ADDENDUM TO REVISED REMEDIAL ACTION PLAN

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FORMER KAST PROPERTY
CARSON, CALIFORNIA

Prepared for

Shell Oil Products US
20945 S. Wilmington Avenue
Carson, California 90810

October 15, 2014

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ADDENDUM TO REVISED REMEDIAL ACTION PLAN

FORMER KAST PROPERTY
CARSON, CALIFORNIA
Site Cleanup No. 1230
Site ID 2040330
Cleanup and Abatement Order No. R4-2011-0046

This Addendum to the Revised Remedial Action Plan dated October 15, 2014 (Addendum) for the former Kast Property was prepared on behalf of Equilon Enterprises LLC, doing business as Shell Oil Products US (Shell or SOPUS), by URS Corporation (URS) and Geosyntec Consultants, Inc. (Geosyntec). This Addendum is being submitted in response to Cleanup and Abatement Order No. R4-2011-0046 issued by the California Regional Water Quality Control Board, Los Angeles Region (RWQCB or Regional Board) on March 11, 2011, as modified by RWQCB correspondence, directing Shell to submit a Remedial Action Plan and Human Health Risk Assessment pursuant to California Water Code Section 13304. This Addendum is being submitted to respond to comments and questions by the California Regional Water Quality Control Board, Los Angeles Region (RWQCB or Regional Board) staff during meetings and conference calls pertaining to the Revised RAP dated June 30, 2014 and to clarify certain aspects of the proposed remedy.

The scope of services performed in preparation of this Addendum to the Revised RAP may not be appropriate to satisfy the needs of other users, and any use or reuse of this document or the information contained herein is at the sole risk of said user. No express or implied representation or warranty is included or intended in this Addendum except that the work was performed within the limits prescribed by the client with the customary thoroughness and competence of professionals working in the same are on similar projects. This report was prepared under the technical direction of the undersigned.

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CERTIFICATION
ADDENDUM TO REVISED REMEDIAL ACTION PLAN

FORMER KAST PROPERTY
CARSON, CALIFORNIA

I am the Senior Project Manager for Equilon Enterprises LLC, doing business as Shell Oil Products US, for this project. I am informed and believe that the matters stated in the this Addendum to the Revised Remedial Action Plan for the former Kast Property, Carson, California are true, and on that ground I declare, under penalty of perjury in accordance with Water Code section 13267, that the statements contained therein are true and correct.

Douglas Weimer
Sr. Principle Program Manager
Shell Oil Products US
October 15, 2014

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LIST OF ACRONYMS AND ABBREVIATIONS

ACI	American Concrete Institute
bgs	Below ground surface
BTV	Background Threshold Value
Cal-EPA	California Environmental Protection Agency
CAO	Cleanup and Abatement Order
CEQA	California Environmental Quality Act
CLSM	Controlled low-strength materials
cm	Centimeters
COCs	Constituents of Concern
CY	Cubic yard
DTSC	Department of Toxic Substances Control
EIR	Environmental Impact Report
FS	Feasibility Study
g	Grams
Geosyntec	Geosyntec Consultants, Inc.
HHRA	Human Health Risk Assessment
HI	Hazard Index
ILCR	Incremental lifetime cancer risk
L	Liter
LABC	Los Angeles Building Code
LACDPW	Los Angeles County Department of Public Works
mg/kg	Milligrams per kilogram
MNA	Monitored natural attenuation
NAPL	Non-aqueous phase liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NRMCA	National Ready Mixed Concrete Association
O&M	Operations and maintenance
OEHHA	Office of Environmental Health Hazard Assessment
PAHs	Polycyclic aromatic hydrocarbons
PCE	Tetrachloroethene
pcf	Pounds per cubic foot
psi	Pounds per square inch
PSRP	Property-specific Remediation Plan
RACR	Remedial Action Completion Report
RAP	Remedial Action Plan
RAOs	Remedial Action Objectives
RDIP	Remedial Design and Implementation Plan
Regional Board	Regional Water Quality Control Board
ROVI	Radius of vacuum influence
RWQCB	Regional Water Quality Control Board
SCAQMD	South Coast Air Quality Management District
scfm	Standard cubic feet per minute
Site	Former Kast Property, Carson, California
SOPUS	Shell Oil Products United States
SSCGs	Site-specific cleanup goals
SSD	Sub-slab depressurization

SVE	Soil vapor extraction
SVOCs	Semi-volatile organic compounds
SWRCB	State Water Resources Control Board
TCE	Trichloroethene
THMs	Trihalomethanes
TPH	Total petroleum hydrocarbons
TPHd	Total petroleum hydrocarbons as diesel
TPHg	Total petroleum hydrocarbons as gasoline
TPHmo	Total petroleum hydrocarbons as motor oil
URS	URS Corporation
USEPA	United States Environmental Protection Agency
UTL	Upper Tolerance Limit
VOCs	Volatile organic compounds
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
$\mu g/m^3$	Micrograms per cubic meter
%	Percent

EXECUTIVE SUMMARY

This Addendum to the Revised Remedial Action Plan (Revised RAP) for the former Kast Property (Site) in Carson, California was prepared by URS Corporation (URS) and Geosyntec Consultants, Inc. (Geosyntec) on behalf of Equilon Enterprises LLC, doing business as Shell Oil Products US (Shell or SOPUS) in accordance with Cleanup and Abatement Order (CAO) No. R4-2011-0046 issued to Shell by the California Regional Water Quality Control Board – Los Angeles Region (RWQCB or Regional Board) on March 11, 2011 and the RWQCB's letter dated January 23, 2014 directing Shell to submit a RAP and Human Health Risk Assessment (HHRA) pursuant to California Water Code Section 13304. A RAP, Feasibility Study (FS) and HHRA were timely submitted to the Regional Board on March 10, 2014 as directed in the RWQCB's January 23, 2014 letter. The Regional Board, along with the Office of Environmental Health Hazard Assessment (OEHHA) and UCLA Expert Panel reviewed these documents, and the Regional Board provided comments in its letter dated April 30, 2014. The April 30, 2014 letter directed Shell to submit a Revised RAP, FS, and HHRA addressing the RWQCB, OEHHA and the Expert Panel's comments and directives by June 16, 2014. Per the Regional Board's letter dated June 4, 2014, the submittal date was revised to June 30, 2014, on which date the Revised RAP (URS and Geosyntec, 2014), Revised HHRA (Geosyntec, 2014b) and Revised FS (Geosyntec, 2014c) were submitted. This Addendum to the Revised RAP is being submitted to respond to comments and questions by RWQCB staff during meetings and conference calls and to clarify certain aspects of the proposed remedy. Addenda to the Revised HHRA (Geosyntec, 2014d) and Revised FS (Geosyntec, 2014e) are being submitted concurrently as separate documents.

This Executive Summary includes all of the information previously presented in the Executive Summary from the Revised RAP dated June 30, 2014 amended with updated information from this Addendum.

The Revised RAP, along with the Revised HHRA and Revised FS, were prepared to fully address the Regional Board's directives provided beginning on Page 15 of the April 30, 2014 letter. The Revised RAP summarizes the remedial alternative evaluation process provided in the companion Revised FS and identifies and describes recommended full-scale remedial actions for impacted shallow soil and other media at the Site in accordance with requirements of the CAO and directives in the Regional Board's January 23 and April 30, 2014 letters. The Revised RAP and the recommended remedy comply with applicable provisions of the California Health and Safety Code, California Water Code, and State Water Resources Control Board (SWRCB) Resolution 92-49, and in particular, the Regional Board and Expert Panel's comments on the previously submitted RAP dated March 10, 2014.

The Revised RAP and the companion HHRA and FS were prepared following extensive multimedia investigations at the Site from 2008 to present. Key assessment work completed at the Site includes:

- Assessment in public rights-of-way, the adjacent railroad right-of-way, and other non-residential areas including soil, soil vapor, groundwater, and outdoor air media;
- Assessment at 95% of the individual residential properties, including soil, sub-slab soil vapor, and indoor air testing;
- Assessment of environmental impact and feasibility of removal of residual concrete reservoir slabs;
- Pilot testing to evaluate different potential remedies for Site impacts; and
- Development of Site-Specific Cleanup Goals.

The Site has been impacted with petroleum hydrocarbons associated with crude oil storage during the period prior to residential redevelopment. Total petroleum hydrocarbon (TPH) impacts occur in shallow and deep soils together with volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), including polycyclic aromatic hydrocarbons (PAHs), and some metals. VOCs, including benzene, and methane resulting from degradation of petroleum hydrocarbons are present in soil vapor[1]; dissolved-phase VOC and TPH impacts are present in groundwater, and LNAPL consisting of crude oil is locally present in the groundwater underlying a portion of the Site. In addition to hydrocarbon-related impacts, the Site is also locally impacted by chlorinated solvents, such as tetrachloroethene (PCE) and trichloroethene (TCE), and from a class of chlorinated compounds associated with potable water treatment referred to as trihalomethanes (THMs). Because THMs are related to residential water use, they are not considered constituents of concern (COCs) at the Site.

Some of these compounds, referred to as COCs, are present at concentrations that may pose an incremental cancer risk or human health hazard greater than the *de minimis* risk level of one in a million or Hazard Index greater than 1. Although it does not present a human health risk based on exposure, methane can potentially pose an explosion hazard where present in an enclosed space at a concentration between 5 and 15% in air and there is a source of ignition. In addition, concentrations for some COCs exceed criteria for the potential leaching to groundwater pathway.

A set of final recommended Site-Specific Cleanup Goals (SSCGs) was developed in the HHRA (Geosyntec, 2014a). SSCGs were developed for COCs in soil, soil vapor, and groundwater. The Regional Board commented on certain of these SSCGs, and the Revised RAP was modified to incorporate RWQCB-directed and approved SSCGs.

Medium-specific (i.e. soil, soil vapor, and groundwater) Remedial Action Objectives (RAOs) were developed. These RAOs include:

- Prevent human exposures to concentrations of COCs in soil, soil vapor, and indoor air such that total (i.e., cumulative) lifetime incremental cancer risks are within the National Oil and

[1] Unless otherwise specified in this document, the term "soil vapor" is used to address both sub-slab and deeper soil vapor.

Hazardous Substances Pollution Contingency Plan (NCP) risk range of one in one million to one hundred in one million (1×10^{-6} to 1×10^{-4}) and noncancer Hazard Indices are less than 1 or concentrations are below background, whichever is higher. Potential human exposures include onsite residents and construction and utility maintenance workers. For onsite residents, the lower end of the NCP risk range (i.e., 1×10^{-6}) and a noncancer Hazard Index less than 1 have been used.

- Prevent fire/explosion risks in indoor air and/or enclosed spaces (e.g., utility vaults) due to the accumulation of methane generated from the anaerobic biodegradation of petroleum hydrocarbons in soils. Eliminate methane in the subsurface to the extent technologically and economically feasible.
- Remove or treat LNAPL to the extent technologically and economically feasible, and where a significant reduction in current and future risk to groundwater will result.
- Reduce COCs in groundwater to the extent technologically and economically feasible to achieve, at a minimum, water quality objectives in the Basin Plan to protect the designated beneficial uses, including municipal supply.

A further consideration is to maintain residential land-use of the Site and avoid displacing residents from their homes or physically dividing the established Carousel community.

The Revised FS (Geosyntec, 2014c) and Addendum to the Revised FS (Geosyntec, 2014e) identified and screened a range of remedial technologies potentially applicable to site cleanup. Remediation technologies were screened and then assembled into remedial alternatives that were subjected to initial screening and detailed evaluation for cleanup of the Site. Detailed evaluation conducted for the Revised FS and Addendum to the Revised FS included evaluation of costs associated with each of the alternatives considered and incremental costs vs. benefits of different alternatives in accordance with SWRCB Resolution 92-49. Estimates of mass proposed to be left in place and the basis for estimating the time and cost to reduce the concentrations of constituents of concern is detailed in the Revised FS and formed a part of the basis for selecting the recommended Alternative 4D. The estimated cost for the recommended remedy is $146 million. The detailed evaluation of alternatives, along with the April 30, 2014 comments and consideration of State Acceptance, led to selection of the following recommended alternative and multi-media remedial action approach:

- Excavation of shallow soils from both landscaped and hardscaped areas of residential yards at impacted residential properties where RAOs are not met under existing conditions.
  - Excavation will be conducted to a depth of 5 feet below ground surface (bgs) throughout the accessible areas of front and back yards at approximately 207 properties identified based on Site characterization data, the soil concentration contour maps, results of the HHRA, and where groundwater protection SSCGs are exceeded, subject to setbacks to protect structures and sensitive utilities.
  - The 207 properties include those identified in the Revised RAP, four additional properties identified in the Addendum to the Revised HHRA (Geosyntec, 2014d), plus one property where all testing has been completed except soil sampling due to hardscape

cover and utility conflicts that was added based on information from surrounding properties. The excavation will also remove residual concrete slabs, to the extent practicable, if encountered within the depth excavated.

- The 207 properties identified for excavation to 5 feet bgs are shown on the figure on page ES-7.

- Excavation of deeper soils between 5 and approximately 10 feet bgs at approximately 85 properties where significant hydrocarbon mass can be reduced based on the distribution and concentration of hydrocarbons detected. Included are properties identified for this Addendum based on examining different spatial distribution mapping methods: point-by-point maps, two-dimensional contour maps, and three-dimensional contours together with a cost-benefit analysis in the Addendum to the Revised FS (Geosyntec, 2014e).
  - In total, 123 yards at 85 properties are now identified for targeted deeper excavation. Some properties were identified for excavation of both front and back yards, while others were identified for excavation of only the front or back yard.
  - Targeted deeper excavation will be conducted where equipment access is feasible and excavation can be achieved safely, subject to allowable setbacks from structures and sensitive utilities.
  - The 85 properties identified for targeted excavation from 5 to 10 feet bgs are shown on the figure on Page ES-7.
  - In addition, there are 12 properties for which no environmental characterization data have been collected as of September 9, 2014. For purposes of the Environmental Impact Report (EIR) being prepared in accordance with the California Environmental Quality Act (CEQA), it has been assumed that these 12 properties will be excavated to 10 feet bgs. Whether excavation is needed at these 12 properties, and the scope of any such work, would be established based on analysis of sampling data obtained when access is obtained.
  - This brings the assumed total to 219 properties for excavation to 5 feet bgs and 146 yards at 97 properties for excavation to 10 feet bgs for EIR planning purposes.

- The total soil volume to be excavated is approximately 161,700 cubic yards (CY) and includes up to approximately 133,810 CY of soil for excavation to 5 feet bgs, up to 27,855 CY of soil for targeted deeper excavations to 10 feet bgs. These volumes include assumed excavation of the 12 remaining properties that have not been sampled. An additional approximately 8,100 CY of soils will be excavated for SVE piping installation.

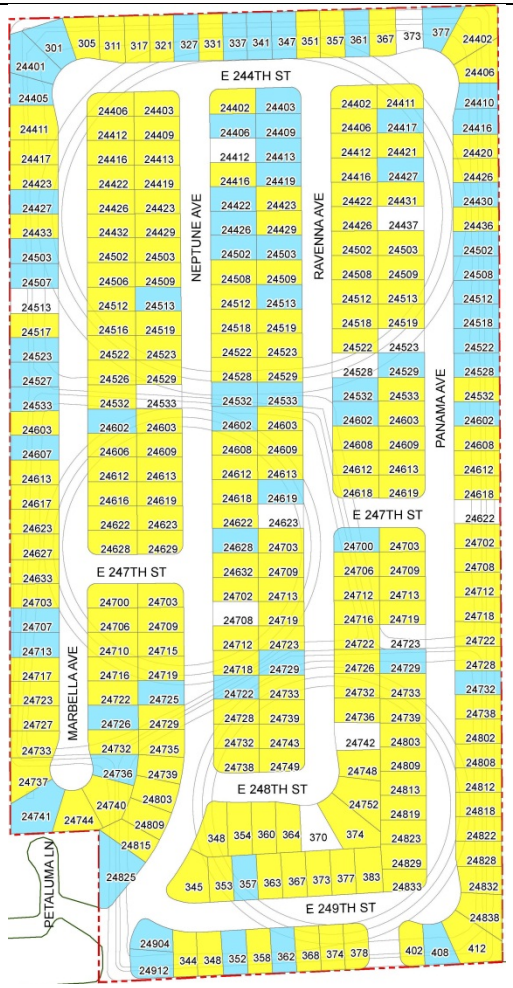
- Potential additional lateral or vertical excavation based on findings from excavations to 5 feet bgs or from 5 to 10 feet bgs has been considered in this Addendum to the Revised RAP where evidence of mobile hydrocarbons are observed during excavation.

- Excavation may be accomplished using a variety of methods, including track-mounted excavators, backhoes, track-mounted limited access auger drill rigs, and by hand, where necessary. Specific equipment to be used will be identified in the Remedial Design and

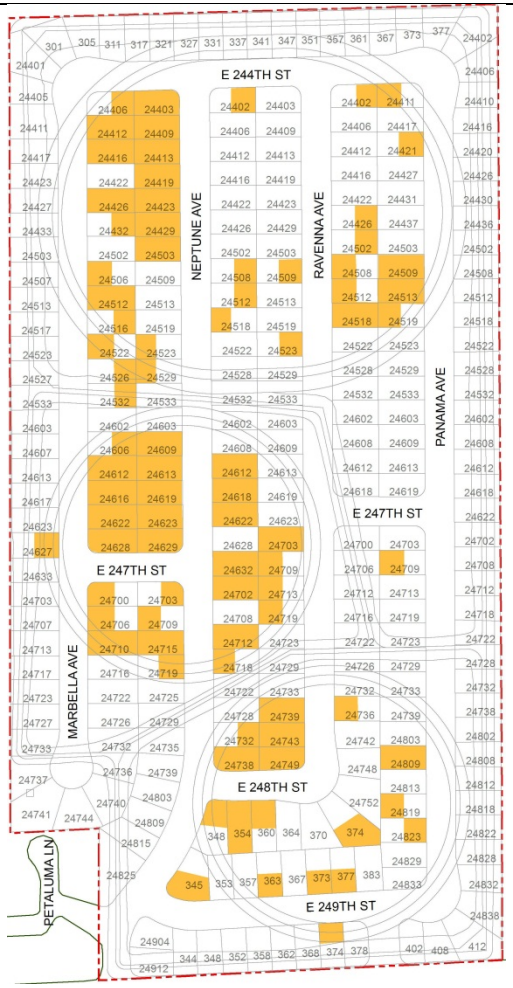
Implementation Plan (RDIP) and in Property-specific Remediation Plans (PSRPs) to be developed after approval of the RAP.

- This Addendum to the Revised RAP includes additional information regarding the use of controlled low-strength materials (CLSM or sand-cement slurry) for backfill of auger and slot-trench excavations. These materials will be used where deeper excavations require backfill the same day and for large-diameter auger borings drilled for soil excavation purposes. Where placed shallower than 3 feet bgs, CLSM will be removed and the upper 3 feet will be backfilled with clean imported soil.
- The possibility of exposure to soils remaining below 5 feet bgs and impacted soils beneath City streets and sidewalks is addressed through existing institutional controls that require a Grading Permit be issued by the City of Carson for excavations deeper than 3 feet and a Surface Containment and Soil Management Plan to address notifications, management, and handling of residual soils that are impacted by COCs at concentrations greater than risk-based levels. This plan is included in Appendix C of the Revised RAP (URS and Geosyntec, 2014).
- Shell will implement a community outreach program to inform and educate residents in the community of residual impacted soils and of the notification procedures for management of these materials via the Surface Containment and Soil Management Plan.
- Following excavation, a combined system of soil vapor extraction (SVE) and bioventing will be used to address residual petroleum hydrocarbons and VOCs in soils below the depth of excavation and areas not excavated. Soil vapor, including methane, will be addressed by active extraction using SVE. Residual longer-chain and less volatile hydrocarbons in soils will subsequently be treated by promoting degradation via bioventing where RAOs are not met following shallow soil excavation. SVE wells will be installed in City streets and on approximately 224 residential properties, as appropriate.
- Bioventing will be conducted via cyclical operation of SVE wells to increase oxygen levels in subsurface soils and promote microbial activity and degradation of longer-chain petroleum hydrocarbons. The same wells will be used for SVE and bioventing through cyclical operation of SVE, which will enhance oxygen flow to the subsurface to promote biodegradation of hydrocarbons during periods when SVE is not active. If intermediate products are generated from biodegradation of hydrocarbons, they will be removed via SVE operation and treated in the SVE treatment system.
- A total of 63 SVE well clusters and an additional 65 shallow zone SVE wells will be installed in the streets. Approximately two SVE wells will be installed on each residential property identified for SVE/bioventing. The distribution and numbers of wells to be installed on each property will be determined during the design phase in individual PSRPs and will take into account areas of properties and locations available for well installation.
- Sub-slab mitigation will be implemented at 28 properties where RAOs are not met and calculated vapor intrusion risk is greater than 1×10^{-6} calculated using an attenuation factor of 0.002 or methane concentrations in sub-slab soil vapor exceed the upper RAO for methane of

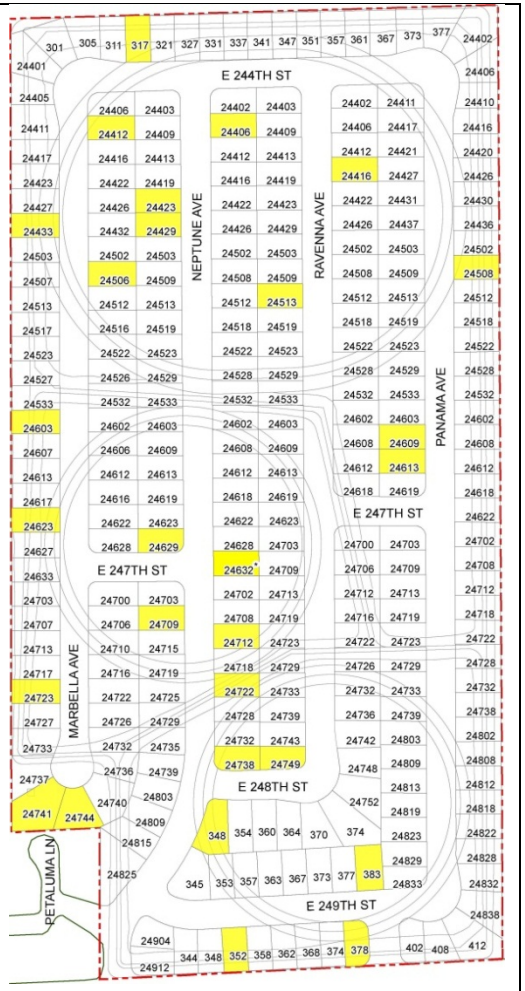
0.5%. The 28 locations where sub-slab mitigation systems will be installed are shown on the figure on Page ES-7. In addition, while the data do not indicate that vapor intrusion is an issue at any of the residences, Shell is prepared to offer installation of a sub-slab mitigation system to any of the homeowners in the Carousel neighborhood to alleviate concerns about potential impacts to their indoor air from the Site.



Properties identified for excavation to 5 ft bgs shown in (yellow)
Properties shown in blue not excavated;
Properties shown in white not investigated
(see Revised Figure 6-1 for details)



Properties identified for targeted excavation from 5 to 10 feet bgs shown in Orange
(see Revised Figure 6-3 for details)



Properties identified for sub-slab mitigation as part of remediation shown in yellow
(see Revised Figure 6-4 for details)

- LNAPL will be recovered where LNAPL has accumulated in monitoring wells MW-3 and MW-12 and in additional wells if it accumulates at a measurable thickness to the extent technologically and economically feasible, and where a significant reduction in current and future risk to groundwater will result. The goal for LNAPL recovery will be an end point of no measurable LNAPL accumulation in monitoring wells at the Site.
- COCs in groundwater will be reduced to the extent technologically and economically feasible via source reduction and monitored natural attenuation (MNA). MNA could be paired with contingency groundwater remediation of oxidant injection in areas where Site-related COCs exceed 100x MCL if, after a five-year review following start of SVE/bioventing operations, the groundwater plume is not stable or decreasing. In addition, it is assumed that upgradient sources would need to be addressed by the overseeing agencies.
- The recommended remedy includes a comprehensive long-term monitoring plan that will include monitoring of:
  - Sub-slab soil vapor probes at properties scheduled for remedial excavation until the SVE/bioventing system becomes operational and periodically thereafter;
  - Select soil vapor probe locations in City streets until the SVE/bioventing system becomes operational; thereafter, monitoring will be conducted at newly installed shallow and multi-depth soil vapor probes;
  - Utility boxes and other Site features previously monitored until after the SVE/bioventing system becomes operational and site conditions demonstrate it is no longer necessary, as approved by the Regional Board;
  - SVE/bioventing system operations and maintenance (O&M) and system effectiveness sampling will be conducted periodically.
- As part of implementation of the Revised RAP, Shell is providing a Temporary Relocation Program that provides temporary alternative accommodations to eligible residents of properties while remedial actions (in particular remedial excavations) are performed in the yards of their residences. A Preliminary Relocation plan was included in the Revised RAP, but was superseded by the RAP Relocation Plan transmitted to the Regional Board on September 19, 2014. This plan includes:
  - During remedial excavation, backfill, and restoration work, residents of the properties where excavation is conducted will be temporarily relocated as described in the RAP Relocation Plan.
  - Residents of properties adjacent to locations where excavations are occurring will be offered alternative accommodations if necessary based on the nature of the excavation work, the potential for interruptions of access to the property, or due to disruptions in utility service to the property.
  - In addition to the Temporary Relocation Program described above, Carousel homeowners are also being offered an Optional Real Estate Program.

For at the 207 locations where soils will be excavated to 5 feet bgs, 85 locations identified for targeted deeper excavation, and at 28 locations where sub-slab depressurization will be conducted, potential exposures and potential nuisance concerns will be addressed in the short term. In addition, while the data do not indicate that vapor intrusion is an issue at any of the residences, Shell is prepared to offer installation of a sub-slab mitigation system to any of the homeowners in the Carousel neighborhood to alleviate concerns about potential impacts to their indoor air from the Site. Deeper soil, soil vapor, and groundwater risk reduction will be implemented over a longer period of time through SVE/bioventing and MNA. These remedial actions are intended to achieve the RAOs and the SSCGs for soil, soil vapor, and groundwater as directed in the Regional Board's Review of the Revised SSCG Report and Directive dated January 23, 2014, comments received on the March 10, 2014 HHRA, FS, and RAP on April 30, 2014, and in accordance with RWQCB-directed and corrected SSCGs.

Although there is no indication that there are any long-term health risks, water quality, or nuisance concerns caused by COCs associated with residual concrete slabs, residual concrete slabs will be removed where practicable and where they can be removed safely when encountered during excavation. SVE/bioventing would address any concerns at the Site related to impacted soils that may be associated with the residual reservoir slabs left in place.

Following approval of the RAP, a Site-wide Remedial Design and Implementation Plan (RDIP) will be prepared. The Site-wide RDIP will provide details on the design and implementation of the planned remedy, including excavation, SVE/bioventing, and sub-slab vapor mitigation activities. It will include detailed plans for installation of the site-wide components of the SVE/bioventing system. In addition, Property Specific Remediation Plans (PSRPs) will be prepared for each property where remedial work will occur that will present detailed plans for remedial activities on a property-by-property basis, including site restoration. Property owners will be consulted regarding scheduling and logistics, particularly regarding site restoration, including any necessary removal and replacement of hardscape and landscaping features.

A tentative schedule of actions to implement the RAP has been developed and is discussed in Section 9 of the Revised RAP. A Gantt chart reflecting this schedule based on excavating four properties at a time has been included as Figure 2-1 to this Addendum. Certain items, including agency review of the RDIP and PSRPs, review of grading plans and permit applications by the City of Carson, Los Angeles County Department of Public Works (LACDPW) and South Coast Air Quality Management District (SCAQMD), and obtaining access at the individual properties, may take longer than estimated and are outside the control of Shell and its consultants. Following agency approval of the RDIP and PSRPs, issuance of Grading Permits by the City of Carson and the Permit to Operate/Construct for the SVE/bioventing treatment system by the SCAQMD, and granting of access, the construction phase of Site remediation, including installation of the SVE/bioventing system is expected to take approximately 6 years.

This Addendum to the Revised RAP addresses the option to increase the pace of remedial excavation as the work progresses to shorten the time required to implement this phase of the remedy. As the work proceeds, and work has been completed on several blocks of eight properties, Shell's contractors will evaluate whether the pace of excavation work can be increased by working on two

blocks of eight properties simultaneously. This determination will consider whether this work can be done safely and efficiently when considering the increased level of effort and amount of equipment and trucks that will be operating in the neighborhood concurrently as well any additional impact to the residents.

Following the active construction phase, operations and maintenance of the SVE/bioventing system will occur for approximately 30 to 40 years. SVE/bioventing system and other monitoring activities, as required, will occur for an estimated 30 to 40 years.

1.0 INTRODUCTION

URS Corporation (URS) and Geosyntec Consultants, Inc. (Geosyntec) prepared this Addendum to the Revised Remedial Action Plan (Addendum) for the former Kast Property on behalf of Equilon Enterprises LLC, doing business as Shell Oil Products US (Shell or SOPUS). This Addendum is being submitted in response to Cleanup and Abatement Order No. R4-2011-0046 issued by the California Regional Water Quality Control Board, Los Angeles Region (RWQCB or Regional Board) on March 11, 2011, as modified by RWQCB correspondence, directing Shell to submit a Remedial Action Plan and Human Health Risk Assessment pursuant to California Water Code Section 13304. On behalf of SOPUS, URS and Geosyntec submitted a Remedial Action Plan (RAP) and companion Feasibility Study (FS), and Human Health Risk Assessment (HHRA) on March 10, 2014. The RWQCB reviewed and commented on the March 10, 2014 RAP, FS, and HHRA and directed Shell to submit a Revised RAP, Revised FS, and Revised HHRA by June 30, 2014, all of which were submitted as directed. This Addendum is being submitted to respond to comments and questions by RWQCB staff during meetings and conference calls and to clarify certain aspects of the proposed remedy. Addenda to the Revised HHRA (Geosyntec, 2014d) and Revised FS (Geosyntec, 2014e) are being submitted concurrently as separate documents.

The Revised RAP (URS and Geosyntec, 2014) recommended the following multi-media remedial actions:

- Excavation of shallow soils to a depth of 5 feet below ground surface (bgs) from both landscaped and hardscaped areas of residential yards at approximately 202 properties where RAOs are not met under existing conditions. Excavation will be conducted throughout the accessible areas of front and back yards identified based on Site characterization data, soil concentration contour maps, results of the Revised HHRA (Geosyntec, 2014b), and where groundwater protection site-specific cleanup goals (SSCGs) are exceeded, subject to setbacks to protect structures and sensitive utilities. Residual concrete slabs will also be removed, to the extent practicable, if encountered within the depth excavated.
- Targeted deeper excavation of soils between 5 and approximately 10 feet bgs at approximately 82 properties where significant hydrocarbon mass can be reduced based on the distribution and concentration of hydrocarbons detected. This targeted deeper excavation will be conducted where equipment access is feasible and excavation can be achieved safely, subject to allowable setbacks from structures and sensitive utilities.
- A Remedial Design and Implementation Plan (RDIP) and Property-specific Remediation Plans (PSRPs) will be developed after approval of the RAP to describe in detail planned remedial actions at individual properties.
- Following excavation, a combination of soil vapor extraction (SVE) and bioventing will be used to address residual petroleum hydrocarbons and VOCs in soils below the depth of excavation and areas not excavated. Soil vapor, including methane, will be addressed by active extraction using SVE and subsequent treatment by promoting degradation of residual hydrocarbons via bioventing. SVE wells will be installed in City streets and on approximately 221 residential properties, as appropriate.

- Bioventing will be conducted via cyclical operation of SVE wells to increase oxygen levels in subsurface soils and promote microbial activity and degradation of longer-chain petroleum hydrocarbons. The same wells will be used for SVE and bioventing through cyclical operation of SVE, which will enhance oxygen flow to the subsurface to promote biodegradation of hydrocarbons during periods when SVE is not active.
- Sub-slab mitigation will be implemented at 28 properties where RAOs are not met and calculated vapor intrusion risk is greater than 1×10^{-6} or methane concentrations in sub-slab soil vapor exceed the upper RAO for methane of 0.5%. In addition, while the data do not indicate that vapor intrusion is an issue at any of the residences, Shell is prepared to offer installation of a sub-slab mitigation system to any of the homeowners in the Carousel neighborhood to alleviate concerns about potential impacts to their indoor air from the Site.
- LNAPL will be recovered where LNAPL has accumulated in monitoring wells MW-3 and MW-12 and in additional wells if it accumulates at a measurable thickness to the extent technologically and economically feasible, and where a significant reduction in current and future risk to groundwater will result. The goal for LNAPL recovery will be an end point of no measurable LNAPL accumulation in monitoring wells at the Site.
- COCs in groundwater will be reduced to the extent technologically and economically feasible via source reduction and monitored natural attenuation (MNA). MNA could be paired with contingency groundwater remediation of oxidant injection in areas where Site-related COCs exceed 100x MCL if, after a five-year review following start of SVE/bioventing operations, the groundwater plume is not stable or decreasing. Upgradient sources would need to be addressed by the overseeing agencies.
- The recommended remedy includes a comprehensive long-term monitoring plan that will include monitoring of:
    - Sub-slab soil vapor probes at properties scheduled for remedial excavation until the SVE/bioventing system becomes operational and periodically thereafter;
    - Select soil vapor probe locations in City streets until the SVE/bioventing system becomes operational; thereafter, monitoring will be conducted at newly installed shallow and multi-depth soil vapor probes;
    - Utility boxes and other Site features previously monitored until the SVE/bioventing system becomes operational and Site conditions demonstrate it is no longer necessary, as approved by the Regional Board; and
    - SVE/bioventing system operations and maintenance (O&M) and system effectiveness sampling will be conducted periodically.

The Revised RAP, Revised HHRA Report (Geosyntec, 2014b), and Revised FS (Geosyntec 2014c) were submitted to the Regional Board on June 30, 2014. While Shell believes these documents, and the Remedial Action Plan, HHRA Report and Feasibility Study originally submitted on March 10, 2014, proposed a remedial approach that would address the environmental conditions in the Carousel neighborhood and be protective of residential land use, Shell and its consultants have prepared this Addendum and the companion Addenda to the Revised FS and Revised HHRA to address the

comments and clarifications requested by the Regional Board during a July 30, 2014 meeting and subsequent meetings and discussions with the Regional Board's technical staff.

2.0 DISCUSSION OF ISSUES FOR CLARIFICATION AND RAP REVISIONS

2.1 UPDATED ASSESSMENT OF ARSENIC CONCENTRATIONS THAT ARE GREATER THAN THE ARSENIC SOUTHERN CALIFORNIA UPPER TOLERANCE LIMIT (UTL) CONCENTRATION

As discussed in the revised HHRA, metals may be associated with petroleum hydrocarbons, but are also naturally occurring in the environment. For each metal, an Upper Tolerance Limit (UTL) has been developed as a Background Threshold Value (BTV) based on local background (Revised HHRA Appendix A, Geosyntec, 2014b). These values are used with upper-bound Site concentration estimates to determine if a metal is above background and should be considered further. For arsenic, the Cal-EPA Department of Toxic Substances Control (DTSC) background concentration UTL of 12 milligrams per kilogram (mg/kg) for southern California sites (Cal-EPA DTSC, 2007) and a more detailed statistical evaluation were used as presented in Appendix A of the Revised HHRA. Based on the results of the detailed analysis five properties were identified in the Revised HHRA that were considered to have arsenic concentrations above background.

In response to verbal comments received from the Office of Health Hazard Assessment (OEHHA), arsenic concentrations were re-evaluated in the Addendum to the Revised HHRA (Geosyntec, 2014d) with respect to the DTSC background concentration of 12 mg/kg. Properties that had a maximum arsenic concentration greater than the DTSC background value of 12 mg/kg within the 0 to 10-foot depth interval were identified. A total of 94 properties were identified with a maximum concentration greater than 12 mg/kg. Many of these properties have only 1 or 2 samples that exceed the background value of 12 mg/kg, and the arsenic concentrations were typically within the range of background data DTSC used to derive the value of 12 mg/kg (the DTSC background dataset has a maximum concentration of 19.6 mg/kg). In addition, many of these properties have been identified for shallow excavation in the Revised RAP for other constituents.

The list of 94 properties where the maximum concentration exceeded the UTL value of 12 mg/kg along with the list of properties identified for 0 to 5-foot excavation in the Revised RAP were reviewed. Seventy-six of the properties were included in the Revised RAP for shallow excavation, which will remove arsenic concentrations above the UTL value of 12 mg/kg from the 0 to 5-foot depth interval. For the remaining 18 properties, arsenic concentrations and depth interval were further reviewed with respect to the remediation plan in the Revised RAP (see Addendum to Revised HHRA). Nine properties did not have a maximum concentration of arsenic above the background UTL of 12 mg/kg in the 0 to 5-foot depth interval. Of the nine remaining properties, the arsenic concentrations are within the background range of the dataset used by DTSC to derive the background value of 12 mg/kg with the exception of two properties: 20.6 mg/kg at 24417 Marbella Avenue, and 28.3 mg/kg at 24423 Marbella Avenue. At each of these properties only two samples exceeded the background UTL of 12 mg/kg within the 0 to 5-foot interval. These two properties have been included in the 0 to 5-foot excavation program in this Addendum to the Revised RAP.

In response to OEHHA's comments, Tables 14 and 15 of the Revised HHRA were modified to include the maximum detected arsenic concentrations for each property as compared to the value of 12 mg/kg. The two properties that have been identified for inclusion in the remediation plan based on the data evaluation summarized above are identified by the hatched symbol on Revised Figures 6-1 and 6-2. These two properties will be added to the remediation plan for the 0 to 5-foot excavation.

2.2 UPDATE OF HHRA FINDINGS FOR PROPERTIES WITH SOIL SAMPLES THAT WERE NOT INCLUDED IN THE REVISED FS AND REVISED RAP

The Revised HHRA (Geosyntec, 2014b) presented in June 2014 included data that were reported as of May 23, 2014. Since the Revised HHRA was prepared, soil samples have been collected for two properties (24527 Marbella Avenue and 24519 Ravenna Avenue) and additional soil samples were collected at 357 244th Street. The data for these properties (including any new soil vapor data that were collected) were evaluated following the methodology outlined in the Revised HHRA. The results of the evaluation are presented in Tables 14 through 20 of the Addendum to the Revised HHRA (Geosyntec, 2014d) and are presented graphically on Figures 4, 5, 6 and 7 of the same document. Property addresses that exceeded the lower bound of the risk management range for incremental lifetime cancer risk (ILCR) and a noncancer Hazard Index of 1 for soil and sub-slab soil vapor, respectively, were identified. In addition, soil leaching to groundwater and metals present above background were considered. For 24527 Marbella Avenue, the results indicated that this property met the RAOs established in the Revised RAP and therefore are not included in the Revised RAP Addendum. For 24519 Ravenna Avenue, the results indicated that the property should be considered in the Revised RAP Addendum for human health and potential leaching to groundwater considerations for the 0 to 5-foot depth interval and potential leaching to groundwater considerations for the greater that 5 to 10-foot depth interval. For 357 E. 244th Street, the results indicated that the property should be considered in the Revised RAP Addendum for potential leaching to groundwater considerations for the 0 to 5 foot-depth interval. Based on these evaluations, these properties have been included in this Addendum to the Revised RAP for excavation in the 0 to 5-foot interval and SVE/bioventing. In addition, the 24533 Neptune property was not able to be sampled but has been identified for remedial action based on surrounding property results for the 0 to 5-foot and 5 to 10-foot depth intervals.

The number of properties that have been identified for consideration in the Revised FS Addendum and Revised RAP Addendum based on updated HHRA findings are summarized in the table below:

Media	Depth	Number of Properties for Consideration
Soil	≤5 ft bgs	207
Soil	≤5 ft bgs and >5 to ≤10 ft bgs combined	229
Soil Vapor	Sub-Slab	28

2.3 ADDITIONAL EVALUATION OF PROPERTIES FOR TARGETED MASS REMOVAL EXCAVATIONS TO 10 FEET BGS

An alternative that evaluates local targeted excavation between 5 and 10 feet bgs was included in the Revised FS and in the Revised RAP (Alternative 4D). Targeted excavation areas were identified where, based on distribution of hydrocarbon impacts in the 5 and 10-foot bgs interval, the potential exists for substantial hydrocarbon mass removal via deeper excavation. The assessment of areas for targeted excavation also considers the technical feasibility and cost effectiveness of the mass removal.

Properties for targeted deeper excavation under Alternative 4D were previously identified by reviewing the distribution of TPH in soil in the 5 to 10-foot bgs interval and by considering a cost-benefit analysis of the proposed targeted excavation. The contoured and point-by-point distribution of the TPH fractions (as depicted on Figures 3-3 through 3-5, 3-9 through 3-11, and 6-3 of the Revised RAP) were reviewed to identify areas of elevated TPH concentrations, including areas with TPH above residual concentrations. At the request of Regional Board staff, and in an effort to address the uncertainty in contouring, the TPH distribution was additionally evaluated by examining different spatial distribution mapping methods: point-by-point maps, two-dimensional contour maps, and three-dimensional contours. Based on this data evaluation, an additional eight front yards were identified for deeper excavation; five of these are at properties where the back yard was previously identified for deeper excavation, and three are at additional properties not previously identified. In total, 123 yards at 85 properties are now identified for targeted deeper excavation. Properties identified for targeted deeper excavation from 5 to 10 feet bgs are summarized in Revised Table 6-1 and shown on Revised Figure 6-3. Some properties were identified for excavation of both front and back yards, while others were identified for excavation of only the front or back yard.

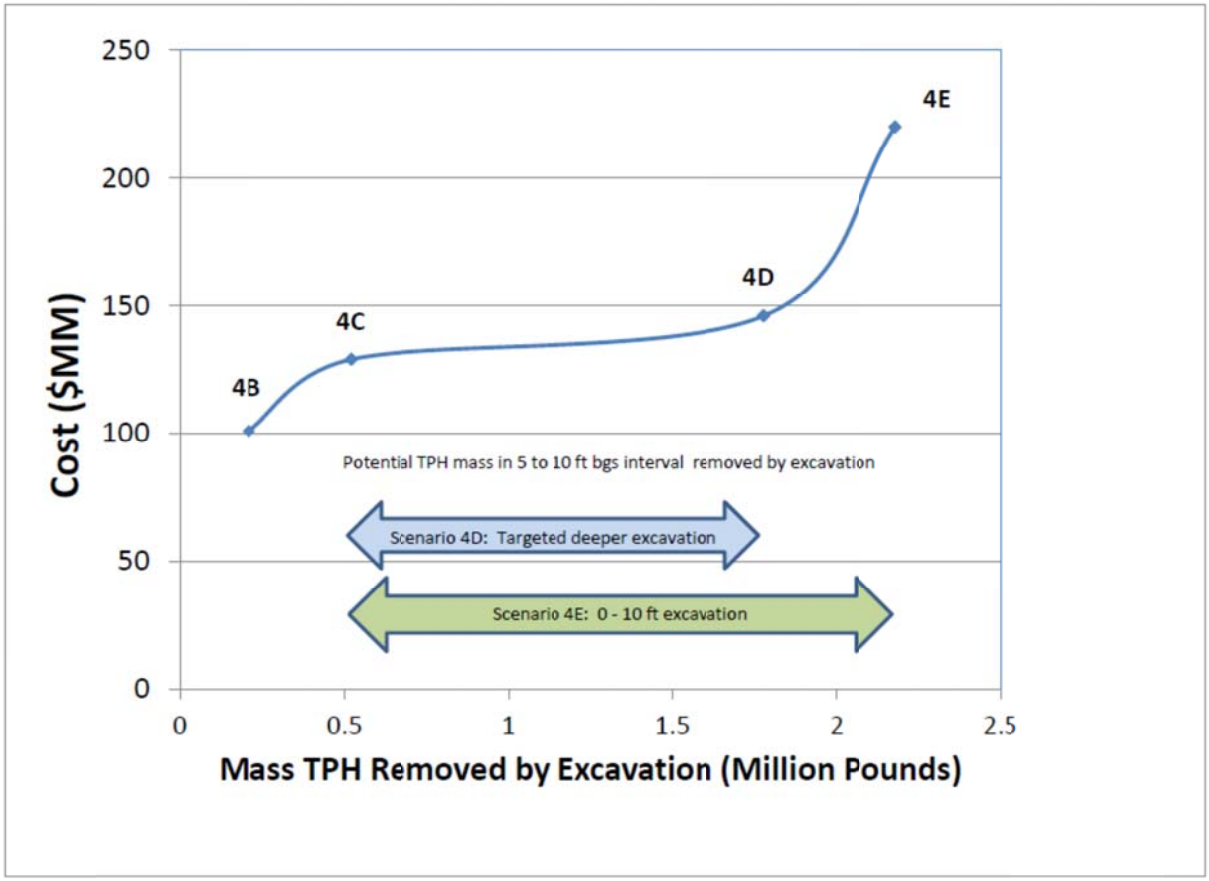
Factors that affect the cost and feasibility of conducting excavations between 5 and 10 feet bgs were considered in identifying properties for targeted deeper excavation under Alternative 4D:

- Targeted deeper excavation is not proposed for properties that are not identified for excavation in the 0 to 5-foot bgs interval. The added cost and time to excavate the 0 to 5-foot bgs interval for the sole purpose of hydrocarbon mass removal in the 5 to 10-foot bgs interval would have a dramatic effect on the practicability of targeted deeper excavations under these circumstances.
- Targeted deeper excavation is not proposed for yards where a swimming pool is present. If a swimming pool is present in a yard, then excavation for a large portion of the yard has already taken place and given the technical difficulties of excavating around a swimming pool and the potential damage to swimming pools and its appurtenant equipment, targeted deeper excavation in these areas is not considered practicable.
- Targeted deeper excavation is not proposed for yards where a limited mass is expected to be removed. For example yards with one or two samples with elevated TPH concentrations at depth or where the contours of elevated TPH concentrations cover a small portion of the yard are not identified for targeted deeper excavation.

Excavation to 5 feet bgs for properties exceeding human health criteria or soil SSCGs for leaching to groundwater criteria is estimated to result in 520,000 pounds of hydrocarbon mass removal. The proposed targeted deeper excavation (Alternative 4D) is estimated to result in an additional 1,260,000 pounds of hydrocarbon mass removal, for a total of 1,780,000 pounds of hydrocarbon mass removed under this proposed remedy. For comparison, excavation to 10 feet bgs for all properties exceeding human health criteria or soil SSCGs for leaching to groundwater criteria (Alternative 4E) is estimated to result in approximately 2,180,000 pounds of hydrocarbon mass removal, of which 1,660,000 is in the 5 to 10-foot bgs interval. Consequently, the targeted deeper excavation (Alternative 4D) is estimated to remove approximately 76% of the TPH mass that could potentially be excavated in the 5 to 10 feet bgs interval at all properties where leaching to groundwater SSCGs were exceeded (Alternative 4E). It should be noted that these mass estimates are for the excavation portion of the recommended remedy. Significant further mass removal will occur through SVE/bioventing which will be implemented Site-wide upon completion of the excavation program.

A cost-benefit analysis of this proposed targeted deeper excavation (Alternative 4D) was conducted by comparing the TPH mass that would be removed under the different excavation scenarios evaluated to the cost for removal (similar to the incremental cost per pound of TPH removed presented in the Revised RAP). This cost-benefit analysis is summarized on the figure below.

Cost vs Mass of TPH Removed



This figure shows a substantial increase in the estimated incremental cost for TPH mass removal (i.e., the slope of the curve) for additional excavation beyond what is proposed for the targeted deeper excavation. There is likewise a declining benefit of mass removal for additional excavation of TPH-impacted soil in the 5 to 10-foot bgs interval beyond what is proposed for the targeted deeper excavation. Based on this cost-benefit analysis, the proposed remedy of targeted deeper excavations followed by SVE/bioventing (Alternative 4D) is the most efficient pathway for reduction of TPH and related compounds at the Site.

2.4 UPDATE OF PROPERTIES IDENTIFIED FOR REMEDIAL ACTIONS

The Revised RAP recommended various remedial actions to be conducted at specific properties, as summarized above in Section 1.0, based on evaluation of data collected through May 1, 2014. The number of specific properties identified was used for estimating cost and schedule of RAP implementation. Based upon these data, 202 properties were identified for excavation to 5 feet bgs, 82 properties were identified for targeted deeper excavation from 5 to approximately 10 feet bgs, and 221 properties were identified for SVE/bioventing system installation.

Additional soils data were collected at three properties since the evaluations were performed for the June 30, 2014 Revised RAP. As discussed in Section 2.2, the updated HHRA evaluation identified two of those properties as not meeting RAOs in in the 0 to 5-foot bgs interval. Consistent with the approach described in the Revised RAP, excavation will be conducted at these properties to a depth of 5 feet bgs throughout the accessible portions of front, back, and side yards subject to setbacks to protect structures and sensitive utilities. Additionally, based on the evaluations for these properties presented in the Addendum to the Revised HHRA, three additional properties were identified for SVE/bioventing system installation.

Based on further evaluation of metals data for properties not identified for excavation due to presence of other constituents of concern (COCs), two additional properties were identified for excavation to 5 feet bgs in the Addendum to the Revised HHRA. These properties were included based on presence of arsenic in soils at concentrations exceeding the regional background concentration adopted by the DTSC. (See Section 2.1 for discussion of the evaluation of arsenic concentrations relative to background.)

One additional property, for which sampling is completed but soil data were not collected due to presence of a swimming pool, hardscape cover, and utility conflicts, has been added to the list of properties for excavation to 5 feet bgs and for SVE/bioventing system installation, based on evaluation of data from neighboring properties. This increases the total number of properties identified for excavation to 5 feet bgs to 207, increases the properties identified for SVE/bioventing to 224, and reduces the number of properties with no data to 12. Consistent with the approach described in the Revised RAP, excavation will be conducted at these 207 properties to a depth of 5 feet bgs throughout the accessible portions of front, back, and side yards subject to setbacks to protect structures and sensitive utilities.

The Revised RAP identified 82 properties for targeted deeper excavation from 5 to approximately 10 feet bgs. Some of these properties would have targeted excavations to 10 feet bgs in both front and

back yards, and some properties would have deeper excavation in only one yard (front or back). A total of 115 yard areas were identified for deeper excavation in the Revised RAP. In response to Regional Board staff comments, Geosyntec conducted further data evaluation to identify additional properties where substantial hydrocarbon mass could be achieved by targeted deeper excavation to 10 feet bgs. Based on this data evaluation, an additional eight front yards were identified for deeper excavation; five of these are at properties where the back yard was previously identified for deeper excavation, and three are at additional properties not previously identified. This evaluation is described in Section 2.3 above. Revised Table 6-1 lists properties identified for soil excavation to 5 feet bgs and properties identified for targeted deeper excavation from 5 to 10 feet bgs.

There remain 12 properties with no soil matrix data as of September 9, 2014. Evaluations will be conducted when access is obtained, sampling is conducted, and data are evaluated to assess whether RAOs are met under existing conditions based on unrestricted land use. If the RAOs are not met, these properties will receive the same remedial approach, as appropriate based on property-specific conditions, as other properties identified for remediation. Per Regional Board direction, for purposes of evaluating potential environmental impacts associated with RAP implementation, the Environmental Impact Report (EIR) being prepared in accordance with the California Environmental Quality Act (CEQA) assumes that all 12 properties will be excavated to a depth of 10 feet bgs in front and back yards, where possible, and to 5 feet bgs only in side yards. The actual need for remedial action at these properties will be evaluated when and if access becomes available, soil sampling is conducted, and data are obtained.

Sub-slab mitigation will be implemented at 28 properties where RAOs are not met and while the data do not indicate that vapor intrusion is an issue at any of the residences, Shell is prepared to offer installation of a sub-slab mitigation system to any of the homeowners in the Carousel neighborhood to alleviate concerns about potential impacts to their indoor air from the Site. The additional data collected and evaluations conducted since the June 30, 2014 submittal of the Revised HHRA, FS, and RAP have not impacted the anticipated number of properties for implementation of this portion of the proposed remedy.

Additionally, it is understood that some individual homeowners may choose not to allow the proposed remedial actions to be conducted at their properties. This homeowner decision would decrease the number of properties for a selected remedial action activity.

2.5 UPDATED TABLES AND FIGURES SHOWING PROPERTIES IDENTIFIED FOR REMEDIAL ACTIONS

Revised Table 6-1 lists properties identified for soil excavation to 5 feet bgs and properties identified for targeted deeper excavation from 5 to 10 feet bgs; this table replaces Table 6-1 from the Revised RAP. These properties are shown on Revised Figures 6-1 and 6-3, respectively. Also included are revised Figures 6-2 and 6-4 from the Revised RAP updated to include data available as of September 9, 2014.

2.6 UPDATED EXCAVATION SOIL VOLUME ESTIMATES

The updated estimated excavation soil volumes for recommended Alternative 4D per this Addendum to the Revised RAP include:

- Up to 133,810 cubic yards (CY) for excavation to 5 feet bgs at 219 properties (average of approximately 611 CY of soil per property):
  - 126,477 CY of soil is for excavation to 5 feet bgs at 207 properties identified on the basis of human health risk or potential for leaching of COCs to groundwater.
  - 7,332 CY is for excavation to 5 feet bgs at 12 properties that have no soil characterization data. These 12 properties with no data have been included as a contingency. The actual need for remedial action at these properties will be evaluated when access becomes available, sampling is conducted, and data are obtained. This estimated volume assumes excavation of front, back and side yards to 5 feet bgs.
  - The 133,810 CY value is an upper-bound volume estimate for excavation to 5 feet bgs, as it does not include a reduction in volume for setbacks, sloping of excavation walls, and avoidance of sensitive utilities (particularly the transite pipe water mains located in front yards of approximately half the properties in the Carousel tract).
- Up to 27,855 CY of additional soil for targeted deeper excavation of 146 yards to 10 feet bgs:
  - 123 yards would be excavated at 85 properties identified where targeted deeper excavation would result in significant hydrocarbon mass reduction based on a technological and economic evaluation.
  - 23 yards (both front and back yards of 11 properties and front yard only of one property with a pool) may be excavated at 12 properties that do not have soil characterization data. These 12 properties are included as a contingency; the actual need for remedial action at these properties will be evaluated when access becomes available, soil sampling is conducted, and data are obtained and evaluated.
  - Both front and back yards would be excavated at 49 properties (includes 11 of the 12 properties with no data); front yards only would be excavated at 24 properties, and back yards only would be excavated at 24 properties.
  - None of these estimates take into account volume reductions for setbacks, sloping of excavation walls, and avoidance of sensitive utilities.
- The total estimated soil volume that potentially may be excavated is 133,810 + 27,855 = 161,655 CY, rounded to 161,700 CY.
- For purposes of estimating the upper bound soil volume that may be excavated for evaluation of potential project impacts in the EIR being prepared for the project, the RWQCB has directed Shell and the EIR preparer to assume a contingency for over excavation of 10% of the total soil volume.

  - Ten percent of 161,700 = 16,170 CY, rounded to 16,200 CY. This would bring the total soil volume from residential excavations for consideration in the EIR to approximately 177,900 CY.
  - The total number of properties that would be excavated would be 219 (207 + 12). For estimation of truck trips, we have assumed that 239 properties would be excavated to accommodate the 10% contingency soil volume per direction from the RWQCB for purposes of impact evaluation in the EIR. This additional contingency soil volume is not, however, a planned component of the RAP.

- In addition to this estimated volume for residential excavation, there would be approximately 8,100 CY of soil excavated from trenches installed in City streets for SVE piping installation.
- This will bring the grand total upper bound soil excavation volume to for consideration in the EIR 186,000 CY.

2.7 POTENTIAL ADDITIONAL EXCAVATION BASED ON FINDINGS DURING EXCAVATION

The RWQCB has directed that the EIR for implementation of the RAP include a contingency soil volume equal to 10 percent of the planned excavation volume to allow additional excavation if warranted based on Site conditions encountered during planned excavation. This section of the RAP Addendum includes a discussion of criteria that may be used to make decisions regarding conducting additional vertical or lateral excavation.

The primary purpose of the additional excavation would be to remove hydrocarbon mass. In an excavation-only remediation scenario, confirmation samples are typically collected to determine if the RAOs have been met and thus whether the remedial action is complete. In the proposed remedy, however, any VOCs or hydrocarbon mass remaining after excavation is completed that exceed the RAOs will be addressed by the combined SVE/bioventing system. Therefore, decisions regarding additional excavation beyond the planned lateral or vertical limits of excavation will be based on field conditions and will focus on observation of mobile non-aqueous phase liquid (mobile NAPL).

Field observational criteria will be used to make decisions regarding whether additional excavation is warranted at a particular property or properties. Observations that may trigger additional excavation include: 1) observation of obvious mobile NAPL; 2) hydrocarbons seeping or oozing from excavation walls; 3) wet crude oil-like residue on gloves when soils are handled; 4) use of paint filter tests and to determine whether mobile NAPL is present and using a graduated cylinder to separate water from hydrocarbons in recovered liquids.

Once an excavation has reached the planned lateral or vertical limits, the decision to conduct additional excavation will be based on field observation of the presence of mobile NAPL. Soils from the excavation sidewalls and bottom will be examined by the supervising onsite geologist/engineer for the obvious presence of mobile NAPL to assess the need for additional excavation. This will include observations of migrating NAPL (oozing or seeping into excavation) or wet crude oil residue on gloves when soils are handled. If mobile NAPL appears to be present in the soils, the soils/liquids

will be collected directly from the excavation or from the bucket of the excavator and tested for the presence of liquids using the paint filter test (EPA Method 9095B). Any liquids passing the paint filter will then be placed in a graduated and allowed a 5-minute time period to assess whether mobile NAPL is present. The presence of mobile NAPL will be assessed by visual inspection of the liquids in the glassware.

Additional excavation will be conducted if the presence of mobile NAPL is confirmed using field observations/testing as discussed below:

- If, during a 5-foot excavation, the presence of mobile NAPL is confirmed:
  - At the base of the 5-foot excavation, the excavation will locally proceed deeper to remove soils containing mobile NAPL, to the extent it can be done safely and without damaging property. The vertical extent of excavation will not exceed 10 feet.
  - Along an excavation sidewall that adjoins a property that is already planned for 5-foot excavation, the excavation will occur at that adjacent property in accordance with the PSRP and Grading Permit for that property.
  - Along an excavation sidewall that adjoins a property that was not identified for excavation to 5 feet, a PSRP would need to be prepared and a Grading Permit would need to be obtained before soils beneath the adjacent property are excavated to remove impacted soils. Localized lateral excavation onto the adjoining property would be performed, to the extent it can be done safely and practicably, to remove the NAPL-impacted material only after a Grading Permit is obtained, or a waiver is granted by the City, for the additional excavation work. This may delay restoration of both properties until the Grading Permit can be obtained creating an inconvenience to the residents.
- If, during a 10-foot targeted excavation for mass removal (i.e., during excavation from 5 to 10 feet bgs) the presence of mobile NAPL is confirmed:
  - At the base of the 10-foot excavation, mobile NAPL would be removed to the extent practicable, but in no case will the vertical extent of excavation exceed 10 feet.
  - Along the excavation sidewall for a partial yard excavation, lateral excavation will continue to the extent it can be done safely and without damaging property until the mobile NAPL has been removed or the property line or other boundary has been reached.
  - Along an excavation sidewall that adjoins a property that was not identified for excavation, soils beneath the adjacent property would not be excavated to remove impacted soils below 5 feet.
  - Along an excavation sidewall that adjoins a property that was identified for excavation to 5 feet, but not identified for excavation to 10 feet:
    - If that adjacent property has not yet been excavated, the PSRP and Grading Permit would be amended to allow limited deeper excavation to remove targeted mass, and localized lateral excavation would be performed, to the extent it can be done safely and practicably, to remove the NAPL-impacted material.

  - If the adjacent property has been excavated but not yet backfilled, the PSRP and Grading Permit would be amended to allow limited deeper excavation to remove targeted mass, and localized lateral excavation would be performed, to the extent it can be done safely and practicably, to remove the NAPL-impacted material.
  - If the adjacent property has been excavated and backfilled, localized limited lateral excavation would be performed, as can be done safely and practicably, to remove the targeted material, and documentation would be amended as applicable.
- If the mobile NAPL encountered is due to smear on top of the residual concrete base, no additional lateral excavation will be performed.

- Mobile NAPL will not be removed from an excavation sidewall if that sidewall adjoins a building foundation, city sidewalk/street, or utility line.

2.8 POST-EXCAVATION SAMPLING

Post-Excavation sampling is discussed in Section 8.1.7 of the Revised RAP as follows:

> "Post-excavation soil samples will be collected from the walls of excavations adjacent to residential structures. Samples will only be collected from walls of excavations along property lines, where the adjacent property has not been or is not scheduled to be excavated. Samples will be collected from two depths at two locations along each side of the residences (8 locations, 16 samples total) and from two locations at the bottom of each excavation in the back and front yards (4 samples), yielding a total of 20 samples per property. Samples will be collected from two locations at two depths along property lines in the front and back yards of properties where the adjacent property will not be excavated. Depths of sidewall samples will be established in the field based on visual observations. These samples will be analyzed for COCs with the potential to migrate to soil vapor and groundwater, including TPHg, TPHd, TPHmo, and VOCs. Because of their very low solubility and migration potential, post-excavation samples will not be analyzed for SVOCs, PAHs, or metals."

Based upon discussions with Regional Board staff, the post-excavation sampling approach is modified as follows:

- Post-excavation soil samples will be collected only as can be performed safely and efficiently due to physical constraints based on the types and locations of excavation being performed.
  - At locations where excavations are conducted using slot trenching, shallow samples (0.5 and 2 feet bgs) may be collected by personnel located within the trench or at ground surface adjacent to the trench using appropriate safety precautions and hand auger or other sampling equipment. Deeper samples will be collected from ground surface adjacent to the trench using appropriate safety precautions and hand auger or other sampling equipment. Personnel will not enter trenches deeper than 4 feet bgs for sample collection purposes.

  - At locations where excavations are conducted using large diameter auger methods, all samples will be collected by personnel at ground surface adjacent to the boring using appropriate safety precautions. Samples collected from the bottom of targeted excavations from 5 to 10 feet bgs will need to be collected from the auger bucket or soil cuttings, as the diameter of the boring will not permit using tools to collect samples at 10 feet bgs from the ground surface. Therefore these samples would be from materials excavated and would not document concentrations of COCs that remain after excavation. Under no circumstances will personnel enter auger excavation borings.

- Post-excavation soil samples will be collected from the walls of excavations at two lateral locations adjacent to each side of residential structures at depths of 2 and 5 feet bgs. If feasible within operational and safety constraints, a sample will be collected at 10 feet bgs from properties where targeted deeper excavation is conducted. A sample will not be collected from 0.5 feet bgs adjacent to residences, as it is anticipated that the foundation of the residence and its concrete footings will extend below this depth.
- Samples will be collected from excavations adjacent to property lines only from walls of excavations where the adjacent property is not scheduled to be excavated, or where the adjoining yard will be/has been excavated to a shallower depth. Samples will be collected from two lateral locations in each yard at depths of 0.5, 2 and 5 feet bgs. If feasible within operational and safety constraints, a sample will be collected at 10 feet bgs at properties where targeted deeper excavation extends to 10 feet bgs and the adjoining property is not targeted for the same depth.
- At properties where targeted deeper excavation to 10 feet bgs is conducted for a partial yard, samples will be collected from one or two lateral locations along the excavation wall remaining on the property at a depth 10 feet bgs, if feasible within operational and safety constraints. (Samples will not be collected at 0.5, 2 and 5 feet bgs because the remainder of the yard will be or already have been excavated to 5 feet bgs.)
- Samples will be collected from the excavation adjacent to the City sidewalk, subject to operational and safety constraints, including protection of utilities. Samples will be collected from two lateral locations in each front yard at depths of 2 and 5 feet bgs. If feasible within operational and safety constraints, a sample will be collected at 10 feet bgs at properties where excavation extends to 10 feet bgs.
- Samples will be taken from the excavation wall along the back of the property line for those properties bordering on the outer edge of the tract and that back up to homes along Carmel Drive in the Monterey Pines community and the former Turco Products Facility west of the Site, the MTA Railroad right-of-way north of the Site, homes along Island Avenue east of the Site, and Lomita Boulevard south of the Site. Samples will be collected from two lateral locations in each yard at depths of 0.5, 2 and 5 feet bgs. If feasible within operational and safety constraints, a sample will be collected at 10 feet bgs where excavations extend to this depth.
- Samples will be collected from the bottom of each excavation at either 5 or approximately 10 feet bgs in the back and front yards, subject to operational and safety constraints, as follows:

- At least two samples each will be collected from the excavation bottom from the front and back yards of the residence (at least four samples total);
- Samples will be collected at the intersection of the sidewall and the base of the excavation as discussed above. These include:
  - Two samples from the excavation bottom from each front yard and back yard adjacent to the residence (four samples total);
  - Two samples from the excavation bottom from each front part and back part of the side yards adjacent to the residence (four samples total);
  - Two additional samples from the excavation adjacent to City sidewalks in front yards (two additional samples from front yards only); and
  - Additional samples may be collected from the excavation bottom at the wall along property lines at locations where the adjacent property is not scheduled for or has not been excavated, or along the tract perimeter as described above.
- In combination, this will result in a minimum of 14 excavation bottom samples per property for a typical rectangular-shaped approximately 50 by 100-foot lot.
- Additional base of excavation samples will be collected from larger irregularly shaped lots so that there will be a minimum of one sample collected for approximately every 400 square feet of excavated area.

- Post-excavation samples will be analyzed for COCs with the highest potential to migrate to soil vapor and groundwater, including VOCs, TPHg, TPHd, and TPHmo. Because of their very low solubility and migration potential, post-excavation samples will generally not be analyzed for SVOCs, PAHs, or metals. For the 12 properties shown on Revised Figure 6-1 where antimony, arsenic, or thallium concentrations exceed background, the post-excavation samples collected from depths of 0.5, 2 and 5 feet bgs will also be analyzed for these metals.
- Provisional property-specific sample locations will be identified in the PSRP to be prepared for each property.

2.9 USE OF CONTROLLED LOW-STRENGTH MATERIALS (SAND/CEMENT SLURRY) FILL MATERIALS

Placement of cement-sand slurry (slurry), more properly referred to as controlled low-strength material (CLSM), in the lower part of slot-trench and auger excavations is a safe and necessary component of the excavation portion of the selected remedy. CLSM is a self-compacting, flowable fill material used primarily as backfill in lieu of compacted or granular backfill. CLSM is pumpable using a standard concrete pumper, flows easily, and is self-leveling. Its consistency is like that of a slurry or lean grout (comparable to that of a milk shake), yet several hours after placement the material is hard enough to support traffic loads without settling.

2.9.1 CLSM – General Properties and Uses

CLSM is not concrete or soil cement. It is a fluid mixture made of Portland cement, water, and fine aggregate or fly ash. It contains the same components as concrete, but in different proportions. By using a lower proportion of cement than used for concrete, CLSM has in-place properties following curing similar to compacted fill soils (ACI, 1999). The American Concrete Institute (ACI) defines CLSM as having a compressive strength less than 1,200 pounds per square inch (psi); however, most current CLSM applications require unconfined compressive strengths of less than 300 psi to allow for possible future excavation (ACI, 1999). CLSM with an unconfined compressive strength of less than 150 psi is considered excavatable by hand tools (National Ready Mixed Concrete Association (NRMCA) *Guide Specification for Controlled Low Strength Materials (CLSM)*, undated).

Because excavatable CLSM has physical properties similar to compacted soils, there is no reason to believe that tree and shrub roots would not penetrate the cured fill materials. The density of typical CLSM ranges from 115 to 145 pounds per cubic foot (pcf) (Smith, 1991), which is consistent with the density of Site soils of 125 pcf established by geotechnical materials testing of Site soils to support the excavation pilot tests.

The CLSM fill materials will be designed to achieve permeability generally comparable to that of the surrounding soil so as not to cause short circuiting or reduced radius of vacuum influence during SVE/bioventing operation. CLSM may be designed to be as permeable as a uniform coarse sand with a hydraulic conductivity of 4.0×10^{-1} centimeters per second (cm/sec) or as impermeable as clay with a hydraulic conductivity of 1.0×10^{-7} cm/sec. Permeability of most excavatable CLSM is in the range of 10^{-4} to 10^{-5} cm/sec (ACI, 1999). It is often desirable to have the permeability of backfill material equal to or greater than the surrounding soil, and the NRMCA (undated) recommends designing CLSM mixtures to have a hydraulic conductivity coefficient equal to that of fine sand (4.0×10^{-4} cm/sec).

CLSM is ordinarily slightly alkaline and its resistivity increases as the material hardens and the cement continues to hydrate, so that within a few days, CLSM usually has an electrical resistivity that is sufficient to alleviate most corrosivity concerns (Federal Highway Administration, 1997).

CLSM is used widely in the construction industry as a structural fill or backfill material in place of compacted soil around structures, particularly in confined or limited spaces. Conventional compacted soil backfill in trenches and around small structures involves placement of soil fill material in thin layers and mechanical compaction followed by compaction density testing. Because CLSM flows and needs no compacting, it is ideal for use in tight or restricted-access areas where placing and compacting soil or granular fill is difficult or impossible. Also, because CLSM is self-compacting, it eliminates the need for mechanical compaction and associated safety hazards for workers.

Further advantages of using CLSM over compacted soil and granular fill include (modified from University of Florida, 2004):

- CLSM has a fast setup time, providing support for construction equipment the following day.

- It sets up with sufficient strength that it stabilizes trenches and prevents future trench settlement.
- The additional costs for CLSM compared to compacted soil backfill are offset by the elimination of soil compaction and testing labor, reducing the required equipment, manpower and inspection requirements.
- CLSM does not form voids and is less prone to settlement than compacted soil.
- CLSM mix designs can be varied to achieve desired density and permeability.
- It can be used to fill deeper excavations that would otherwise require shoring to allow personnel entry to conduct soil compaction and testing, thereby reducing safety hazards to workers.

The use of CLSM/slurry is common in the construction industry and has been approved by the City of Carson for use at other locations below streets and sidewalks in the City. Also, the Los Angeles County Department of Public Works, Geotechnical and Materials Engineering Division allows the use of CLSM as engineered fill or as trench backfill material, and the City of Los Angeles Building Code (LABC) allows the use of CLSM for the backfill of excavations.

2.9.2 Use of CLSM or Slurry in the Proposed Remedy

In its review comments on the March 10, 2014 RAP, the RWQCB directed Shell to consider comments by the UCLA Expert Panel and address these comments in the Revised RAP. Two of the Expert Panel's comments related to achieving additional hydrocarbon mass removal by localized deeper excavation and using auger excavation methods to achieve deeper soil removal. These comments were addressed in the Revised RAP, and targeted deeper excavation from 5 to 10 feet bgs using a combination of auger excavation with a limited-access bucket auger drill rig and conventional excavation using slot trenching was included in the proposed remedy, Alternative 4D.

Use of slurry backfill is a required element of bucket auger excavation. Using this approach, a vertical large-diameter boring is advanced to the intended depth of excavation. The boring must then be backfilled with slurry the same day for stabilization and safety purposes, and to allow continuing the excavation process by advancing a large-diameter boring directly adjacent to the first boring. This process is repeated until the planned scope of auger excavation is completed at that location. The auger excavation method recommended by the Expert Panel cannot be utilized without use of CLSM backfill.

In a similar manner for targeted deeper excavation by slot trenching, CLSM will be used to stabilize slot trench sidewalls and backfill slot trenches to allow excavation of the adjacent slots. Flowable slurry will be used to backfill slot trenches from the base of the trench to the approximate ground surface. This fill material will provide a footing for equipment to operate when excavating the adjacent slots, which will in turn be backfilled with slurry. When the excavation is completed to its planned lateral limits, the upper part of the slurry section extending to an approximate depth of 3 feet bgs will be removed and replaced with imported certified clean fill soil and compacted as required in the County-approved Grading Plans and City of Carson-issued Grading Permits, and the yard re-landscaped.

Coarse granular (gravel) fill could be placed without mechanical compaction; however, this backfill method would not allow adjacent auger excavation or slot trenching, as the granular fill would run into the new excavation, undermining the fill and potentially the adjacent structure as well as creating a hazardous condition for workers. Additionally, use of coarse granular fill would create short circuiting of the SVE/bioventing system and defeat its purpose.

During the excavation pilot testing, the County Department of Public Works required that slot trenches be excavated and backfilled the same day as part of Grading Permit conditions. We anticipate that this approach will be required during RAP implementation, particularly for filling of slot trenches adjacent to structures. For the reasons described above, use of CLSM will be required in order to perform targeted deeper excavation to 10 feet bgs for purposes of hydrocarbon mass removal, and is a safe and necessary component of the excavation portion of the selected remedy.

2.10 EXPEDITED IMPLEMENTATION OPTION TO ACCELERATE REMEDIATION OF RESIDENTIAL PROPERTIES

As described in the Revised RAP, excavation will proceed in phases, with each phase of work including approximately eight contiguous properties, assuming access can be obtained. Where possible, each phase will include homes on both sides of a city block (e.g., the east side of Marbella and west side of Neptune Avenues or the east side of Ravenna and west side of Panama Avenues). This approach will be used so that back-of-lot fences or block walls can be removed one time and excavation conducted in both adjoining yards before the fences are restored. Removal of the side and back fences/walls will also facilitate equipment access and ability to conduct bulk excavations rather than more time consuming slot trenching.

Each phase will include approximately eight properties with work occurring on properties in sequence. For properties on the perimeter of the tract, work will likely proceed at a smaller number of properties for each phase. The work will begin with demolition and removal of hardscape and landscaping at two properties simultaneously. As currently envisioned and assuming approval through the EIR process of the number of daily truck trips required, excavation will then proceed working concurrently on four properties. As the excavations are completed, backfill will occur followed by restoration of hardscape and landscaping. Work on the second phase of properties (i.e., the next eight properties working down the block), will begin approximately at the end of week six or eight of work on the first phase. By excavating on four properties concurrently, the overall duration to complete remedial excavation is shortened and excavations can be accomplished more efficiently.

Regional Board staff has requested that Shell evaluate an expedited implementation option wherein excavation work would proceed at a larger number of properties than described in the Revised RAP. As the demolition, excavation, backfill and restoration work proceeds, and work has been completed on several blocks of eight properties, Shell's contractors will evaluate whether the pace of excavation work can be increased by working on two blocks of eight properties simultaneously. This determination will involve consideration of whether this work can be done safely and efficiently when considering the increased level of effort and amount of equipment and trucks that will be operating in the neighborhood concurrently as well as any additional impact to the residents. It may be more feasible to conduct operations at a second set of eight properties that are not contiguous with

the initially planned set of eight properties and are located in a different area of the community to reduce congestion from trucks and construction vehicles. This accelerated implementation option would roughly double the level of activity in the neighborhood, including truck and construction vehicle traffic, and these and other impacts associated with this approach will be evaluated in the project EIR.

Another expedited option that Shell will evaluate, and which may be more feasible, is to conduct demolition, excavation, backfill and restoration work at properties located at the outer edges of the tract on Marbella and Panama Avenues and 244th and 249th Streets while simultaneously conducting remedial excavation and related activities in the interior blocks of the tract. These remediation activities on exterior parcels within the neighborhood would be sequenced so that work is not occurring across the street or in close proximity to work on interior blocks to avoid complete closure of streets and sidewalks. Again, evaluation of the feasibility of this expedited work approach would be conducted after completing work on several blocks of properties and will consider whether this work can be done safely and efficiently.

2.11 CLARIFICATION OF SVE/BIOVENTING DESIGN

2.11.1 SVE/Bioventing Approach

Cyclical operation of a combined SVE and bioventing system is the selected remedial technology to address petroleum hydrocarbons, VOCs, and methane in soil vapor and to promote degradation of residual hydrocarbon concentrations in soils that do not meet RAOs and are not removed by excavation. Use of SVE/bioventing will address impacted areas beneath existing paved areas, City sidewalks, and concrete foundations of the homes, in addition to addressing reduction of COC concentrations in excavated areas below 5 or 10 feet bgs and areas not targeted for deeper excavation for mass removal, with the ultimate goal of achieving RAOs over time. Operation of the SVE/bioventing system will also address impacted soils that may be associated with residual concrete reservoir slabs left in place below the depth of excavation.

The SVE system will be operated in a cyclical manner, with active extraction occurring in different portions of the Site at different times. The SVE/bioventing system(s) will be operated cyclically (pulsed) to extract impacted soil vapor and introduce oxygen to the subsurface to stimulate degradation of the heavier fraction of diesel-range hydrocarbons and motor oil-range hydrocarbons in a bioventing operational mode. During periods of active vapor extraction from a sub-set of wells ("on cycle"), the SVE system will not only remove hydrocarbon vapors, but will also draw oxygen into the subsurface to enhance the biodegradation of residual petroleum hydrocarbons in soil. During periods when no extraction is occurring for the set of wells ("off cycle"), remediation will be achieved through biodegradation alone (i.e., bioventing). The system will be designed to use the same infrastructure (i.e., extraction wells) for both SVE and bioventing, and the cyclical operating conditions will be used to implement both remedial actions. The SVE/bioventing system will be operated in manner to achieve the soil oxygen demand estimated from the bioventing pilot tests (Geosyntec, 2012).

The SVE pilot test examined vertical extraction wells and the bioventing pilot test examined both vertical and horizontal extraction wells. Although horizontal and vertical extraction wells were both effective in treating soils through bioventing during pilot testing, the physical and operational limitations of using horizontal wells make vertical extraction wells the preferred option for the proposed remedy. Vertical extraction wells will be used for implementation of the SVE/bioventing system for the Site based on the following rationale:

- The lateral radii of influence for horizontal and vertical wells are similar. The estimated radius of influence for the horizontal wells during the bioventing pilot test ranged from 6 to 20 feet while the radius of influence for the vertical wells during the bioventing pilot test ranged from <5 to 15 feet.
- The vertical wells will provide better remediation for impacted soils deeper than 5 feet bgs. The horizontal wells were installed at a depth of 5 feet bgs during the bioventing pilot test. With this placement, the effect of the horizontal wells on soils within the 5 to 10-foot depth interval is likely limited due to short-circuiting via the granular soil backfill that will be placed following excavation to 5 feet bgs. The vertical SVE/bioventing wells with screened interval from 5 to 10 feet bgs within the soils targeted for remediation will have a greater impact on this zone.
- The vertical wells can be placed closer to the buildings and consequently provide greater reduction of COCs in soils beneath the homes. Based on the proposed excavation approach, it will be logistically impractical to place horizontal SVE wells within a few feet of the building foundation. Because the vertical wells will be installed with hand tools, the vertical wells can be located much closer to the building foundation.

2.11.2 SVE/Bioventing Conceptual Design

SVE/bioventing will be implemented throughout the Site to remediate volatile petroleum hydrocarbons (i.e., gasoline-range petroleum hydrocarbons and the lighter fractions of the diesel range petroleum hydrocarbons), VOCs, and methane, and induce increased airflow to promote microbial degradation of longer-chain hydrocarbons (diesel and motor oil-range petroleum hydrocarbons). The SVE/bioventing infrastructure will consist of a system of extraction wells, belowground conveyance piping, aboveground manifold and treatment compound(s), vapor treatment system(s), and various system controls and instrumentation. SVE will be applied in the shallow zone from approximately 5 to 10 feet bgs, intermediate zone from approximately 15 to 25 feet bgs, and deep zone from approximately 30 to 40 feet bgs and locally deeper depending on depths of soil impact and depth to groundwater. Nested shallow, intermediate, and deep zone wells will be installed in the streets of the Site, which provide ready access for installation. Shallow zone wells will also be installed within the front and back yards of select residences. In general, two wells will be installed on each residential property identified for SVE/bioventing; however, locations and actual numbers of these shallow-zone wells in the front and back yards will be designed during preparation of PSRPs for individual properties and will be based on locations where RAOs are not met in the 0 to 10-foot bgs depth interval and to achieve SVE/bioventing coverage beneath houses. Well and piping components for SVE/bioventing wells installed on residential properties will be entirely below grade. These shallow wells will be screened from 5 to 10 feet bgs and will be connected to the SVE system via conveyance piping, which will be installed in the streets.

Based on the SVE pilot test ROVI results for the intermediate zone, a total of 63 nested well clusters (shallow, intermediate, and deep zone) will be installed in the streets with an average spacing of approximately 125 feet. Based on the estimated ROVI of 50 feet for the shallow zone from the SVE pilot test, an additional 65 shallow zone wells will be installed between the nested wells in the streets of the Site to provide increased vapor extraction coverage within the shallow zone. Additionally, shallow zone wells will be installed in the front and back yards of residences requiring remediation of the shallow zone soil by SVE/bioventing. Due to potential short-circuiting from surface landscaping, the shallow zone ROVI for the residential wells has conservatively been reduced to 25 feet.

The ROVI for the SVE/bioventing system is based on the results of the SVE pilot test rather than the bioventing pilot test, because the blower planned for vapor extraction of the combined system is a robust unit with large capacity and vacuum and a system to treat extracted vapors (see Section 8.2.2 of the Revised RAP). The estimated radius of influence reported for the bioventing pilot test (Geosyntec, 2012) assumed small fans would be used to minimize the concentrations of extracted vapors. The radii of influence estimated from the bioventing pilot test are not applicable for the proposed SVE/bioventing system. Data from the SVE pilot test indicates the expected ROVI for shallow wells will range from 25 to 78 ft. This is consistent with the pilot test results reported for the Turco facility adjacent to the former Kast property, wherein they established a shallow zone ROVI of approximately 26 to 32 feet (ERM-West, 2008). Additionally, the concurrent application of SVE at greater depths in the areas where shallow SVE is proposed will enhance the potential ROVI due to superposition of vacuum influence of the different wells.

As shown in Revised Table 6-1, a total of 224 residences are identified for SVE/bioventing remediation. A total of 229 properties are identified in Table 6-1 as exceeding either human health risk or leaching to groundwater criteria in the ≤5 foot or >5 to 10 foot depth interval. Five of these properties were identified based on metals concentrations alone, reducing the number of properties for SVE/bioventing to 224.

Following approval of the RAP, a RDIP providing the well field layout, SVE system(s) location(s) and specifications, and conveyance piping layout will be submitted for RWQCB approval.

2.11.3 SVE/Bioventing Equipment

Based on the estimated quantity of extraction wells (63 nested street wells, 65 shallow zone street wells, and approximately 474 shallow zone residential wells), it is impractical to construct an SVE system to extract simultaneously from all of the proposed wells. As a result, a system or systems rated for a combined 3,000 standard cubic feet per minute (scfm) at up to 12 inches of mercury (in-Hg) vacuum is planned.

Shell is currently evaluating offsite locations for the installation of the remediation equipment. Potential offsite SVE system locations are being evaluated in terms of technological feasibility, accessibility and availability of the locations. These potential SVE locations are shown on Figure 8-8 of the Revised RAP.

2.12 REVISIONS TO POST-CONSTRUCTION LONG-TERM MONITORING AND SAMPLING PLAN

2.12.1 SVE/Bioventing System Effectiveness Monitoring

Section 8.6 of the Revised RAP provides a recommended long-term post-construction monitoring and sampling plan for the Site. To monitor SVE/bioventing system effectiveness, 16 multi-depth soil vapor monitoring wells/probes will be installed in City streets. As described in the Revised RAP, well screens will be installed at depths of approximately 1.5, 5, 7.5, 20, and 35 feet bgs in each of the 16 cluster vapor wells. The locations and design of the vapor wells/probes will be presented in the RDIP.

To address comments from Regional Board staff, the frequency of sampling of the multi-depth soil vapor wells has been increased and the nature of monitoring clarified, as described below:

- Soil vapor samples will be collected from each of the vapor wells following system startup and analyzed by a National Environmental Laboratory Accreditation Program (NELAP)-certified laboratory for VOCs by USEPA Method TO-15 and fixed gases (including methane) by ASTM Method D-1946 with the following frequency:
  - Quarterly for a period of 2 years
  - Semi-annually for a period of 3 years
  - Annually for a period of 5 years, and
  - Every 5 years thereafter.

  Analytical results for these sampling events will be reported semi-annually along with semi-annual groundwater monitoring data.

- In addition to collection for laboratory analysis, the soil vapor wells/probes will be monitored using field instruments, including a landfill-gas meter (Landtec GEM-2000 or equivalent) to monitor methane, carbon dioxide and oxygen (fixed gases) in percent levels, a flame ionization detector (FID) to monitor for total VOCs including methane in the parts per million (ppm) level, and a photo ionization detector (PID) to monitor for total non-methane VOCs, and a manometer to monitor for initial pressure with the following frequency:
  - Monthly for a period of 1 year,
  - Quarterly for a period of 4 years, and
  - Annually thereafter.

  Field monitoring data for these monitoring events will be reported semi-annually along with semi-annual groundwater monitoring data.

2.12.2 Residential Sub-Slab Soil Vapor Probe Monitoring

Section 8.6.4.1 of the Revised RAP presents the recommended monitoring program for sub-slab soil vapor probes prior to and following SVE/bioventing system startup. As presented in the Revised RAP, this monitoring would be conducted would be conducted at the 202 properties identified for

soil excavation from 0 to 5 feet bgs. The number of properties to be monitored is amended to 207 to coincide with the revised number of properties identified for soil excavation from 0 to 5 feet bgs.

2.13 REPORTING ON RAP IMPLEMENTATION AND MONITORING

Following approval of the Revised RAP, Shell's contractors will submit Remediation Progress Reports on a quarterly basis. The progress reports will detail work accomplished during the previous quarter, any impediments or problems encountered and measures taken to resolve those issues, documents or other items submitted for review for which review comments or approval is outstanding, and work planned for the following quarter. The quarterly reports will also include an evaluation of whether the work is proceeding according to schedule and provide recommendations for steps that may be taken to accelerate the work and maintain schedule, as appropriate.

A Remedial Design and Implementation Plan (RDIP) will be prepared and submitted approximately 12 weeks following approval of the RAP for Regional Board review and approval. The RDIP will provide a detailed discussion of the specific tasks necessary to implement the Site-wide remedy, including engineering design of the selected remedial actions, project phasing, and operation/ monitoring/maintenance of different components of the remedy.

The Site-wide RDIP will address non-property specific elements of the remedial design, including general excavation methodologies, identification of suitable backfill criteria, surveying, traffic plans, notifications and site preparation, proposed odor, dust, and noise control measures, etc. It will additionally provide discussion of staging and logistical issues related to the excavation portion of the work. The overall sequencing and preliminary schedule will be discussed, including activities necessary to fully implement each of the components of the remedy, how these activities will be coordinated to facilitate construction/implementation, and identification of potential major scheduling problems or delays which may impact the overall schedule.

For the SVE/bioventing system, the RDIP will include the proposed well field layout, SVE system(s) location(s) and specifications, and conveyance piping layout. This will include treatment system design criteria. The RDIP will detail the periodic monitoring, maintenance requirements, and reporting for SVE system operation. SVE/bioventing system recordkeeping requirements, including operating parameters; monitoring of the influent, effluent, and extraction wells using field instrumentation; and the performance of routine system preventive maintenance and troubleshooting will also be addressed in the RDIP. The general sub-slab mitigation design will be included in the RDIP.

The RDIP will also identify anticipated permitting requirements and regulatory compliance activities, including Grading Permits, Stormwater Discharge Permits, dust control requirements, SCAQMD Rule 1166 Mitigation Plan requirements for excavation, SCAQMD Permit to Construct/Operate for SVE/bioventing operation, SCAQMD permits for asbestos removal to install the sub-slab mitigation systems, permits for treatment of sub-slab mitigation effluent and other required permits.

In addition to the RDIP, Property Specific Remedial Plan (PSRPs) will be prepared for each property where remedial actions are planned. The PSRPs will define areas to be excavated, depths of

excavations, features to be removed and those that will be protected in place, and locations of underground utilities that need to be either protected in place or removed and restored. The PSRPs will include lot-specific grading plans and geotechnical evaluations, as required, to support the grading plans. The PSRPs will also include landscape restoration plans that will be developed in consultation with the property owners/residents. The PSRPs will be submitted to the Regional Board for initial review. The PSRPs will then be submitted to the Los Angeles County Department of Public Works (LACDPW), Department of Building and Safety (DBS) and Geotechnical Materials Engineering Division (GMED) for review and approval of grading plans prior to issuance of Grading Permits by the City of Carson.

Following completion of remedial actions (excavation, backfill and restoration; on-property SVE well and piping installation; and installation of sub-slab mitigation systems), and receipt of permit closure approval and post-excavation sample analytical results, property-specific Remedial Action Completion Reports (RACRs) will be prepared and submitted to document remedial actions implemented and concentrations of specific COCs remaining in onsite soils following excavation. The RACRs will include record drawings as part of documentation of work performed. RACRs will be submitted 45 days after receipt of permit closure approval or receipt of post-excavation sample results, whichever is later.

At the properties identified for a sub-slab depressurization (SSD) system installation, sub-slab soil vapor probes will be monitored and sampled, and annual inspections of the SSD systems will be performed as discussed in Section 8.4.6.2 of the Revised RAP. At the properties identified for soil excavation from 0 to 5 feet bgs, sub-slab soil vapor probes will be monitored and sampled as discussed in Section 8.4.6.1 of the Revised RAP. These sampling results will be evaluated in accordance with the procedures included in the Revised HHRA and Addendum to the Revised HHRA, and reported in the quarterly progress reports. If results of sub-slab soil vapor analysis indicate that potential vapor intrusion risk exceeds 1×10^{-6} and RAOs for potential vapor intrusion are exceeded, and the property has not previously been identified for installation of sub-slab mitigation, a SSD system will be installed. If a SSD system has previously been installed, it will be checked to confirm it is working as designed, and if not, corrective steps such as installing a larger fan or expanding the system will be evaluated.

Following RAP approval, monitoring of groundwater in both shallow zone and Gage wells will be conducted and reported semi-annually, on a synchronized groundwater monitoring schedule with neighboring facilities as discussed in the RWQCB's March 23, 2011 directive. Installation of the SVE/bioventing system is anticipated to impact the integrity of the existing street soil vapor probes; however, quarterly monitoring and reporting of existing soil vapor probes at 1, 1.5 and 5 feet bgs at nine onsite probe locations and one offsite location in the streets will continue until site conditions demonstrate it is no longer necessary or feasible. Quarterly monitoring and reporting of 69 onsite and offsite utility vaults will continue until after the SVE/bioventing system becomes operational and site conditions demonstrate it is no longer necessary, as approved by the Regional Board.

After installation and startup of the SVE/bioventing system, periodic monitoring will be conducted as specified in the South Coast Air Quality Management District (SCAQMD) Permit. These reports will be submitted to the SCAQMD in accordance with the schedule stipulated in the Permit to

Construct and Operate issued by SCAQMD and will be copied to the Regional Board. Mass removal estimates will be provided to the RWQCB on an annual basis.

Additionally, periodic monitoring of street soil vapor probes and soil and soil vapor sampling will be performed to confirm effectiveness of the SVE/bioventing system as discussed in Section 8.6.3 of the Revised RAP and Section 2.12.1, above. As discussed in the Revised RAP, results of the baseline and periodic sampling will be used to evaluate overall system effectiveness as well as optimize system operation and will be evaluated in an initial 5-year review report to be submitted five years after SVE system start-up, and subsequent SVE system operational review reports submitted on a 5-year basis. System operational VOC and methane monitoring data, in conjunction with system effectiveness data will be evaluated to establish when soil vapor SSCGs have been met or asymptotic concentrations have been achieved. At that time, a recommendation may be made to terminate the SVE operational mode, in which case the system operational status would change to bioventing only mode and the extraction system would only be operated periodically to induce oxygen flow to the subsurface.

Anticipated reports and their frequency of submittal are summarized below:

Report	Frequency
Remedial Design and Implementation Plan (RDIP)	12 weeks following approval of the RAP
Remediation Progress Reports	Quarterly
Property Specific Remedial Plan (PSRPs)	As completed
Property Specific Remedial Action Completion Reports (RACRs)	45 days following completion of remedial actions (excavation, backfill and restoration; on-property SVE well and piping installation; and installation of sub-slab mitigation systems), and receipt of permit closure approval and post-excavation sample analytical results, whichever is later
Groundwater monitoring	Semi-annually
LNAPL removal	Removal monthly, reported in Semi-annual Groundwater Report
Monitoring of existing soil vapor probes at nine onsite probe locations and one offsite location in the streets.	Quarterly until no longer necessary or feasible
Monitoring of 69 onsite and offsite utility vaults	Quarterly until after SVE/bioventing system becomes operational and site conditions demonstrate it is no longer necessary, as approved by the RWQCB
SCAQMD Permit monitoring	TBD, in accordance with the schedule stipulated in the Permit to Construct and Operate
SVE/bioventing mass removal estimates	Annual
Annual inspections of the SSD systems	Reported in the quarterly progress reports
Sub-slab soil vapor probes sampling	Reported in the quarterly progress reports
Periodic monitoring of street soil vapor probes and soil and soil vapor sampling to confirm effectiveness of the SVE/bioventing system	Analytical results and field data will be reported semi-annually along with semi-annual groundwater monitoring data. Evaluation will be conducted in initial 5-year review report to be submitted five years after SVE system start-up, and subsequent SVE system operational review reports submitted on a 5-year basis

2.14 PRELIMINARY CONCEPTUAL SCHEDULE FOR RAP IMPLEMENTATION

Section 9.5 of the Revised RAP presents a narrative discussion of the tentative schedule for implementation of the RAP. This preliminary conceptual schedule is presented in Gantt chart format on Addendum Figure 2-1. The Gantt chart schedule is based on a start date of May 12, 2015 following anticipated certification of the EIR and approval of the RAP the first week in April 2015 and the CEQA-required 30-day EIR appeal period. This schedule is conditioned on a number of actions by others that will affect implementation of subsequent activities and therefore must be considered tentative. This preliminary schedule assumes homeowners/residents will provide timely access for meetings to support preparation of PSRPs and so that the remedial excavation work and restoration can be implemented in a logical progression as series of blocks of eight homes in sequence working down a city block, as described as the recommended remedy in the Revised RAP and this Addendum. If homeowners do not provide access to allow the work to proceed in this manner, additional time will be required. The preliminary schedule also assumes timely approval of grading plans and issuance of Grading Permits by the LA County DPW and City of Carson, and allows up to six weeks for plan review and approval. The schedule also does not account for delays due to inclement weather or other acts of God.

This preliminary conceptual schedule will be updated with a more detailed schedule during preparation of the RDIP with input from the selected remediation contractor. Additionally, this schedule may be updated periodically as the work progresses; these updates would be communicated in the Remediation Progress Reports.

3.0 REFERENCES

American Concrete Institute (ACI), 1991. Controlled Low-Strength Materials. Report prepared by ACI Committee 229. ACI 229R-99 (Reapproved 2005).

California Environmental Protection Agency, Department of Toxic Substances Control (Cal-EPA DTSC), 2007. Arsenic Strategies, Determination of Arsenic Remediation, Development of Arsenic Cleanup Goals for Proposed and Existing School Sites. March 21, 2007.

ERM-West, Inc. (ERM), 2008. Revised Technical Memorandum No. 1, Proposed Interim Measure. Report prepared by ERM on behalf of Pedro First LLC. January 14, 2008.

Federal Highway Administration, 1997. User Guidelines for Waste and Byproduct Materials in Pavement Construction. Publication Number: FHWA-RD-97-148. Updated: 04/23/2012.

Geosyntec, 2012. Bioventing Pilot Test Summary Report. Former Kast Property, Carson, California. December 6, 2012.

Geosyntec, 2014a. Human Health Risk Assessment Report, Former Kast Property, Carson, California, Site Cleanup No. 1230, Site ID. 2040330. March 10, 2014.

Geosyntec, 2014b. Revised Human Health Risk Assessment Report, Former Kast Property, Carson, California, Site Cleanup No. 1230, Site ID. 2040330. June 30, 2014.

Geosyntec, 2014c. Revised Feasibility Study, Former Kast Property, Carson, California. June 30, 2014.

Geosyntec, 2014d. Addendum to the Revised Human Health Risk Assessment, Former Kast Property, Carson, California. September 30, 2014.

Geosyntec, 2014e. Addendum to the Revised Feasibility Study, Former Kast Property, Carson, California. September 30, 2014.

National Ready Mixed Concrete Association, undated. Guide Specification for Controlled Low Strength Materials (CLSM).

Smith, Anne, 1991. Controlled Low Strength Material. Concrete Construction, May 1991.

University of Florida, 2004. Use of Accelerated Flowable Fill in Pavement Section. Report Prepared for Florida Department of Transportation in Cooperation with U.S. Department of Transportation by University of Florida Department of Civil and Coastal Engineering, Najafi, F.T., and Tia, Mang principal investigators, February 2004.

URS, 2010f. Soil Vapor Extraction Pilot Test Report, Former Kast Property, Carson, California, Site Cleanup No. 1230, Site ID 2040330. September 30, 2010.

URS and Geosyntec, 2014. Revised Remedial Action Plan, Former Kast Property, Carson, California, Cleanup No. 1230, Site ID. 2040330. June 30, 2014.

TABLES

Table 6-1 (REVISED September 2014 for RAP and FS)
Property Addresses for Consideration in Remedial Planning

Address	Shallow Excavation		SVE/Bioventing	Targeted Excavation for >5 to ≤10 ft bgs depth interval			Sub-Slab Soil Vapor Mitigation
	Exceeds HH Criteria or Leaching to GW SSCGs < 5 ft bgs	Exceeds HH Criteria or Leaching to GW SSCGs >5 to <10 ft bgs	Exceeds in either ≤ 5ft or >5 to ≤10 ft bgs depth interval	Front Yard	Back Yard	Both Yards	Identified in HHRA based on > 1 E-6 Risk Level
24402 NEPTUNE AVE	X	X	X		X		
24402 PANAMA AVE	X		X				
24402 RAVENNA AVE	X	X	X		X		
24403 NEPTUNE AVE	X	X	X	X	X	X	
24403 RAVENNA AVE		X	X				
24406 MARBELLA AVE	X	X	X		X		
24406 NEPTUNE AVE		X	X				X
24406 PANAMA AVE	X		X				
24406 RAVENNA AVE	X	X	X				
24409 NEPTUNE AVE	X	X	X	X	X	X	
24409 RAVENNA AVE		X	X				
24411 MARBELLA AVE	X		X				
24411 PANAMA AVE	X	X	X		X		
24412 MARBELLA AVE	X	X	X	X	X	X	X
24412 RAVENNA AVE	X	X	X				
24413 NEPTUNE AVE	X	X	X	X	X	X	
24413 RAVENNA AVE		X	X				
24416 MARBELLA AVE	X	X	X	X	X	X	
24416 NEPTUNE AVE	X		X				
24416 RAVENNA AVE	X	X	X				X
24417 MARBELLA AVE	a	a	a				
24417 PANAMA AVE		X	X				
24419 NEPTUNE AVE	X	X	X	X	X	X	
24419 RAVENNA AVE		X	X				
24420 PANAMA AVE	X		X				
24421 PANAMA AVE	X	X	X	X			
24422 MARBELLA AVE	X	X	X				
24422 NEPTUNE AVE		X	X				
24422 RAVENNA AVE	X	X	X				
24423 MARBELLA AVE	a	a	a				
24423 NEPTUNE AVE	X	X	X	X	X	X	X
24423 RAVENNA AVE	X	X	X				
24426 MARBELLA AVE	X	X	X	X	X	X	
24426 NEPTUNE AVE		X	X				
24426 PANAMA AVE	X		X				
24426 RAVENNA AVE	X		X		X		
24427 PANAMA AVE		X	X				
24429 NEPTUNE AVE	X	X	X	X	X	X	X
24429 RAVENNA AVE	X	X	X				
24431 PANAMA AVE	X	X	X				
24432 MARBELLA AVE	X	X	X		X		
24433 MARBELLA AVE	X		X				X
24436 PANAMA AVE	X		X				
24502 MARBELLA AVE	X	X	X				
24502 NEPTUNE AVE		X	X				
24502 RAVENNA AVE	X	X	X		X		
24503 NEPTUNE AVE	X	X	X	X	X	X	
24503 PANAMA AVE	X	X	X				
24503 RAVENNA AVE		X	X				

Table 6-1 (REVISED September 2014 for RAP and FS)
Property Addresses for Consideration in Remedial Planning

Address	Shallow Excavation		SVE/Bioventing	Targeted Excavation for >5 to ≤10 ft bgs depth interval			Sub-Slab Soil Vapor Mitigation
	Exceeds HH Criteria or Leaching to GW SSCGs < 5 ft bgs	Exceeds HH Criteria or Leaching to GW SSCGs >5 to <10 ft bgs	Exceeds in either ≤ 5ft or >5 to ≤10 ft bgs depth interval	Front Yard	Back Yard	Both Yards	Identified in HHRA based on > 1 E-6 Risk Level
24506 MARBELLA AVE	X	X	X	X			X
24508 NEPTUNE AVE	X	X	X		X		
24508 RAVENNA AVE	X	X	X	X			
24509 NEPTUNE AVE	X	X	X				
24509 PANAMA AVE	X	X	X	X	X	X	
24509 RAVENNA AVE	X	X	X	X			
24512 MARBELLA AVE	X	X	X	X	X	X	
24512 NEPTUNE AVE	X	X	X		X		
24512 RAVENNA AVE	X	X	X	X			
24513 NEPTUNE AVE		X	X				
24513 PANAMA AVE	X	X	X	X	X	X	
24513 RAVENNA AVE		X	X				X
24516 MARBELLA AVE	X	X	X		X		
24517 MARBELLA AVE	X		X				
24518 NEPTUNE AVE	X	X	X	X			
24518 RAVENNA AVE	X	X	X	X	X	X	
24519 NEPTUNE AVE	X	X	X				
24519 PANAMA AVE	X	X	X		X		
24519 RAVENNA AVE	X	X	X				
24522 MARBELLA AVE	X	X	X	X			
24522 NEPTUNE AVE	X	X	X				
24522 RAVENNA AVE	X	X	X				
24523 NEPTUNE AVE	X	X	X		X		
24523 RAVENNA AVE	X	X	X	X			
24526 MARBELLA AVE	X	X	X		X		
24528 NEPTUNE AVE	X	X	X				
24529 NEPTUNE AVE	X	X	X		X		
24529 RAVENNA AVE	X	X	X				
24532 MARBELLA AVE	X	X	X		X		
24532 PANAMA AVE	X	X	X				
24533 NEPTUNE AVE *	X	X	X				
24533 PANAMA AVE	X		X				
24602 MARBELLA AVE		X	X				
24602 PANAMA AVE		X	X				
24603 MARBELLA AVE	X		X				X
24603 NEPTUNE AVE	X	X	X				
24603 PANAMA AVE	X		X				
24603 RAVENNA AVE	X	a	X				
24606 MARBELLA AVE	X	X	X		X		
24607 MARBELLA AVE		X	X				
24608 NEPTUNE AVE	X	X	X				
24608 PANAMA AVE	X	X	X				
24608 RAVENNA AVE	X	X	X				
24609 NEPTUNE AVE	X	X	X	X	X	X	
24609 PANAMA AVE	X	X	X				X
24609 RAVENNA AVE	X		X				
24612 MARBELLA AVE	X	X	X	X	X	X	
24612 NEPTUNE AVE	X	X	X	X	X	X	
24612 PANAMA AVE	X	X	X				

Table 6-1 (REVISED September 2014 for RAP and FS)
Property Addresses for Consideration in Remedial Planning

Address	Shallow Excavation		SVE/Bioventing	Targeted Excavation for >5 to ≤10 ft bgs depth interval			Sub-Slab Soil Vapor Mitigation
	Exceeds HH Criteria or Leaching to GW SSCGs < 5 ft bgs	Exceeds HH Criteria or Leaching to GW SSCGs >5 to <10 ft bgs	Exceeds in either ≤ 5ft or >5 to ≤10 ft bgs depth interval	Front Yard	Back Yard	Both Yards	Identified in HHRA based on > 1 E-6 Risk Level
24612 RAVENNA AVE	X		X				
24613 MARBELLA AVE	a	a	a				
24613 NEPTUNE AVE	X	X	X	X	X	X	
24613 PANAMA AVE	X	X	X				X
24613 RAVENNA AVE	X	X	X				
24616 MARBELLA AVE	X	X	X	X	X	X	
24617 MARBELLA AVE	X	a	X				
24618 NEPTUNE AVE	X	X	X	X	X	X	
24618 PANAMA AVE	X	X	X				
24618 RAVENNA AVE	X		X				
24619 NEPTUNE AVE	X	X	X	X	X	X	
24619 PANAMA AVE	X	X	X				
24619 RAVENNA AVE		X	X				
24622 MARBELLA AVE	X	X	X	X	X	X	
24622 NEPTUNE AVE	X	X	X	X	X	X	
24623 MARBELLA AVE	X	X	X				X
24623 NEPTUNE AVE	X	X	X	X	X	X	
24627 MARBELLA AVE	X	X	X	X			
24628 MARBELLA AVE	X	X	X	X	X	X	
24628 NEPTUNE AVE		X	X				
24629 NEPTUNE AVE	X	X	X	X	X	X	X
24632 NEPTUNE AVE[b]	X	X	X	X	X	X	X
24633 MARBELLA AVE	X		X				
24700 MARBELLA AVE	X	X	X	X			
24702 NEPTUNE AVE	X	X	X	X	X	X	
24702 PANAMA AVE	X	X	X				
24703 MARBELLA AVE	X		X				
24703 NEPTUNE AVE	X	X	X	X			
24703 PANAMA AVE	X	X	X				
24703 RAVENNA AVE	X	X	X	X	X	X	
24706 MARBELLA AVE	X	X	X	X			
24706 RAVENNA AVE	X		X				
24708 PANAMA AVE	X	X	X				
24709 NEPTUNE AVE	X	X	X		X		X
24709 PANAMA AVE	X	X	X		X		
24709 RAVENNA AVE	X	X	X		X		
24710 MARBELLA AVE	X	X	X	X	X	X	
24712 NEPTUNE AVE	X	X	X	X	X	X	X
24712 PANAMA AVE	X	X	X				
24712 RAVENNA AVE	X		X				
24713 PANAMA AVE	X	X	X				
24713 RAVENNA AVE	X	X	X		X		
24715 NEPTUNE AVE	X	X	X	X	X	X	
24716 MARBELLA AVE	X	X	X				
24716 RAVENNA AVE	X		X				
24717 MARBELLA AVE	X		X				
24718 NEPTUNE AVE	X	X	X	X			
24718 PANAMA AVE	X	X	X				
24719 NEPTUNE AVE	X	X	X	X			

Table 6-1 (REVISED September 2014 for RAP and FS)
Property Addresses for Consideration in Remedial Planning

Address	Shallow Excavation		SVE/Bioventing	Targeted Excavation for >5 to ≤10 ft bgs depth interval			Sub-Slab Soil Vapor Mitigation
	Exceeds HH Criteria or Leaching to GW SSCGs < 5 ft bgs	Exceeds HH Criteria or Leaching to GW SSCGs >5 to <10 ft bgs	Exceeds in either ≤ 5ft or >5 to ≤10 ft bgs depth interval	Front Yard	Back Yard	Both Yards	Identified in HHRA based on > 1 E-6 Risk Level
24719 PANAMA AVE	X	X	X				
24719 RAVENNA AVE	X	X	X		X		
24722 MARBELLA AVE	X		X				
24722 PANAMA AVE	X		X				
24722 RAVENNA AVE	X		X				
24723 MARBELLA AVE	X		X				X
24723 RAVENNA AVE	X	X	X				
24726 RAVENNA AVE	X		X				
24727 MARBELLA AVE	X		X				
24728 NEPTUNE AVE	X	X	X				
24728 PANAMA AVE	X	X	X				
24729 NEPTUNE AVE	X		X				
24732 MARBELLA AVE	X		X				
24732 NEPTUNE AVE	X	X	X		X		
24732 RAVENNA AVE	X		X				
24733 MARBELLA AVE	X		X				
24733 PANAMA AVE	X		X				
24733 RAVENNA AVE	X	X	X				
24735 NEPTUNE AVE	X		X				
24736 RAVENNA AVE	X	X	X	X			
24737 MARBELLA AVE	X	X	X				
24738 NEPTUNE AVE	X	X	X	X	X	X	X
24738 PANAMA AVE	X		X				
24739 NEPTUNE AVE	X		X				
24739 PANAMA AVE	X	X	X				
24739 RAVENNA AVE	X	X	X	X	X	X	
24740 MARBELLA AVE	X		X				
24743 RAVENNA AVE	X	X	X	X	X	X	
24744 MARBELLA AVE	X		X				X
24748 RAVENNA AVE	X	X	X				
24749 RAVENNA AVE	X	X	X	X	X	X	X
24752 RAVENNA AVE	X	X	X				
24802 PANAMA AVE	X		X				
24803 NEPTUNE AVE	X		X				
24803 PANAMA AVE	X	X	X				
24808 PANAMA AVE	X		X				
24809 NEPTUNE AVE	X	X	X				
24809 PANAMA AVE	X	X	X	X	X	X	
24812 PANAMA AVE	X		X				
24813 PANAMA AVE	X	X	X				
24815 NEPTUNE AVE	X	X	X				
24818 PANAMA AVE	X		X				
24819 PANAMA AVE	X	X	X		X		
24822 PANAMA AVE	X	X	X				
24823 PANAMA AVE	X	X	X	X			
24828 PANAMA AVE	X	X	X				
24829 PANAMA AVE	X	X	X				
24832 PANAMA AVE	X	X	X				
24833 PANAMA AVE	X	X	X				

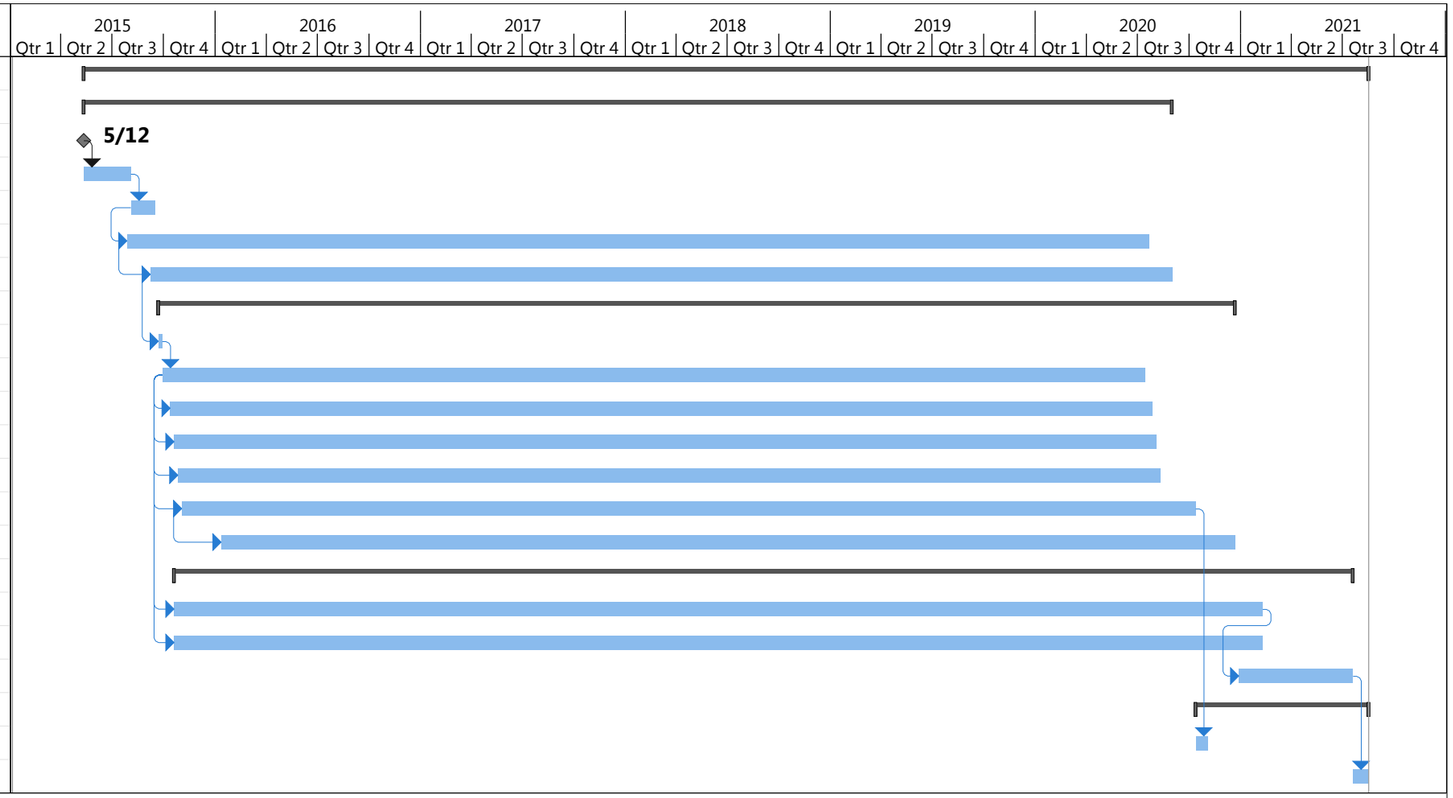
Table 6-1 (REVISED September 2014 for RAP and FS)
Property Addresses for Consideration in Remedial Planning

Address	Shallow Excavation		SVE/Bioventing	Targeted Excavation for >5 to ≤10 ft bgs depth interval			Sub-Slab Soil Vapor Mitigation
	Exceeds HH Criteria or Leaching to GW SSCGs < 5 ft bgs	Exceeds HH Criteria or Leaching to GW SSCGs >5 to <10 ft bgs	Exceeds in either ≤ 5ft or >5 to ≤10 ft bgs depth interval	Front Yard	Back Yard	Both Yards	Identified in HHRA based on > 1 E-6 Risk Level
24838 PANAMA AVE	X		X				
24904 NEPTUNE AVE		X	X				
24912 NEPTUNE AVE		X	X				
305 244TH ST	X	X	X				
311 244TH ST	X	X	X				
317 244TH ST	X		X				X
321 244TH ST	a	a	a				
331 244TH ST	a	a	a				
344 249TH ST	X		X				
345 249TH ST	X	X	X	X			
348 248TH ST	X	X	X	X			X
348 249TH ST	X	X	X				
351 244TH ST	X		X				
352 249TH ST		X	X				X
353 249TH ST	X	X	X				
354 248TH ST	X	X	X	X	X	X	
357 244TH ST	X		X				
357 249TH ST		X	X				
358 249TH ST	X		X				
360 248TH ST	X	X	X	X			
363 249TH ST	X	X	X	X			
364 248TH ST	X	X	X				
367 244TH ST	X		X				
367 249TH ST	X	X	X				
368 249TH ST	X	X	X				
373 249TH ST	X	X	X	X			
374 248TH ST	X	X	X		X		
374 249TH ST	X	X	X	X			
377 249TH ST	X	X	X	X			
378 249TH ST	X	X	X				X
383 249TH ST	X	X	X				X
402 249TH ST	X		X				
412 249TH ST	X	X	X				

"X" - Property Selected For Remediation based on results of Human Health Risk Assessment or additional considerations such as targeted mass removal (Excavation at some properties > 5 to ≤10 feet bgs) or risk management considerations (For subslab depressurization systems)

FIGURES

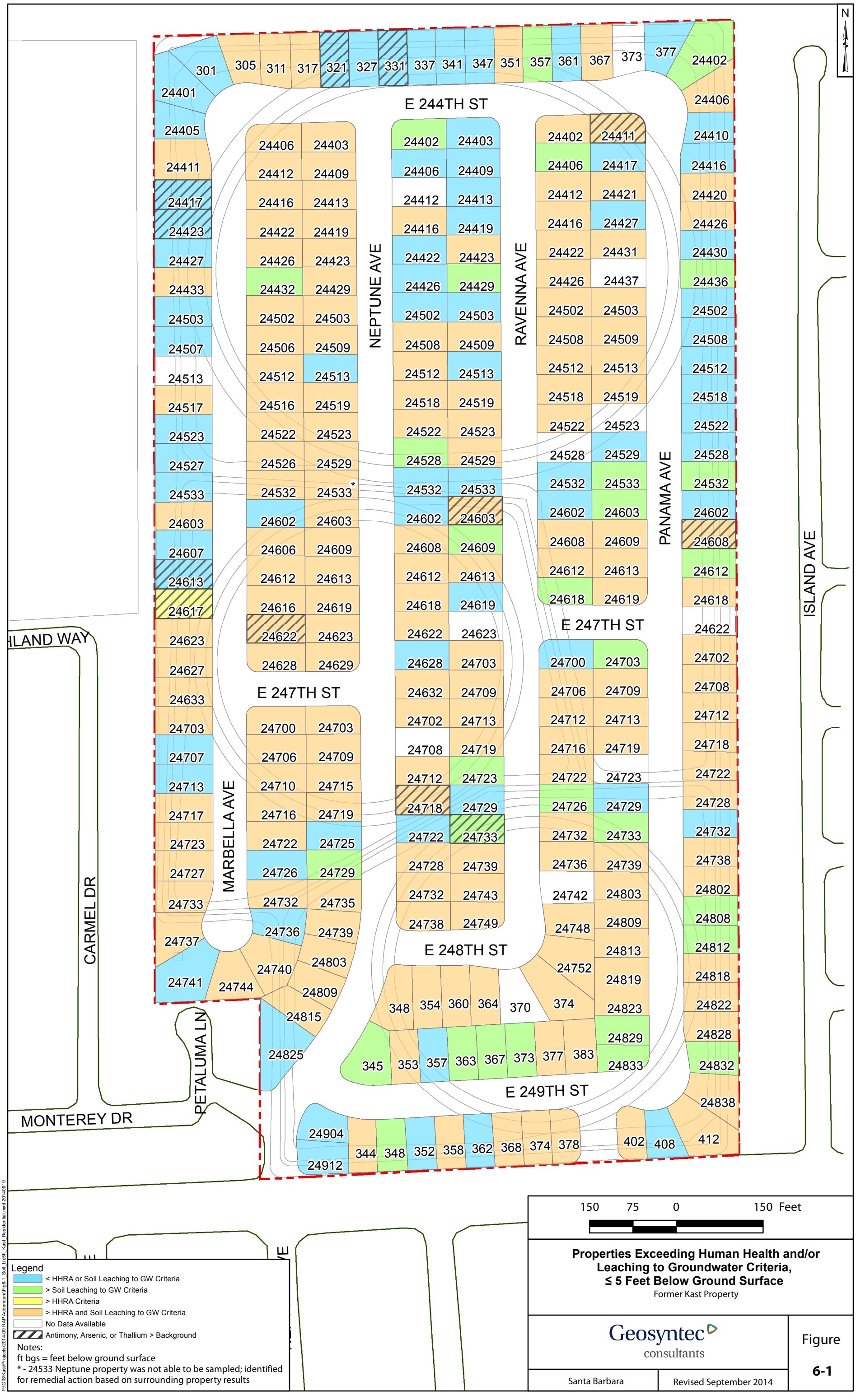
ID	Task Name	Duration	Start
1	**RAP Implementation**	**327 wks**	**Tue 5/12/15**
2	**Preconstruction Activities**	**277 wks**	**Tue 5/12/15**
3	RAP Approval	0 wks	Tue 5/12/15
4	RDIP Preparation (Including SVE, SSD Design and Pemitting)	12 wks	Tue 5/12/15
5	RDIP Review and Approval	30 days	Tue 8/4/15
6	PSRPs (27.4 Blocks of 8 houses)	260 wks	Tue 7/28/15
7	Permitting (Grading, Utilities, R/W, AQMD)	260 wks	Tue 9/8/15
8	**Excavation and Restoration Activities (219 houses)**	**274 wks**	**Tue 9/22/15**
9	Mobilization	1 wk	Tue 9/22/15
10	Hard and Softscape Demo	250 wks	Tue 9/29/15
11	Excavate and Load Impacted Soil, Backfill	250 wks	Tue 10/13/15
12	SVE Wells, Subslab Venting and Piping Installation at houses	250 wks	Tue 10/20/15
13	Utilities Restoration	250 wks	Tue 10/27/15
14	Landscape/Hardscape Restoration	258 wks	Tue 11/3/15
15	Property Specific Remedial Action Completion Reports	258 wks	Tue 1/12/16
16	**SVE/Bioventing Activities**	**300 wks**	**Tue 10/20/15**
17	Trenching and Piping Installation	277 wks	Tue 10/20/15
18	Well Installation in Street	277 wks	Tue 10/20/15
19	SVES Compound Construction and Equipment Installation	29 wks	Tue 12/29/20
20	**Post Excavation Construction**	**44 wks**	**Tue 10/13/20**
21	Asphalt Capping of Streets	3 wks	Tue 10/13/20
22	SVE system startup	4 wks	Tue 7/20/21



Project: FORMER KAST PROPERTY RAP IMPLEMENTATION
PRELIMINARY CONCEPTUAL SCHEDULE

Figure: 2-1 Date: Mon 10/13/14

Task	Inactive Task	Manual Summary Rollup	External Milestone
Split	Inactive Milestone	Manual Summary	Deadline
Milestone	Inactive Summary	Start-only	Progress
Summary	Manual Task	Finish-only	Manual Progress
Project Summary	Duration-only	External Tasks	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NEPTUNE AVE
RAVENNA AVE
PANAMA AVE
ISLAND AVE
E 247TH ST
MARBELLA AVE
E 248TH ST
E 249TH ST
PETALUMA LN
CARMEL DR
MONTEREY DR
HLAND WAY
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150 75 0 150 Feet
Legend
< HHRA or Soil Leaching to GW Criteria
> Soil Leaching to GW Criteria
> HHRA Criteria
> HHRA and Soil Leaching to GW Criteria
No Data Available
Antimony, Arsenic, or Thallium > Background
Notes:
ft bgs = feet below ground surface
* - 24533 Neptune property was not able to be sampled; identified for remedial action based on surrounding property results
Properties Exceeding Human Health and/or Leaching to Groundwater Criteria, ≤ 5 Feet Below Ground Surface
Former Kast Property
Geosyntec consultants
Santa Barbara
Revised September 2014
Figure 6-1
P:\GIS\Kast\Projects\2014-09 RAP Addendum\Fig6-1_Soil_Lt6ft_Kast_Residential.mxd 20140919


N
E 244TH ST
NEPTUNE AVE
RAVENNA AVE
PANAMA AVE
ISLAND AVE
E 247TH ST
E 247TH ST
E 248TH ST
E 249TH ST
MARBELLA AVE
CARMEL DR
PETALUMA LN
MONTEREY DR
HLAND WAY
Legend
< HHRA or Soil Leaching to GW Criteria
> Soil Leaching to GW Criteria
> HHRA Criteria
> HHRA and Soil Leaching to GW Criteria
No Data Available
Antimony, Arsenic, or Thallium > Background
Notes:
ft bgs = feet below ground surface
* - 24533 Neptune property was not able to be sampled; identified for remedial action based on surrounding property results
150 75 0 150 Feet
Properties Exceeding Human Health and/or Leaching to Groundwater Criteria,
> 5 Feet and ≤ 10 Feet Below Ground Surface
Former Kast Property
Geosyntec consultants
Santa Barbara
Revised September 2014
Figure
6-2
P:\GIS\Kast\Projects\2014-09 RAP Addendum\Fig6-2_Soil_5to10ft_Kast_Residential.mxd 20140919

N

E 244TH ST

E 247TH ST

E 247TH ST

E 248TH ST

E 249TH ST

NEPTUNE AVE

RAVENNA AVE

PANAMA AVE

ISLAND AVE

MARBELLA AVE

PETALUMA LN

CARMEL DR

HLAND WAY

MONTEREY DR

NEPTUNE AVE

150 75 0 150 Feet

Legend

- TPH Concentrations > 10x SSCG
- Targeted Excavation Area
- Pool
- Site Boundary

Notes:

NSE = No Shallow Excavation Planned
P = Pool
W = Water Main
ND = No Data

Properties Identified for Targeted Excavation > 5 and ≤ 10 Feet Below Ground Surface

Former Kast Property

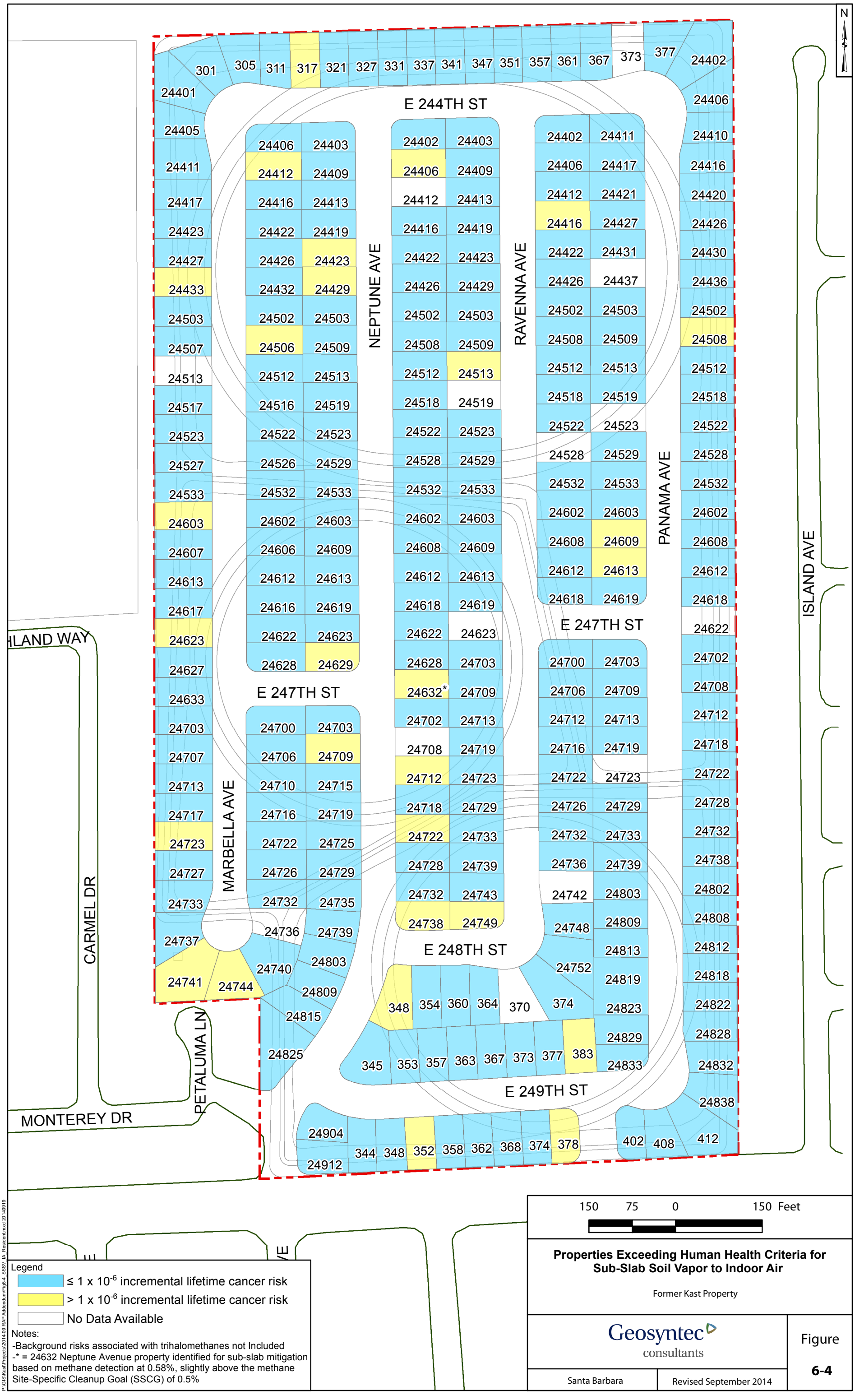
Geosyntec consultants

Santa Barbara

Revised September 2014

Figure 6-3

P:\GIS\KastProjects\2014-09 RAP Addendum\Fig6-3_Targeted_Excavation_Area_gt5and10ft.mxd 20140919


N
E 244TH ST
NEPTUNE AVE
RAVENNA AVE
PANAMA AVE
ISLAND AVE
E 247TH ST
MARBELLA AVE
E 248TH ST
E 249TH ST
PETALUMA LN
CARMEL DR
MONTEREY DR
HLAND WAY
301 305 311 317 321 327 331 337 341 347 351 357 361 367 373 377
24401 24402 24405 24406 24410 24411 24416 24417 24420 24423 24426 24427 24430 24433 24436 24437 24502 24503 24507 24508 24513 24512 24517 24518 24523 24522 24527 24528 24533 24532 24603 24602 24607 24608 24613 24612 24617 24618 24623 24622 24627 24628 24633 24632* 24703 24702 24707 24708 24713 24712 24717 24718 24723 24722 24727 24728 24733 24732 24737 24738 24741 24744 24803 24740 24809 24815 24812 24818 24822 24828 24825 24832 24838
24406 24403 24412 24409 24416 24413 24422 24419 24426 24423 24432 24429 24502 24503 24506 24509 24512 24513 24516 24519 24522 24523 24526 24529 24532 24533 24602 24603 24606 24609 24612 24613 24616 24619 24622 24628 24629
24402 24403 24406 24409 24412 24413 24416 24419 24422 24423 24426 24429 24502 24503 24508 24509 24512 24513 24518 24519 24522 24523 24528 24529 24532 24533 24602 24603 24608 24609 24612 24613 24618 24619 24622 24623 24628 24703 24709 24713 24708 24719 24712 24723 24718 24729 24722 24733 24728 24739 24732 24743 24738 24749
24402 24411 24406 24417 24412 24421 24416 24427 24422 24431 24426 24437 24502 24503 24508 24509 24512 24513 24518 24519 24522 24523 24528 24529 24532 24533 24602 24603 24608 24609 24612 24613 24618 24619
24700 24703 24706 24709 24710 24715 24716 24719 24722 24725 24726 24729 24732 24735 24736 24739 24740 24803 24741 24744 24809 24815 24825
24700 24703 24706 24709 24712 24713 24716 24719 24722 24723 24726 24729 24732 24733 24736 24739 24742 24803 24748 24809 24752 24813 24819 24823 24829 24833
348 354 360 364 370 374
345 353 357 363 367 373 377 383
24904 24912 344 348 352 358 362 368 374 378 402 408 412
150 75 0 150 Feet
Properties Exceeding Human Health Criteria for Sub-Slab Soil Vapor to Indoor Air
Former Kast Property
Geosyntec consultants
Figure 6-4
Santa Barbara
Revised September 2014
Legend
≤ 1 x 10-6 incremental lifetime cancer risk
> 1 x 10-6 incremental lifetime cancer risk
No Data Available
Notes:
-Background risks associated with trihalomethanes not Included
-* = 24632 Neptune Avenue property identified for sub-slab mitigation based on methane detection at 0.58%, slightly above the methane Site-Specific Cleanup Goal (SSCG) of 0.5%
P:\GIS\Kast\Projects\2014-09 RAP Addendum\Fig6-4_SSSV_IA_Resident.mxd 20140919