 16 – Section 5

G.10

We note that the stated remedial action objectives (RAOs) focus on vapor intrusion (VI) risk to property east of Crenshaw Boulevard that result from the principal cause of the VI risk. However, the source of VI risk to this area east of Crenshaw Boulevard has not been completely determined. This part of the Groundwater RAW should be clarified and be updated with a statement that upon completion of the study area characterization and development of the site conceptual model, an appropriate remedial plan based on site specific remedial action objectives can be developed.

Comment A2. Page 17 – Section 6

The rationale for selecting the four different proposed removal actions:

- No Action Alternative
- Monitoring natural attenuation (MNA)
- Enhanced in situ bioremediation (EISB)
- Zero-valent Iron (ZVI) barrier

has not been presented. Except for the automatic inclusion of the “no action alternative” we recommend that additional detail be provided that indicates how these remedies were determined as most appropriate for initial consideration to meet the stated remedial objectives.

Comment A3. Page 17 – 21 - Section 6.1 (6.1.1 – 6.1.6), Identification of Removal Alternatives.

G.11

- (A3a) For both the No Action and MNA alternatives, we recommend including additional background that more completely describes the commonalities and differences of these remedy approaches.
- (A3b) *Section 6.1.2.* MNA is not an active remedy but is a comprehensive monitoring program that works to estimate the rate of contaminant reduction and time to regulatory goals. Regarding MNA, we have several comments:
 - MNA should be retained as a primary management approach (i.e., it should not be eliminated) as it may appropriate for dilute, low concentration areas of contaminant impact.
 - MNA also is NOT intended to be a specific vapor remedy but could be a groundwater remedy in parts of the study area. The last sentence of section 6.1.2 states that MNA may be used in combo with other remedies, which we agree. We recommend that this use of MNA be emphasized earlier in the section.
- (A3c) *Section 6.1.3.* The description of EISB should be enhanced. We recommend including a definition that is based on the state of the practice, such as: *enhanced bioremediation relies on*

improving the environment for microbial reduction of contaminants by adding nutrients to the groundwater conditions and MAY / MAY NOT also apply non-native microbial cultures. The RAW indicates that EISB commonly is augmented by biological culture addition, but this is not correct. Augmentation is primarily used if characterization of the subsurface microbial conditions indicate that augmentation is necessary and pilot testing or other quantitative site analysis is performed. No such analysis has yet been performed at this site. We therefore recommend clarification of the description in this section.

- (A3d) The last paragraph on Page 18 states “this technology typically can be maintained for 3 or more years after is application, depending on the geochemistry and substrate to establish EISB conditions.” The Groundwater RAW does not provide supporting information to these claims; we recommend that descriptions of both the potential duration of treatment and geochemical influence are enhanced and that the issues that may limit remedy performance (effectiveness and duration) are described. Please consider adding project examples, quantitative analysis, and any other supporting information. From our experience, we know inadequate performance of similar methods can occur due to incomplete characterization or not considering future changes to the site conditions. Please also add methods that would be used to maintain appropriate EISB / geobiochemical conditions after the remedy application.
- (A3e) On Page 19, the Groundwater RAW claims success from the EISB at HSC. A technical analysis of the 2013-2017 program including assessment of mass reduction, geochemical conditioning, statistical monitoring, aquifer volume of impact, and impact on transformation product (secondary VOCs) development should be added.
- (A3f) Throughout Page 19, the Groundwater RAW proposes facts that are not yet developed including the potential need to use a specific commercial bioaugmentation culture, the specifics of selecting the plume margin zone of a “EISB Barrier” along Crenshaw, the need to have a specific number of injections (5) over a specific time frame (14 years), and then a specific cost. Please include design details (even if preliminary), calculations, and justification for whether a biological augmentation is needed. Also, please include the hydraulic characterization analysis that is a necessity for designing and implementing a successful in situ remedy application.
- (A3g) Section 6.1.4. Page 20 – ZVI. The opening statement under 6.1.4 intended to describe the reaction from zero valent iron (ZVI) that promotes contaminant mitigation in groundwater is incomplete. An established publicly available guidance (e.g., from the Interstate Technology Regulatory Council – ITRC,¹⁹ for example) should be used. Note that ZVI is produced in nano to macro size and is also installed without slurry material for placement. Also, the reaction to reduce contaminants occurs both directly through surface reactions and indirectly via biological enhancements. The statement implies that it is only “hydrogen” that promotes cVOC transformation – this is not correct, though the creation of dissolved hydrogen through the ZVI corrosion process is an enhancement for biologically-mediated reactions.
- (A3h) The Groundwater RAW does not include remedy-specific site characterization data to defend the choice of remedy, its proposed design, effectiveness, or cost. Comprehensive site hydrogeological and chemical data has not been collected from the proposed remedy alignment,

¹⁹ <https://itrcweb.org/teams/projects/permeable-reactive-barriers>

thus estimated cost may be significantly inaccurate. The statement. “A ZVI remedy, with EISB substrates, will be protective of human health and the environment, comply with RAOs, and be effective in the short and long term” is not yet established based on the existing site data, or supporting laboratory and/or pilot tests. Also, there is no specific data presented by the Groundwater RAW that integrates EISB with ZVI potential application at this field site. A treatment barrier along this alignment not designed using site specific hydraulic data may likely have a high degree of uncertain performance or would have to be substantially oversized (at great cost) to increase potential performance success.

Comment A4. Page 22 – Section 6.2.3 – Groundwater Pump and Treat (P&T)

The discussion regarding the potential viability of this technology should include more discussion and clarity regarding the choice to not retain this alternative. Although the document correctly notes that P&T does not typically treat groundwater to MCLs, the method can be quite effective, if designed with site specific hydraulic data, to capture and contain affected water and prevent it from migrating downgradient. Also, the method can create a hydraulic capture that in some cases can be effective for allowing downgradient resources to slowly recover. While P&T may not be a final remedy, the Groundwater RAW should more fully examine the specific technical detail for comparing this to the other remedies and not just discard the alternative without being analyzed.

Comment A5. Page 24-25 – Section 6.2.6 - EISB

Similar comments to the previous discussion, with additional notes. The Groundwater RAW proposes to rely on the existing (?) 77 dual nested injection wells on the HSC site. However, there is no indication that these wells still are in usable condition. There also is no analysis stating that each of the 77 locations are necessary based on site conditions, and there has been no critical analysis (hydraulic, geochemical, biochemical) of the HSC program that ended in 2017. Without this information and critical analysis, the proposed design, cost, and effectiveness is highly speculative and should not be used with any certainty. Please complete the analysis to allow a more comprehensive examination to occur.

Comment A6. Page 25 – Section 6.3 – Removal Action Alternatives

This entire section appears to be incomplete with respect to describing the technical information important to remedy selection as required by the NCP. NCP guidance requests specific analysis and not just highly speculative qualified statements that support selection criteria for remedy alternatives including analysis of long-term effectiveness and performance, short-term performance, and ability to reduce toxicity, mobility and/or volume reduction through treatment. The Groundwater RAW does not include sufficient technical analysis on the proposed alternatives, therefore, an accurate representation of potential effectiveness cannot be completed. We recommend inclusion of **interim remedial objectives** such as a detailed site characterization program, followed by analysis (and possibly in parallel with pilot or lab studies to assess remedy selection) be performed. Otherwise, the projections of performance success and cost are highly speculative.

Comment A7. Page 27 – Section 6.3.1.1 – Discussion on Long and Short-Term Effectiveness of the Remedies

The Groundwater RAW contains no specific example or analysis to estimate the length of effectiveness of the remedies. The Groundwater RAW also does not appear to fully describe the known effectiveness

characteristics of ZVI for which performance and durability is based on numerous factors, including ZVI size, aquifer geochemistry, hydrology, and application. The statement that purports a “5- to 10-year duration” is not technically sufficient as sufficient information on this technology could be integrated with existing site data or estimated new site characterization information to develop a more rigorous analysis and estimate of potential longevity using projected design needs. Examples of ZVI performance in an application ranges from less than 1 year (where design flaws have occurred) to over 25 years for early applications.

Comment A8. Page 30 – Section 6.3.2.1

The statement under Long-Term Effectiveness that “*EISB, provides a moderate level of long-term effectiveness by reducing VOCs in groundwater [and will require] repetition [of injections] until VOC concentrations are reduced to acceptable levels*” should be clarified as being speculative until site specific information is analyzed and evaluated. There also is no data supporting the statement for this site that “*EISB provides good coverage due to its mobility with water.*” We recognize that HSC has already installed numerous (77) EISB injection wells for past use, however, there is no information provided showing that these wells remain viable and usable for the proposed new EISB program. The Groundwater RAW should include a program to assess the former injection wells for potential use and offer an alternative program in case such wells are not available due to their condition.

Comment A9. Page 32 – Section 6.4.1 – Plume Margin

The Groundwater RAW proposes a 500-ft long combined ZVI, EISB, MNA remedy only along Crenshaw Bl. While each of the remedy components have been used and proven as successful stand-alone remedies at other sites for several decades, the Groundwater RAW has not provided a detailed analysis of the site characteristics, contaminant occurrence and distribution along Crenshaw, and hydraulic evaluation, performance and design needs to assure this to be a successful remedy alternative. The proposed remedy is a complicated system that also would not directly affect any significant downgradient contaminant impact. The Groundwater RAW also does not include data-based projections on longevity specific to the Skypark study area characteristics. As described by the Groundwater RAW, the proposed remedy implantation would not create a physical “barrier” per se but rather a geo-biochemically enhanced aquifer zone. Injected ZVI systems are not likely to be uniform in construction – this could lead to discontinuities in performance. Substantial effort for predesign and post monitoring network design approaches would be necessary and is not described by the Groundwater RAW. The GROUNDWATER RAW proposes the inclusion of bioaugmentation with a commercial product combined with ZVI. There has been no testing of these two components and any performance is overly speculative. There is no indication of compatibility provided by the Groundwater RAW.

Comment A10. Page 38 – Section 7.3 – Fieldwork Preparation and Permits

Crenshaw is a highly traveled busy highway. Extreme caution must be provided particularly for remedy construction as proposed by the Groundwater RAW. Pressure injection methods (for ZVI) also must first be tested to assure safety and compatibility with all infrastructure.

G.12

The Groundwater RAW should include a remedy specific detailed verification and performance monitoring program. The WDR program is insufficient to assess remedy performance for the purposes of adjusting the remedy, assessing detailed performance, assessing longevity, and is not remedy specific. The EISB and ZVI remedies rely on more than “standard” Groundwater monitoring for assuring success of the implementation. The Groundwater RAW should rely on the numerous technical guidance documents that have been produced over the past 20 years for these remedies. There is no indication that such as been relied on.

APPENDIX B

SELECTED HISTORICAL AERIAL PHOTOGRAPHS FOR THE SKYPARK PROJECT AREA SITE

SOURCES: AERIAL PHOTOGRAPH PROVIDED BY EDR AERIAL PHOTO DECADE PACKAGE ON MARCH 11, 2021.



LEGEND

--- APPROXIMATE PROPERTY LINE



0 430
APPROX. SCALE IN FEET

1989 HISTORIC AERIAL
24777 CRENSHAW BOULEVARD
TORRANCE, CALIFORNIA

APPENDIX

B-1

SOURCES: AERIAL PHOTOGRAPH PROVIDED BY EDR AERIAL PHOTO DECADE PACKAGE ON MARCH 11, 2021.



LEGEND

--- APPROXIMATE PROPERTY LINE



0 470
APPROX. SCALE IN FEET

1994 HISTORIC AERIAL
24777 CRENSHAW BOULEVARD
TORRANCE, CALIFORNIA

APPENDIX

B-2

APPENDIX C

CURRICULUM VITAE FOR SCOTT WARNER

Education

B.S., Engineering Geology
University of California,
Los Angeles, 1983

M.S., Geology –
(Hydrogeology),
Indiana University, 1986

PhD Candidate – Enviro.
Remediation/Climate
Impact (In Progress/Part
Time), University of
Newcastle, Australia,
2019-Present

Professional Registration

Professional Geologist,
Certified Hydrogeologist,
Certified Engineering
Geologist – California

Licensed Geologist /
Hydrogeologist –
Washington

Professional Associations

American Bar Association

Groundwater Resources
Association of California

SF Bay Planning Coalition

Board Positions Held

American Bar
Association – Vice Chair
Water Resources
Committee

Bay Planning Coalition,
San Francisco (BPC) –
Board of Directors,
Former President

GENERAL CAREER BACKGROUND

Mr. Warner is a globally recognized environmental consultant with expertise in contaminant and site assessment, innovative remediation design, geochemistry, water resources protection, and litigation support. For approximately 35 years, his focus has been in groundwater and soil characterization and remediation, hydrogeology, hydrochemistry/geochemistry, water resources management, litigation support and expert witness assignments, policy and regulatory (including NCP, RCRA, CERCLA) review, and engineering geology. Work has been performed on behalf of industrial, agricultural, energy, waste and landfill, and private party and government organizations throughout California and North America as well as in Denmark, England, Scotland, Brazil, Hong Kong and Australia. Mr. Warner has provided lectures and short courses often and for both professional organizations and at academic institutions. He was a codeveloper and instructor for past State and US EPA led courses on innovative groundwater remediation using permeable reactive barrier (PRB) approaches developed by the US Interstate Technology Regulatory Council (ITRC) and Remediation Technology Development Forum (RTDF) and was a primary developer and lecturer for the CRC CARE (Australia) courses on site investigation and remediation.

REPRESENTATIVE EXPERTISE

Mr. Warner has worked on environmental and water resource matters for clients in the energy, food/beverage, manufacturing, mining, transportation, agriculture, recreation, government, legal, insurance, financial, and water supply communities.

For environmental projects, Mr. Warner has provided characterization, assessment and mitigation, and regulatory/policy support for soil, rock, surface water and groundwater sites impacted by legacy, chronic and catastrophic releases of inorganics and metals (including, but not limited to chloride salts, PCBs, lead, nickel, chromium, nitrate, sulfate, arsenic and radionuclides), petroleum hydrocarbons (including crude oil, benzene, toluene, and related additives including MTBE), chlorinated volatile organic compounds (including PCE, TCE and related degradation products), inorganic oxidizers (including perchlorate) and solvent stabilizers (such as 1,4 dioxane) and is involved in research into remediation alternatives for polyfluoroalkyl substances (PFAS) and related compounds.

Since 1991, Mr. Warner has specialized in the design, installation, and evaluation of numerous in situ groundwater remedies such as permeable reactive barriers (PRBs) and geochemical-based remediation at various sites including the first commercial site in California (1994) and a government site in New York (2011) that received the National Ground Water Association's Outstanding Remediation Project Award for a PRB site in New York USA.

For water resource projects, he has designed new and assessed aging water resource production wells, developed capture zone plans, and has assisted transaction projects involving assessment of water resource reliability and sustainability for food and beverage, recreation and manufacturing facilities in the US and internationally.

GEOGRAPHICAL EXPERIENCE

Mr. Warner's history includes work with most EPA Regions and numerous state regulatory agencies. He has worked on projects using Brownfield and/or voluntary cleanup regulations and state Superfund programs as well as provincial, territory, or country-specific regulatory programs. He has worked on sites in many U.S. states (including but not limited to Alabama, Arizona, California, Colorado, Georgia, Hawaii, Idaho, Illinois, Kentucky, Indiana, Michigan, Minnesota, Montana, Nevada, North Dakota, New York, Ohio, Oregon, Tennessee, and Washington), and in Australia, Brazil, Canada, Denmark, England, Hong Kong, Scotland, Sweden, Switzerland, and The Netherlands.

EXAMPLE PROJECTS (NOT LIMITED TO)

- Technical lead for numerous PRB-type projects including, but not limited to, the first-in-the-world PRB installation using zero valent iron in northern California in the early-mid 1990s, a dual PRB system for TCE and perchlorate in the 2000s and project director and lead designer for a PRB remedy site in western New York that received the 2011 Outstanding Groundwater Remediation Project Award from the National Ground Water Association for removal of radioactive strontium-90.
- Development/evaluation of landfill sites, including RCRA permits, statistical analysis, groundwater monitoring, and remedial approaches for facilities in: CA, AL, KS, OR, OK, WA, IL, HI, NV, ID, MI and Hong Kong.
- Expert witness support for assessing the effect of brine and petroleum releases to the soil and groundwater from energy resource work and saltwater well disposal activities, and the subsequent remedial efforts and cost of restoration for large agricultural property in North Dakota.
- Lead hydrologic consultant for assessing groundwater conditions in the Mono Lake/Owens Valley, California area related to air quality management projects along the Los Angeles Aqueduct system.
- Forensic evaluation of soil, surface water and groundwater remedial measures and performance for major contaminant releases from train derailments in Alabama and Ontario, Canada, manufactured gas plant sites in northern California, and a major refinery site in southern California.
- Water resource availability and reliability assessment for ski & swim facilities in 17 US States and Canada; assessment of water resource stress conditions for 30 global manufacturing sites; evaluation of long-term water availability for beverage making in low water drought environment.
- Lead consultant assessing source and migration of VOC impact to soil, soil gas and groundwater beneath multiple PRP site involving manufacturing, aerospace, and defense sites in southern California.
- Multi-property MGP site assessment including occurrence and distribution of contaminants, historical infrastructure review, shoreline conditions, remedial actions, regulatory review, and cost allocation.
- Evaluation of groundwater/surface water interaction and transport of

pesticide chemicals from source areas into a sensitive major riverway, northwest Oregon.

- Principal investigator for natural hazard assessment (earthquakes, tsunamis, lava flow and air quality impact) using GIS and large data set analysis for a large coastal property Hawai'i County, Hawai'i.
- Lead investigator for development of innovative groundwater restoration methods for treating inorganic contamination (perchlorate, chromium, excess TDS) at a major former manufacturing site near Las Vegas, Nevada.
- Evaluation of PCB impacts in areas of potential residential use (Northern California) and where impacted water is used as water supply (Hudson River Valley, New York).
- Closure plan evaluation for a Rocky Mtn. copper mine with consideration of impact from long-term climatic change to slope and pit lake characteristics.
- Development of sulfate-reduction technology for groundwater adjacent to an active large iron mine site in northern Minnesota.
- Site assessment, investigation, and regulatory document development for radioactive waste repositories in various states.
- Review and analysis of water rights and long-term water resource security and sustainability for food/beverage, commercial manufacturing, and recreation sites in California (including Central Valley agricultural, mountain, and coast range sites) and numerous U.S. States (e.g., Washington, Colorado, Utah, Vermont, New Hampshire, New York, Oklahoma, etc.) related to property/business transactions.
- Site response, site characterization, remedy design and implementation, and regulatory support for major catastrophic releases as well as legacy tank releases of petroleum (crude and refined product- and including additives such as methyl tertiary butyl ether [MTBE]) at numerous pipeline, terminal, and distribution sites in California, and tank releases in California and Montana, USA.
- Expert witness support for remediation assessment at a chemical manufacturing/storage facility in Georgia.
- Deposition testimony regarding the impact of site characterization on PCE contaminant distribution and remediation in southern California.
- Arbitration support regarding environmental claims of impact and investigation and review of regulatory actions, including NCP compliance, for Manufactured Gas Plant sites in northern California.
- Trial (by jury) and deposition testimony as expert in hydrogeology, and fate and transport of chlorinated hydrocarbon compounds, including PCE and TCE:, CERCLA, hydrogeology, aerial photographic interpretation of waste storage and environmental conditions, historical forensic evaluation of the source, chlorinated hydrocarbon fate and transport, chemical source area field characterization and review of regulatory actions.

PUBLICATION SHORT LIST

- Warner, S. D.** and Ritchie, C.J. 2022. The Practitioner's Perspective of Zero-Valent Iron as a Pragmatic Media for Contaminant Remediation: It's not 1995 Anymore! 12th Annual Conference on Remediation of Chlorinated and Recalcitrant Compounds. Battelle Memorial Institute, Palm Springs, California, May 2022.
- Newell, C. J., DiGuiseppi, W. H., Cassidy, D. P., Divine, C. E., Fenstermacher, J. M., Hagelin, N. W., Thomas, R. A., Tomiczek III, P., **Warner, S. D.**, Xiong, Z (J), AND Hatzinger, P. B. 2022. PFAS Experts Symposium 2: Evolution from past to present, current efforts, and potential futures. Remediation Journal, <http://10.1002/rem.21705>
- Naidu, R., Nadebaum, P., Fang, C., Cousins, I., Pennell, K., Conder, J., Newell, C.J., Longpre, D., **Warner, S.**, Crosbie, N.D., Surapaneni, A., Bekele, D., Spiese, R., Bradshaw, T., Slee, D, Liu, Y., Qi, F., Mallavarapu, M., Duan, L., McLeod, L., Bowman, M., Richmond, B., Srivstava, P., Chadavavada, S., Umeh, A., Biswas, B., Barclay, A., Simon, J. and P. Nathanail. 2020. Per and polyfluoroalkyl substances (PFAS): Current status and research needs. *Environmental Technology & Innovation* V. 19, 18p. <https://doi.org/10.1016/j.eti.2020.100915>
- Warner, S.D., Bekele D.N., and P. Hadley (2019). Sustainable Remediation: Integrating Risk, Science, and Sustainability Principles. Ency. Sustainability of Science and Technology. https://doi.org/10.1007/978-1-4939-2493-6_55-5
- Rowe, D., Greene, G., **Warner, S.** and Gimre, K. 2017. Remediation and water resource protection under changing climatic conditions. *Environmental Technology & Innovation*, 8 (2017) pp. 291-298. <http://dx.doi.org/10.1016/j.eti.2017.07.008>
- Warner, S.D., 2015. Two Decades of Application of Permeable Reactive Barriers to Groundwater Remediation in *Permeable Reactive Barrier Sustainable Groundwater Remediation*; Naidu, R., Birke, V., Eds, pp.25-39.
- Henry S. and **Warner S.** 2003. *Chlorinated Solvent and DNAPL Remediation: Innovative Strategies for Subsurface Cleanup*. ACS Symposium Series 837, American Chemical Society, 330 pp. January.S
- Sorel D., **Warner S.**, Longino B., Honniball J., and Hamilton L. 2003. *Performance Monitoring and Dissolved Hydrogen Measurements at a Permeable Zero Valent Iron Reactive Barrier*. In Chlorinated Solvent and DNAPL Remediation: Innovative Strategies for Subsurface Cleanup, ACS Symposium Series 837, American Chemical Society, pp. 278-285. January.
- Warner S., Yamane C.L., Gallinatti J.D., and Hankins D.A. 1998. *Considerations for Monitoring Permeable Ground-Water Treatment Walls*. Journal of Environmental Engineering (ASCE), v. 124, no. 6, pp. 524-529.

Warner S., Szerdy F.S., and Yamane C.L. 1997. *Permeable Reactive Treatment Zones: A Technology Update*. 12th Annual Contaminated Soils Conference, University of Massachusetts, Amherst, MA. October 22, 1997, p315-327, in Calabrese, E.J., P.T. Kostecki, and M. Bonazountas, (eds) Contaminated Soils, Volume 3, p. 315-327.

Warner S. and Szerdy F. 1995. *Design and Evaluation of an In-Situ Ground Water Treatment Wall Composed of Zero Valent Iron*. Ground Water, v. 33, no. 5, pp. 834-835.

Gallinatti J.D. and **Warner S.** 1994. Hydraulic Design Considerations for Permeable In Situ Groundwater Treatment Wells. AGWSE Educational Program, Groundwater Remediation: Existing Technology and Future Direction in Groundwater, v. 32, no. 5, p. 851.

Warner S., Krothe N.C., Solomon G.C., and Steinkampf W.C. 1986. *Modeling the Geochemical Evolution of Groundwater within the Grande Ronde Basalt, Columbia Plateau, Washington*. (Abs.) Geo. Soc. America Abs. with Programs, v. 18, p. 782. 1986.

SELECTED PRESENTATIONS

Battelle Conference on Innovations in Climate Resilience – “The Anthrohydrologic Conceptual Model for Groundwater Remedy Design.” March 29-30, 2022, Columbus, Ohio.

Radio ABC (Australia) radio broadcast – “Cleaning up chemical contaminants” <https://www.abc.net.au/radionational/programs/bigideas/cleaning-up-chemical-contaminants/11533770>

CRC CARE Short Course – From Risk to Remediation. March 4-8, 2019, Newcastle, NSW Australia

Halfmoon Short Course – Legal Considerations in Water Resources, February 2019, Sacramento, CA

ITRC Web based courses on Permeable Reactive Barrier Technology – Numerous deliveries between 2000 and 2010 attracting over 2000 students globally.

RTDF Short Courses on Permeable Reactive Barrier Technology, 12 Cities (EPA Lead Cities plus Northern California and Southern California). Sponsored by States and EPA. February 1999 – November 2000

Academic presentations given at: Stanford University; University of California, Berkeley; University of Ferrara, Italy; State University of New York, Buffalo; Oregon Graduate Institute; Colorado State University; University of Nevada, Las Vegas; California State University, Maritime; Indiana University, Bloomington; University of Newcastle, Australia

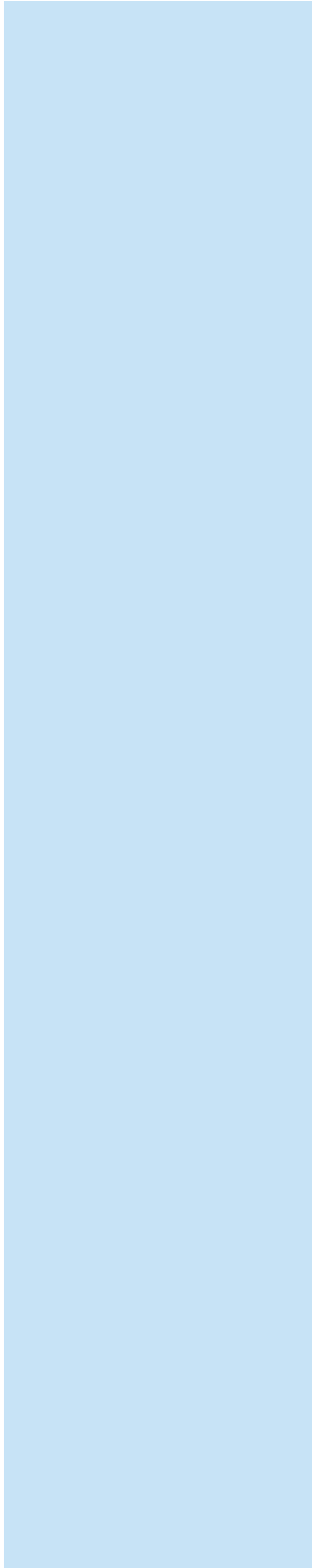
LITIGATION EXPERIENCE

Mr. Warner was qualified as an expert in hydrogeology and remediation for cases (involving petroleum hydrocarbon and fuel constituents and chlorinated solvent chemicals) with the Court of Federal Claims (expert testimony at a jury trial for over 11 hours) and the Federal District Court of Northern California (expert testimony at a bench trial for more than 4 hours) and served as an expert, including testimony, in front of an arbitration tribunal in Amsterdam, The Netherlands. Some examples of litigation, trial, and resolution and deposition experience are listed here:

- Expert witness support for evaluating the performance of remedy applications for VOC affected groundwater (Superfund Case, New Hampshire – ongoing project CONFIDENTIAL). (2020 – 2021)
- Expert witness support for evaluation of VOC impact to soil, soil gas, and groundwater, and chemical fate and migration beneath multiple responsible party case for industrial/aerospace sites (Southern California, ongoing project CONFIDENTIAL). (2019 – 2021)
- Expert witness support for assessing the effect of brine and petroleum releases to the soil and groundwater from energy resource work and salt water well disposal activities, and the subsequent remedial efforts and cost of restoration for large agricultural property in Bottineau County, North Dakota. *D. Peterson and C. Peterson v. Petro Harvester Operating Company, LLC, District Court, Northeast Judicial District, State of North Dakota, County of Bottineau, Civil No. 05-2016-CV-00073*. (2018)
- Arbitration expert report and testimony for an international dispute involving remediation costs of specialty chemical/contaminant components, approaches, and regulatory process related to RCRA and State Response. *ChemicalInvest Holding B.V. and Fibrant LLC v. Koninklijke DSM NV*, Netherlands Arbitration Institute NAI 4464 (2017)
- Expert witness support for remediation assessment at a chemical manufacturing/storage facility in Kennesaw, Georgia. *Davis v. Baychem et al.* Superior Court of Cobb County, Georgia, Civil Action No. 16-1-2518-99 (2017).
- Deposition testimony regarding the impact of site characterization on PCE contaminant distribution and remediation, southern California. *Goldberg v. Goss-Jewett, Inc., et al (Intervenors) v. Pacific Engineering; and PPG Industries*. US District Court Central District of California Case 5:14-CV-01872-DSF (SHx) (2016).
- Deposition testimony regarding the remediation of inorganic constituents (perchlorate and lead) beneath a propellant device manufacturer in Mesa, Arizona. *Nammo Talley, Inc. vs. Allstate Insurance*, United States District Court, District of Arizona, Case No. CV-01007-PHX-GMS (2014).
- Expert witness support, assessment of petroleum impacts at a petroleum

(crude) tank farm in Cut Bank, Montana, *Sundquist, et al v. Ashland, Inc./Black Eagle LLC*, Case No. CV 13-00075-DLC-RKS, United States District Court for the District of Montana, Great Falls Division (2014).

- Expert witness/litigation support on behalf of a large timber mill in coastal northern California relating to history of chemical releases, remediation, and regulatory approach including review of NCP compliance and CERCLA related responses.
- Expert witness review and report development for assessing the fate and migration of PCBs along a river stretch in New York State and potential impact to shoreline aquifer and water resource collection systems for a small town alongside the river.
- Arbitration support regarding environmental claims of impact and investigation and review of regulatory actions, including NCP compliance, for Manufactured Gas Plant sites in northern California (2013).
- Trial (by jury) and deposition testimony as expert in hydrogeology, and fate and transport of chlorinated hydrocarbon compounds, including PCE and TCE:), CERCLA, hydrogeology, aerial photographic interpretation of waste storage and environmental conditions, historical forensic evaluation of the source, chlorinated hydrocarbon fate and transport, chemical source area field characterization and review of regulatory actions Walnut Creek Manor, Ltd. v. Mayhew Center, Ltd., United States District Court, Northern District of California No. C-07-05664 CW (2009) (various declarations continuing into 2014).
- Litigation support regarding a claim of land failure beneath a residential property due to improper construction of a water well (2009).
- Arbitration support regarding the impact of PCE beneath a dry cleaning site in San Jose, California (2008).
- Litigation support regarding a remediation patent infringement matter, Adventus v. Remediation Products, Inc. United States District Court, District of North Carolina, Civil Action No. 3:07cv00153 (2008).
- Deposition testimony as expert in hydrogeology, contaminant fate and transport, contaminants including VOCs, petroleum, and inorganic compounds, and tidal hydrology. Humboldt Baykeeper and Ecological Rights Foundation v. Union Pacific Railroad Company, United States District Court (Northern District of California Case Number 03:2006-cv-02560. (2008).
- Deposition testimony as fact witness: Angeles Chemical v. McKesson, US District Court, Central District California, site specific aspects of groundwater and chemical occurrence of VOCs including PCE, TCE and 1,4-dioxane (2007). Case Number 01-cv-10532
- Deposition testimony as expert in hydrogeology for an east SF Bay Landfill: West Coast Home Builders v. Ashland, Inc. US District Court (Northern California), direction and movement of groundwater flow (2004). Case No. C01-4029.
- Trial (Bench) and deposition testimony as expert in hydrogeology: Cross



Petroleum v. United States (US Forest Service), U.S. Court of Federal Claims, groundwater remediation, groundwater movement, environmental forensics, chemical fate and transport of diesel and gasoline products, including MTBE, in sedimentary and fractured rock (2003). (Fed. Cl. No. 97-251C).