



**Summary of Environmental Remediation Program
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill**

Updated May 1, 2019

1.0 BACKGROUND

The property at 2020 Walnut Avenue (Site) was the site of refinery operations from 1922 to 1994. First owned and operated by McMillan Ring Free Oil Company, the refinery was bought by the Chemoil Corporation in August 1988. Chemoil operated the refinery until February 1994, at which time it was shut down, decommissioned and demolished. The site has been vacant land since completion of demolition in early 1997.

Numerous environmental studies and some cleanup activities have taken place on the property over the past 20 years. A final environmental remedy was delayed, however, awaiting a buyer and a redevelopment plan for the property. In October 2017, Signal Hill XC, LLC (SHXC) purchased the property from the owner (a successor to Chemoil Corporation) and will develop the site.

Over the past two years, while negotiating for the purchase of the property, representatives of SHXC have been working with the Los Angeles Regional Water Quality Control Board (the Regional Board) and with the City of Signal Hill to finalize plans for the cleanup and development of the property, respectively. During that period, additional site investigations were performed, and a remedial action plan to prepare the site for redevelopment (called a Response Plan) was developed by SHXC and approved by the Regional Board. The remedial program which is detailed in the Response Plan consists of the following:

- Installing and operating a soil vapor extraction system on the Site to treat volatile contaminants in soil;
- Installing and operating a system to remove the petroleum free-phase product (LNAPL) that is present on groundwater in isolated locations beneath the Site;
- Installing vapor barriers beneath the new buildings that are planned for the Site as part of property redevelopment;
- Replacing the existing interim treatment barrier with a final treatment barrier to mitigate further offsite migration of contaminated groundwater; and
- Continuing to monitor groundwater concentrations beneath and downgradient from the Site.

Exhibit 1 provides a conceptual diagram of the remedial program planned for the Site. Completion of the activities will be under direction of the Regional Board and will be documented in reports that are available to the public. The remedial program is being implemented in two phases:

- 1) Phase I entails the remediation efforts that will continue until Site redevelopment occurs. Phase I was initiated in December 2017 and will cease when site grading occurs, currently expected in March 2020.
- 2) Phase II is considered the “full-scale” remediation program. It will begin concurrent with Site redevelopment. The Phase II remediation system will remain in operation until it is determined that remediation is complete, and the Regional Board approves cessation of these activities.

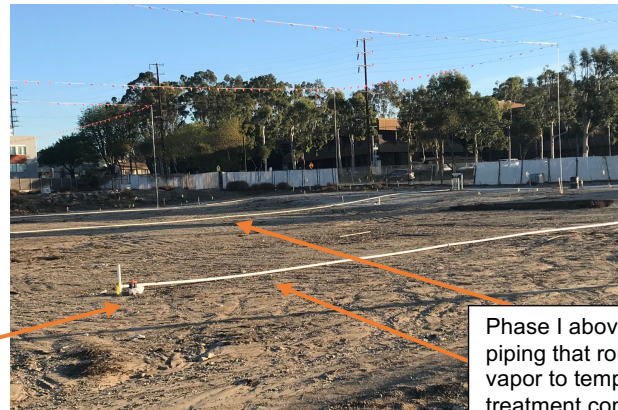
2.0 PHASE I REMEDIATION PROGRAM (CURRENTLY UNDERWAY)

The Phase I remediation program is currently underway and will remain in effect until Site redevelopment begins. Major components or tasks to be completed as part of the Phase I remediation program include:

- Remediation and groundwater monitoring wells. The various types of wells that are currently on Site consist of:
 - Groundwater monitoring wells. These have been installed across the Site and are used to collect samples and monitor groundwater quality beneath the site.
 - Soil vapor extraction (SVE) wells. SVE wells are part of the remediation program; these wells are used to remove petroleum-bearing soil vapor from underneath the property for subsequent treatment.
 - SME system wells. These wells are located along the western property boundary and were utilized by the groundwater treatment system that had operated in the past. Currently, the SME wells are not being used and will be either demolished or incorporated into the Phase II remediation program.

With the exception of the SME system wells, the majority of the remediation and groundwater monitoring wells stub up above grade at various locations across the Site. Locations are provided on Exhibit 2.

- Conveyance piping. SVE wells are connected to above ground schedule 40 PVC piping which route vapor that is extracted from the wells to a temporary trailer-mounted treatment unit.



SVE wellheads currently stub up above grade

Phase I above-ground piping that routes soil vapor to temporary treatment compound

Phase I SVE Wells and Piping

- Temporary Treatment Unit. A temporary treatment unit is being used to extract soil vapors from the SVE wells and treat the vapors prior to discharge to the atmosphere. A 499-gallon propane tank is located onsite and used to supply fuel to the unit. The unit is permitted under the South Coast Air Quality Management District and monitoring is ongoing to ensure that the discharge meets air quality standards. The treatment unit is trailer-mounted and includes a blower which extracts soil vapor from the SVE wells, an internal combustion engine to treat the vapor, and associated instrumentation and controls. The temporary treatment system will operate until the permit expires in May 2109.



Phase I Temporary Treatment Unit and Propane Tank

- **LNAPL Recovery.** Underneath the property there are three isolated areas of petroleum product from prior refinery operations floating on groundwater. A combination of LNAPL recovery units and hand bailing methods are used to remove this product from wells (MW-11, MW-23, MW-24, and MW-25). The recovered material is collected in drums for offsite recycling or disposal. Currently, two LNAPL recovery units are used on Site (Exhibit 2). The LNAPL recovery units are relatively small (less than 3 ft x 3 ft).



LNAPL Recovery Unit

- **Air Sparge Pilot Test.** An air sparge system will be used as a final treatment barrier to prevent migration of contaminated groundwater. During the Phase I Remediation Program, air sparge pilot testing was completed. Air sparging is the process of injecting air into the shallow groundwater to strip or remove volatile hydrocarbons from the groundwater. Pilot testing has been completed and the data is being used to design the full-scale system.



Typical pilot test air sparge injection into well.

- **Demolition of Former SME System Points.** The SME system wells located along the western property boundary that will not be utilized as part of the Phase II treatment barrier will be demolished during 2018 and prior to redevelopment of the property.

What to Expect During the Remainder of Phase I Remediation Program

The majority of the construction for the Phase I program has been completed. The SVE system will continue operation through the end of May. Remaining work in the coming months consist of ongoing groundwater and soil vapor monitoring, LNAPL recovery, and removing the temporary SVE system, and demolishing several of the wells/points associated with the prior treatment barrier. Equipment that will be utilized during well demolition activities include drill rigs, fork lifts, and support trucks. Soil cuttings that are generated during drilling are to be reused at the site if characterization data meet the Soil Reuse requirements. Reuse of soil to the extent possible, minimizes dump truck traffic to or from the site. Any temporary soil stockpiles will be covered with black plastic for protection from stormwater runoff. All soil is managed consistent with the Regional Board-approved Revised Soil Reuse Plan prepared by Apex (January 11, 2019).

3.0 PHASE II REMEDIATION PROGRAM (TO BE CONSTRUCTED IN TANDEM WITH SITE REDEVELOPMENT)

Phase II construction activities will begin concurrent with Site redevelopment. All remaining above ground piping and equipment, utilized as part of the Phase I program, will be removed from the Site. The Phase I monitoring and remediation wells that currently stub up above grade, will be cut down to below grade to allow for site grading.



All Phase I above-ground piping will be removed

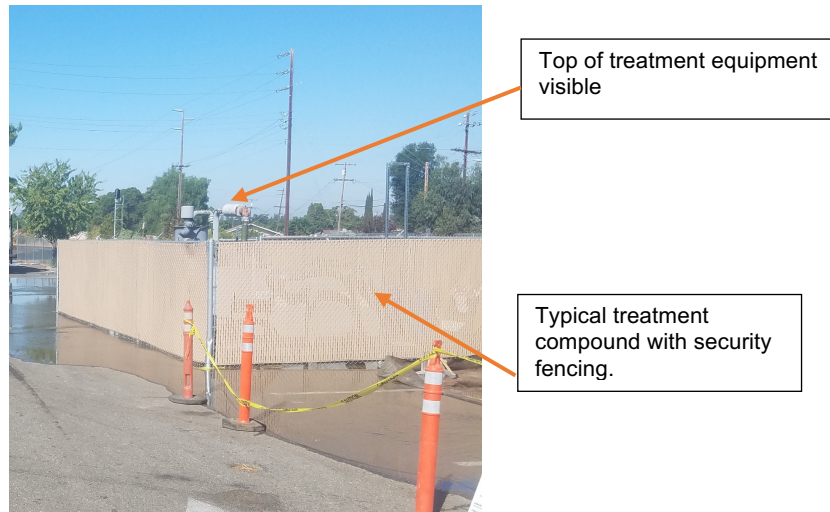
Wellheads that stub up above grade will be cut down below grade for connection to new underground piping

Removal of Phase I Piping/Wellheads

Major components of the consist of the Phase II Remediation Program will consist of the following:

- Remediation and groundwater monitoring wells. Wells are located below grade at various locations across the Site. Most wells will be connected to underground piping and will not be visible at the surface. In order to provide access, the upper portion of each well will terminate in a small (12-inch diameter), traffic-rated wellbox that is flush with the ground surface.
- Installation of additional SVE wells (if necessary) and installation of air sparge treatment barrier. During Phase II, additional SVE wells may be installed on Site to enhance the effectiveness of the Phase I SVE well field. In addition, an air sparge treatment barrier will be installed along the western and southern boundary of the Site (in place of the current SME system). The Phase II air sparge treatment barrier will entail the installation of and estimated 15 to 30 air sparge wells at the perimeter of the Site. Air sparging entails injecting air into the shallow groundwater zone to strip volatile hydrocarbon constituents out of the groundwater and move them into the unsaturated sediments above the groundwater where SVE can be used to extract and treat them. The air sparge wells will be connected via subsurface air conveyance lines to a control manifold and air compressor within the on-site treatment compound.
- Conveyance piping. Piping will be used to connect the wells to the treatment equipment. The piping will be installed in underground trenches, will be connected to the wells underground, and will not be visible to the public. Some of the piping will be located under the future buildings. The final layout of the piping will be determined in the coming months. Exhibit 3 provides a conceptual piping layout diagram. The piping will stub up above grade in a treatment system compound, further described below.
- Treatment System Compound. The equipment required for the Phase II remediation system will be situated in a treatment compound that is surrounded with security fencing with privacy slats. The equipment inside of the compound will have minimal visibility to the public. Plans for the treatment area (location, design, etc.) will be included in the site plans and subject to approval by the City of Signal Hill. Equipment that is located inside of the compound will include:
 - a piping manifold where the underground piping is routed above ground to a common header;
 - a blower which extracts soil gas from the subsurface;
 - an air sparge compressor to provide air to the air sparge system;
 - an oxidizer used to treat the soil gas before it is discharged to the atmosphere;
 - a control panel; and
 - associated instrumentation (flow meters, pressure gauges, etc.).

The treatment compound is expected to occupy a footprint of approximately 20 ft by 30 ft; the anticipated location is shown on Exhibit 3. A typical treatment compound is shown in the photograph below.



Typical Treatment Compound

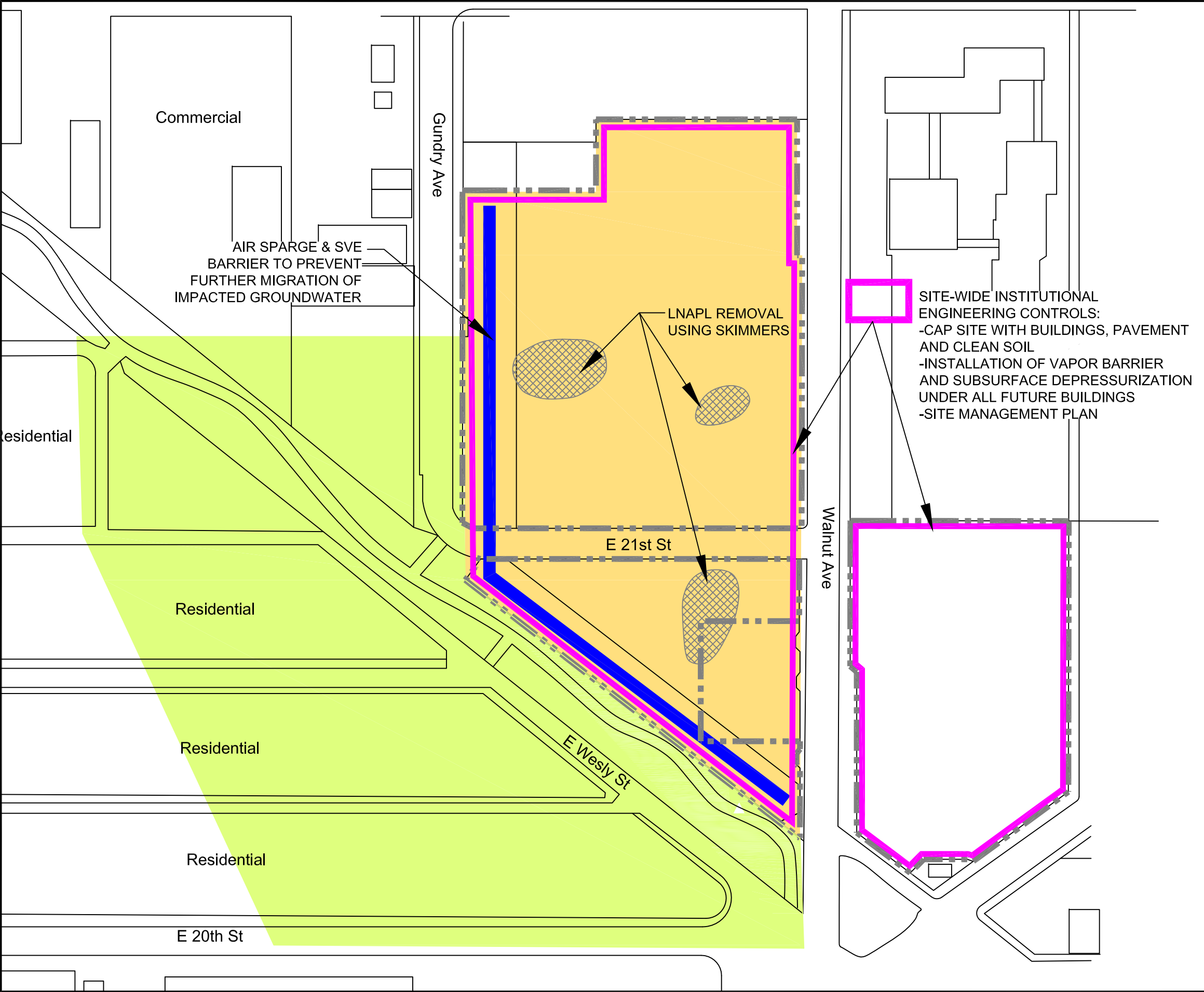
- **LNAPL Recovery Compounds.** As part of site redevelopment, the LNAPL recovery units installed during Phase I will be moved into small fenced areas (LNAPL recovery compounds) which will be constructed during property redevelopment. The fenced areas will be small (approximately 20 ft x 30 ft) and will include privacy slats to provide minimal visibility to the public. Anticipated areas for LNAPL recovery compounds are included on Exhibit 3.

What to Expect During Phase II System Construction

All remediation system construction and ongoing operation will be conducted in accordance with regulatory/agency guidelines and oversight. Permits will be obtained from the City of Signal Hill Building Department and the South Coast Air Quality Management District.

Construction of the Phase II system will occur over the same time period as Site redevelopment and activities will occur in parallel to the extent practicable (i.e., installing underground remediation conveyance piping/trenching in combination with the installation underground utilities for the buildings). Equipment that will be utilized during system construction consists of drill rigs, fork lifts, small excavator or backhoe, temporary baker tanks with water, and support trucks. A substantial quantity of clean, imported fill will be transported to the western parcels for use in the fill areas of the property. This fill will be used to create a separation layer of clean soils to minimize disturbance of impacted soils during installation of building foundations and underground utilities. A small percentage of the soil may require offsite disposal.

Upon the completion of construction, the majority of the Phase II remediation system will be underground and not visible to the public. All above ground equipment will be located within the treatment system and LNAPL recovery system compounds to minimize visibility to the public. Exhibit 3 shows anticipated compound locations. Details will be included in our permit application, expected for submittal during the latter part of 2019.



LEGEND

Site Boundary

Area of Observed or Suspected LNAPL

Downgradient MNA in Residential Area

SVE To Treat Vadose Zone Areas With Detections Above Site-Specific Screening Levels

SVE Soil Vapor Extraction

MNA Monitored Natural Attenuation

LNAPL Light Non-Aqueous Phase Liquid

CONCEPTUAL REMEDIAL APPROACH

FORMER CHEMOIL REFINERY
2020 WALNUT AVENUE
SIGNAL HILL, CA

PROJECT NO.	DATE	DRAWN BY:	APP. BY:
01-CHEMOIL-001	02/08/17	ZA	KD

0 120 240
HORIZONTAL SCALE IN FEET

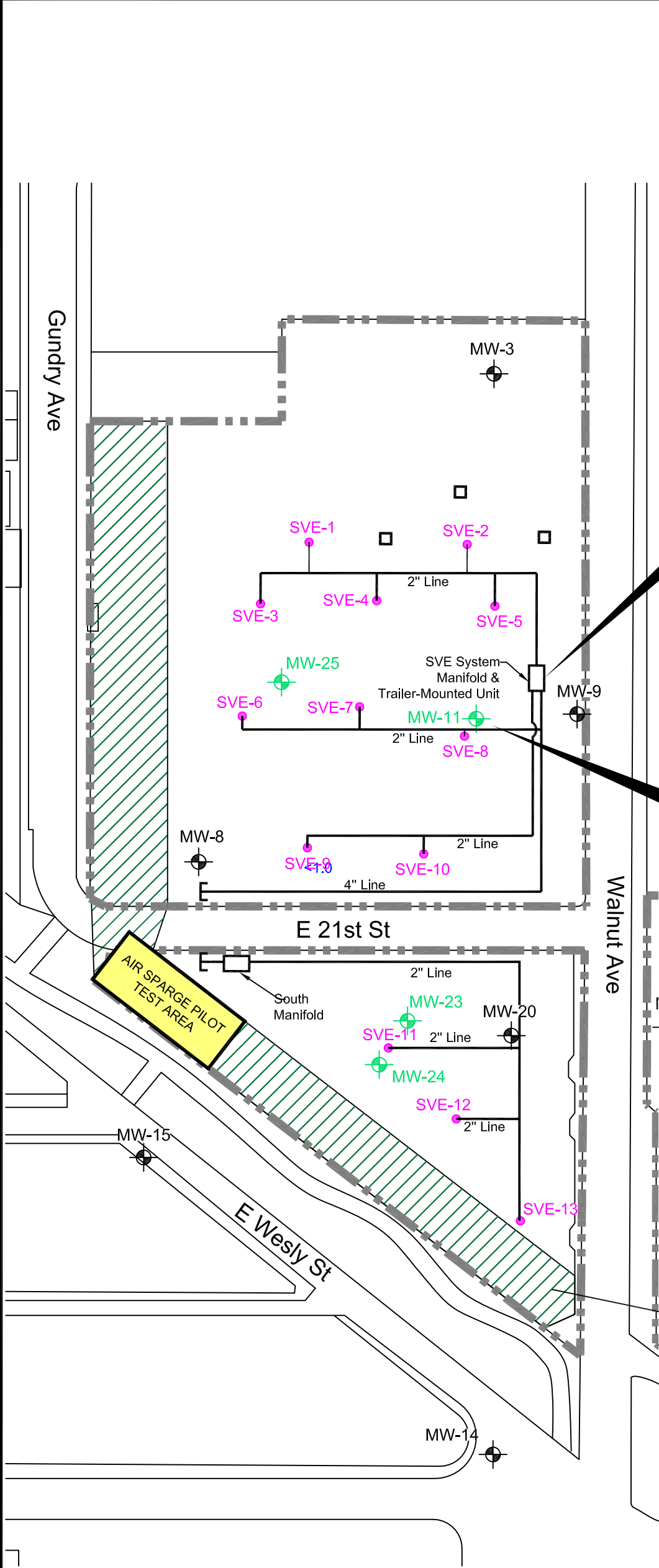
SGI
environmental

APEX

299 WEST HILLCREST DR., SUITE 220
THOUSAND OAKS, CA 91360

N

EXHIBIT
1



SOIL VAPOR EXTRACTION (SVE)
(TEMPORARY)



LNAPL RECOVERY UNIT

FORMER SME SYSTEM AREA. WELLS AND
INJECTION POINTS TO BE DEMOLISHED

LEGEND

Site Boundary

MW-16

Groundwater Monitoring Well
Locations

SVE-1

Phase I Soil Vapor Extraction Well

MW-23

LNAPL Recovery Well



256 BUENA VISTA STREET SUITE 200
GRASS VALLEY, CALIFORNIA 95945

FORMER CHEMICAL REFINERY
2020 WALNUT AVENUE
SIGNAL HILL, CALIFORNIA

PROJECT NO.

093-CHEMOIL-003

DATE:

MAY 2018

DR. BY:

CM

APP. BY:

SH

PHASE I
REMEDIAL PROGRAM

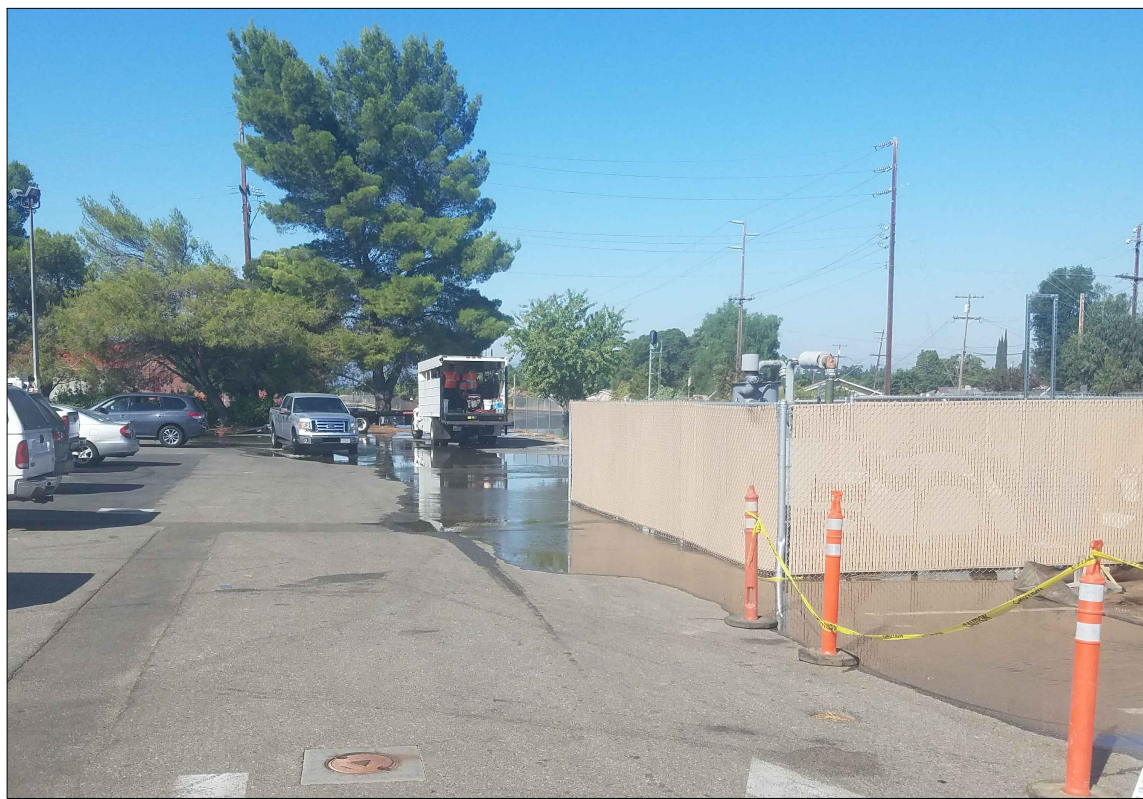
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APPROXIMATE SCALE IN FEET

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EXHIBIT

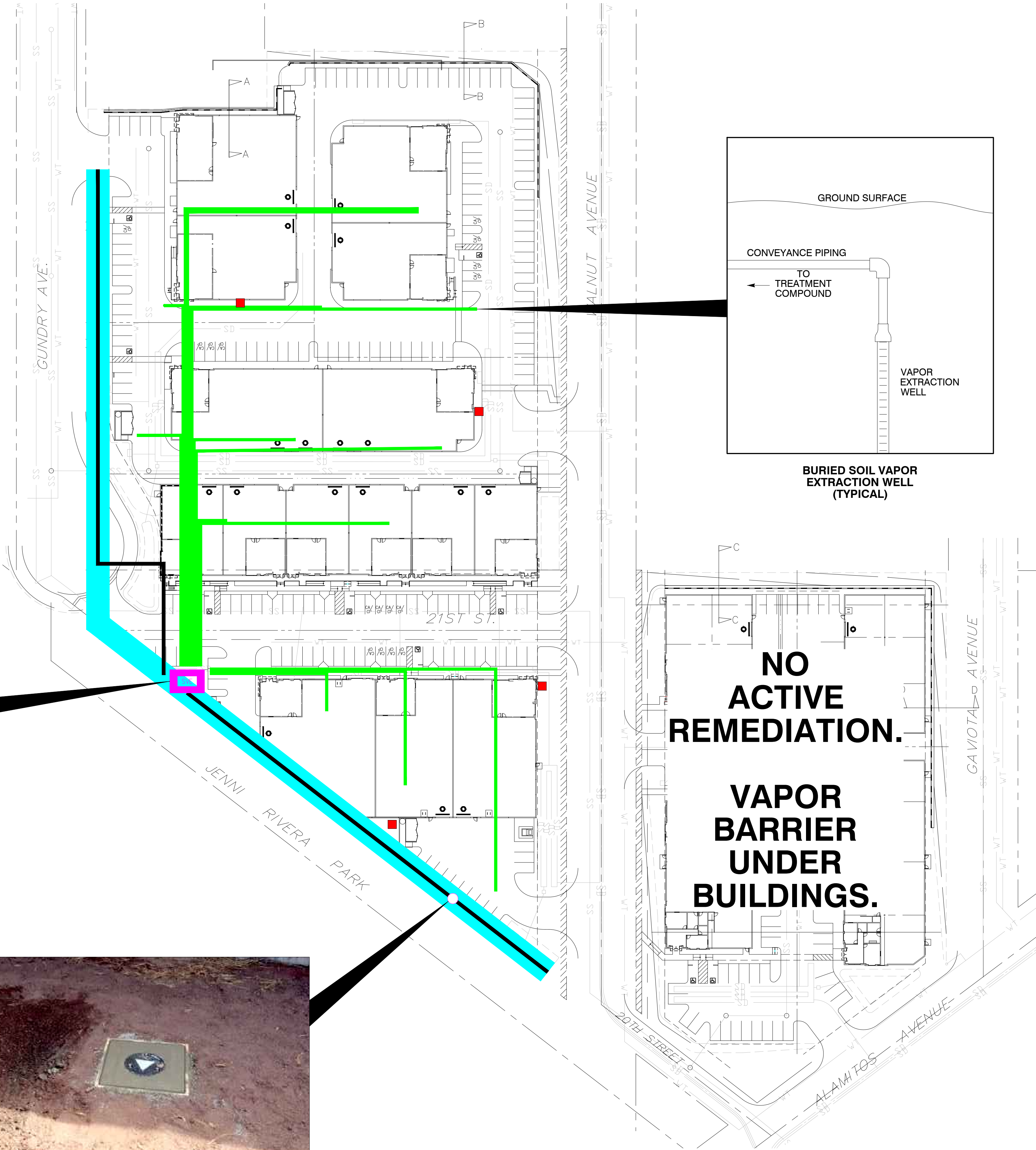
2



TREATMENT COMPOUND
(TYPICAL)



AIR SPARGE WELLHEAD
(TYPICAL)



LEGEND

- BURIED CONVEYANCE PIPING (LAYOUT SHOWN IS A CONCEPTUAL PLAN. EXACT PIPING LAYOUT TO BE DETERMINED AT A LATER DATE)
- LNAPL RECOVERY UNIT ENCLOSURE, ABOVE GROUND (4 TOTAL)
- ABOVE GROUND REMEDIATION COMPOUND
- AIR SPARGE AND SVE BARRIER
- BELOW GROUND SPARGING SYSTEM

NOTES:

VAPOR BARRIER WILL BE INSTALLED UNDER ALL BUILDINGS

BASE MAP RESOURCES:

- FRED CORNWELL, R.C.E 45591
- CA ENGINEERING, INC.

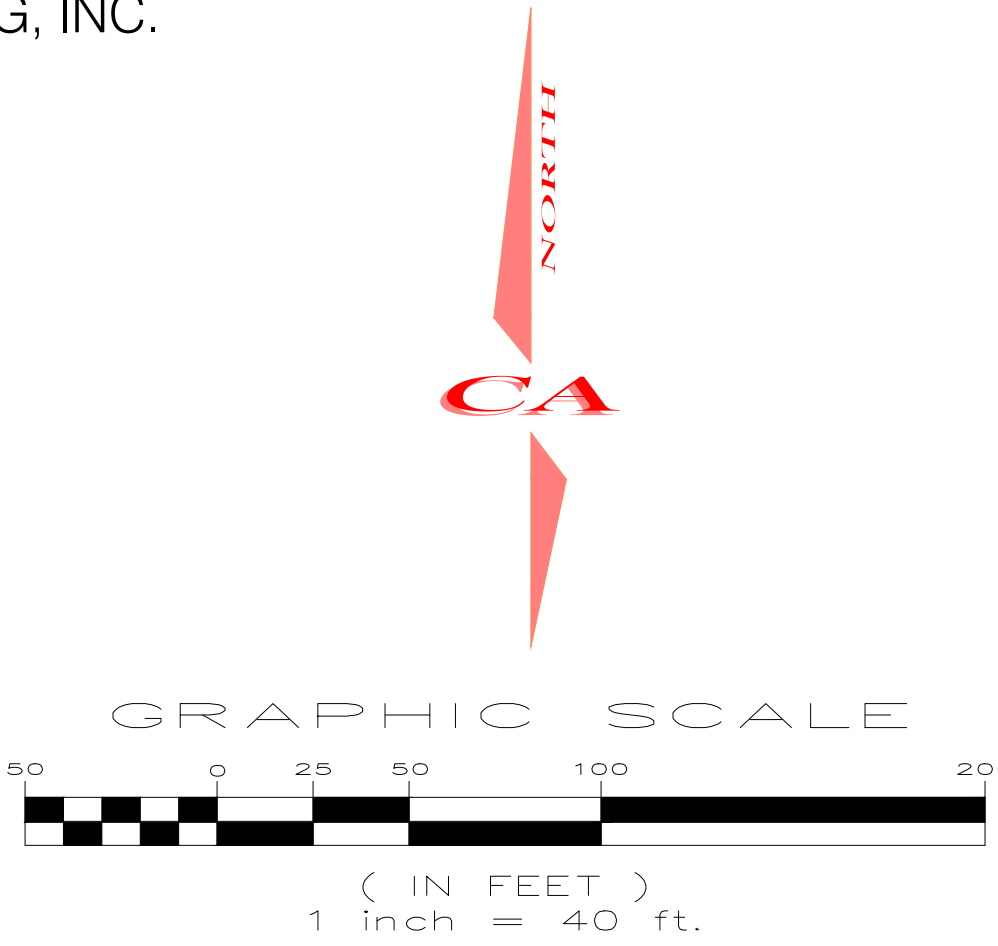


EXHIBIT 3
PHASE II CONCEPTUAL
REMEDATION SYSTEM LAYOUT

2020 WALNUT AVENUE
SIGNAL HILL, CALIFORNIA

PROJECT NO.:	DATE:	DRAWN BY:	APP. BY:
093-CHEMOIL-003	MAY 2018	CM	SH


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