

City of Carson Report to Mayor and City Council

July 18, 2013
New Business Discussion

SUBJECT: CONDUCT A WORKSHOP TO DISCUSS THE STATUS OF THE ENVIRONMENTAL INVESTIGATION AND CLEANUP STRATEGIES FOR THE CAROUSEL TRACT (KAST PROPERTY)


Submitted by Clifford W. Graves
Director of Community Development


Approved by Jacquelyn Acosta
Acting City Manager

I. SUMMARY

On April 16, 2013, the City Council heard a presentation from Mr. Sam Unger, Executive Director of the Los Angeles Regional Water Quality Control Board (Regional Board) providing an update on the environmental investigation of the Carousel Tract neighborhood. The City Council requested that a future meeting be scheduled to allow more substantive discussion with the Regional Board and to provide more participation from the residents and other interested stakeholders. All residents and property owners within the Carousel Tract have been invited to participate in this workshop.

II. RECOMMENDATION

REVIEW and CONSIDER the next steps for the environmental investigation and cleanup of the Carousel Tract Neighborhood.

III. ALTERNATIVES

TAKE another action the City Council deems appropriate.

IV. BACKGROUND

Since 2008, the Regional Board has required Shell Oil Company (Shell) to investigate the contamination at the Carousel Tract neighborhood and to clean the soil and groundwater in the community to a level that meets established cleanup goals. The most recent fact sheet prepared by the Regional Board, dated May 2013, is attached as Exhibit No. 1. The fact sheet describes the status of the investigation and the next steps to establish a cleanup strategy, called a Remedial Action Plan (RAP). The RAP will detail how the cleanup goals for the Carousel Tract will be achieved.

A Site-Specific Cleanup Goal Report was released for public review, and two comments were received by the end of the comment period on June 24, 2013. Both the City of Carson and the law firm of Girardi & Keese submitted comments. A copy of the City of Carson comment letter is attached as Exhibit No. 2.

The City Council has expressed deep concern with the amount of time that has elapsed since the Regional Board initiated the environmental investigation in May, 2008. There have been many efforts by the City of Carson to assist the Regional Board during the environmental investigation. More recently, the City Council authorized the retention of the law firm of Girardi & Keese as a means of seeking a quicker resolution from Shell and those parties associated with the development of the Carousel Tract. Girardi & Keese has filed a lawsuit on behalf of the City of Carson seeking the full and total abatement of the contamination below the Carousel neighborhood.

This workshop will provide an opportunity for the staff of the Regional Board to describe the current status of the environmental investigation and to detail the upcoming process for establishing a RAP. Also, representative(s) from the Office of Environmental Health Hazard Assessment will explain its review of technical reports and participation in identifying appropriate remedial strategies to protect public health. There will be further discussion by Girardi & Keese and the environmental experts retained to represent the City of Carson and the Carousel Tract residents and property owners.

V. FISCAL IMPACT

None.

VI. EXHIBITS

1. Regional Board Fact Sheet dated May 2013 (pgs. 4-6)
2. City of Carson comment letter to Regional Board dated June 18, 2013 (pgs. 7-41)

Prepared by: Sheri Repp Loadsman, Planning Officer

TO:Rev06-19-2013

Reviewed by:

City Clerk	City Treasurer
Administrative Services	Public Works
Community Development	Community Services

Action taken by City Council	
Date _____	Action _____



Water Boards

STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

State of California
Los Angeles Regional Water Quality Control
Board

FACT SHEET
May 2013

Update: Next Steps for the Investigation and Cleanup of the Carousel Tract Community

Introduction

This Fact Sheet has been prepared to provide you with an update on the status of the environmental investigation and cleanup activities being conducted at the Carousel Tract community located in the City of Carson. In addition, this fact sheet contains information about technical milestones and upcoming opportunities for public input.

By the end of 2013, Shell Oil Products US (Shell) will be required to submit a cleanup strategy, called a Remedial Action Plan (or RAP), that details how Shell will go about cleaning residual oil and other wastes in soil and groundwater in the community that was caused by activities at the Former Kast Tank Farm Property. The Los Angeles Regional Water Quality Control Board (Regional Board) oversees the investigation and cleanup activities at the Carousel Tract community to assure that all environmental work is conducted in a thorough manner that is most protective of human health and the environment.

At this time, the Regional Board is encouraging public review and comment on a document called the Site-Specific Cleanup Goal Report.

COMMUNITY OPEN HOUSE
Monday, June 10, 2013 at 6 p.m.
Carson Community Center
Community Hall C
801 East Carson Street
Carson, CA 90745

The Regional Board will host a community open house to discuss project activities being conducted at the Carousel Tract community. The Regional Board recommends that you attend this open house to learn about and provide input on the activities associated with the investigation and cleanup at the site.

PUBLIC COMMENT PERIOD
Comments will be accepted through June 24
The Site-Specific Cleanup Goal Report is available for public review at the locations listed on page 3 of this Fact Sheet. The Regional Board will make a final decision on the Site-Specific Cleanup Goal Report after all public comments have been reviewed. Please submit written comments postmarked on or before **June 24, 2013** to:

Cynthia Miller, Public Participation Specialist
320 W. 4th Street Suite 200, Los Angeles, CA 90013
Comments submitted via email should be sent to:
cynthia.miller@waterboards.ca.gov

What is a Site-Specific Cleanup Goal?

A Site-Specific Cleanup Goal is the standard that the cleanup must meet to assure protection of the health of people in the community, and protection of the environment. Shell will be required to clean soil and groundwater in the community to a level that meets the established cleanup goal for the Carousel Tract community. Before the Regional Board considers the site fully remediated, confirmation of soil and groundwater sampling will be performed to ensure that the cleanup goal has been achieved.

The Site-Specific Cleanup Goal Report, currently available for public review and comment, was prepared by Shell pursuant to the Cleanup and Abatement Order issued by the Regional Board. The Site-Specific Cleanup Goal Report will be used to determine the methods and extent of remediation, which will be detailed in a RAP that will be prepared in the upcoming months.

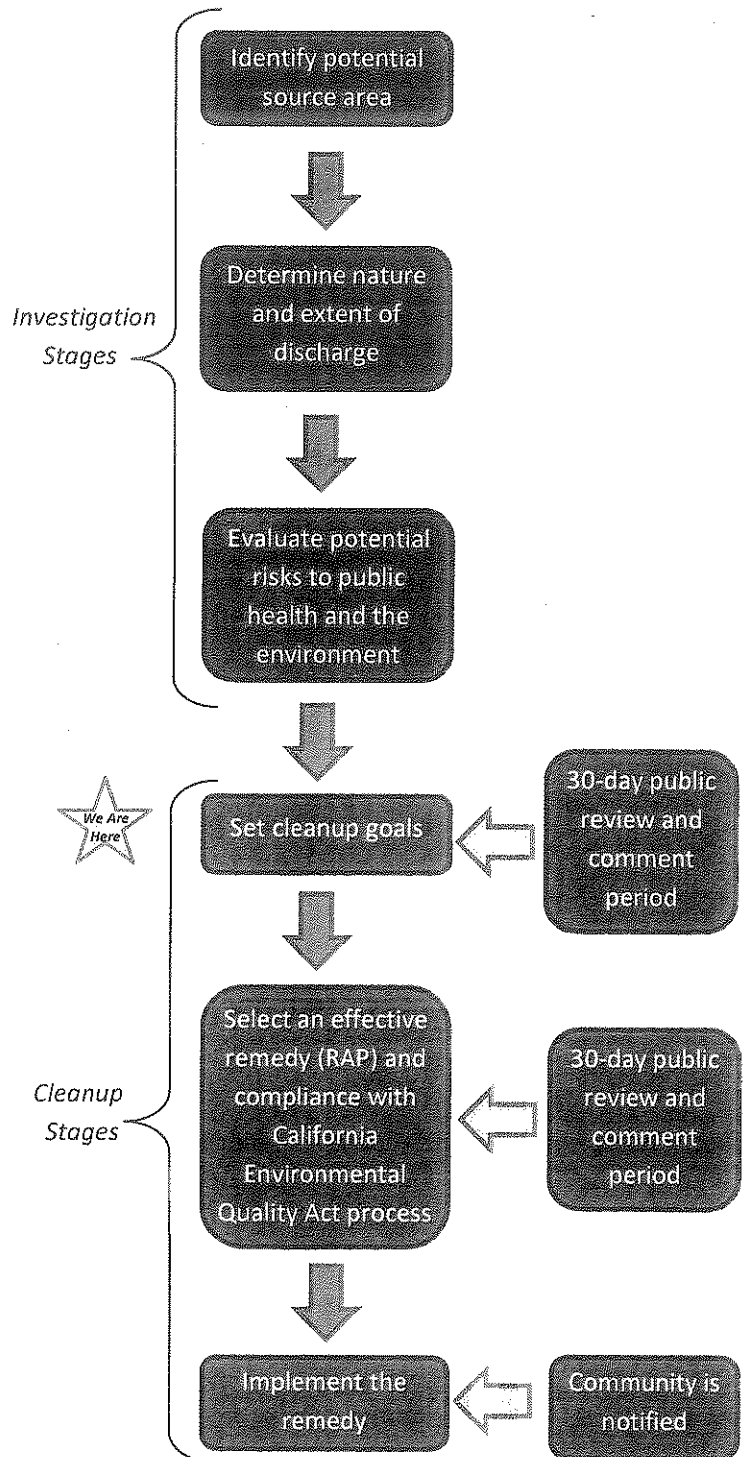
Update on Environmental Investigation

The Regional Board's investigation priorities for the Carousel Tract community have focused on determining whether the community is safe using the following criteria:

- Are residents breathing vapors from soil and groundwater contamination?
- Is the accumulation of methane posing a threat to residents' safety?
- Is the drinking water contaminated?

Ongoing monitoring of methane, and sampling of soil vapor and groundwater have indicated

Where We Are In The Site Cleanup Process



that there is no immediate health risk to residents. Since 2008, more than 14,000 samples of soil, groundwater, and indoor air have been collected and analyzed. Results of all sampling, including indoor air sampling conducted in homes can be requested by contacting Regional Board staff, or can be viewed online by going to:

<http://www.waterboards.ca.gov/losangeles/Kast/index.shtml>.

Next Steps

At the end of the public comment period for the Site-Specific Cleanup Goal Report, the Regional Board and the Office of Environmental Health Hazard Assessment will review and consider all public comments received. If necessary, Shell will make revisions to the Report prior to final approval. A Response to Comments document will be mailed to those who provide contact information with their comment submission.

Once the Site-Specific Cleanup Goal Report is approved, the Regional Board will direct Shell to prepare the RAP which will detail how Shell proposes to accomplish cleanup of the Carousel Tract community. The RAP and other documents, including, as necessary California Environmental Quality Act (CEQA) documents, will be made available to the public for review and comment.

Cleanup of the Carousel Tract community will begin once the Regional Board issues an approval of the RAP and completes the CEQA documents.

Information Resources

The Regional Board invites and encourages you to learn more about this site and to comment on its investigation. Work plans, sampling results, and assessment reports for the site are available for public review. For your convenience, relevant project documents have been placed at the Carson Public Library. The complete administrative file for this project is available for review at the Regional Board's office and on the website listed below.

Carson Public Library

151 E. Carson St.
Carson, CA 90745-2797
(310) 830-0901

Mon. – Thu.: 10 a.m. - 8 p.m., Fri.: 10 a.m. - 6 p.m., Sat.: 10 a.m. - 5 p.m., Sun.: 1 p.m. - 5 p.m.

Los Angeles Regional Water Quality Control Board

320 West 4th Street, Suite #200
Los Angeles, CA 90013
By appointment, please call (213) 576-6600
or fax your request to (213) 576-6717

The administrative file for the site can be viewed by going to:

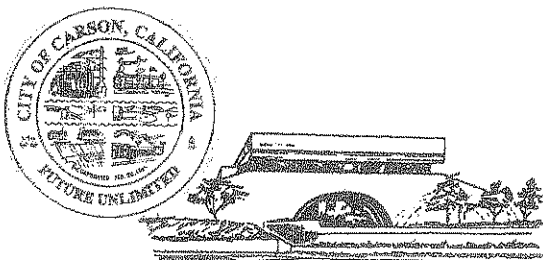
<http://www.waterboards.ca.gov/losangeles/Kast/index.shtml>

For More Information On This Site

Teklewold Ayalew, PhD, PG
Regional Board Project Manager
(213) 576-6739
tayalew@waterboards.ca.gov

Cynthia Miller
Regional Board Public Participation Specialist
(213) 576-6694
cynthia.miller@waterboards.ca.gov





CITY OF CARSON

June 18, 2013

Dr. Teklewold Ayalew
 California Regional Water Quality Control Board – Los Angeles Region
 320 West Fourth Street; Suite 200
 Los Angeles, California 90013

Re: **COMMENT LETTER – FORMER KAST PROPERTY TANK FARM –
 SITE SPECIFIC CLEANUP GOAL REPORT**

Dear Teklewold Ayalew,

This comment letter is submitted on behalf of the City of Carson in response to the request for public comments on the Site-Specific Cleanup Goal Report dated February 22, 2013. It has been five long years since this tragedy first came to light and, to date, there has been no successfully executed method of remediation. Thus far, Shell has tested four different technologies and all four have either proven insufficient and/or potentially dangerous to the public. We have patiently waited for the Los Angeles Regional Water Quality Control Board (LARWQCB), acting authority over this project, to force Shell Oil to abate this nuisance and return the Carousel community to the once beautiful and peaceful neighborhood it used to be. However, this process has taken much longer than originally anticipated. With respect, this delay is unacceptable to the Carson City Council and to our entire community

We, the elected officials of the City of Carson, hereby demand that the LARWQCB take ALL appropriate measures to ensure that the Carousel tract neighborhood (formerly known as the Shell Oil, Kast Property Tank Farm) is properly and expeditiously remediated, leaving absolutely ZERO risk to public health and welfare. After careful review, it has become abundantly clear that Shell Oil's present plan, detailed in the Site Specific Cleanup Goal Report, falls far short of meeting this Council's reasonable expectations. Allowing the standards for cleanup to exceed the limit set by the LARWQCB for TPHg by over 130 times and TPHd by 110 times is completely unacceptable. Shell's proposed Site Specific Cleanup Goals are even higher than soil screening levels used by the Regional Board at industrial sites where no residential land use is proposed or even possible in the future. For example, at the Valero Refinery in Wilmington, an industrial site, the Regional Board approved a set of cleanup criteria consisting of 1,000 mg/kg TPHg and 10,000 mg/kg TPHd. When compared to Shell's proposal of 66,000



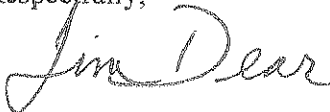
mg/kg TPHg and 110,000 mg/kg TPHd on a site where parents plan to garden and children hope to play, the results are unacceptable. The fact that this report would even be considered for public comment is incomprehensible.

We recognize this step in the remedial process to be an extremely important one; therefore, we implore you to proceed expeditiously. The revised and final Cleanup and Abatement Order allowed Shell to submit "...site-specific cleanup goals for residential (i.e., unrestricted) land use..." Proposed Site Specific Cleanup Goals are required to "...include detailed technical rationale and assumptions underlying each goal. However, there is no rationale to allow Shell's excessive Site Specific Clean Up Goals for residential properties at the Site when the Regional Board has previously required more protective Maximum Soil Screening Levels at residential and industrial sites in the region (e.g. East Bluff Residential Community in Signal hill).

We respectfully submit three reports prepared by environmental consultants, who are internationally recognized experts, to assist the LARWQCB in considering alternative technical rationale. We believe the LARWQCB will find their scientific analysis, and further their suggestions, to be more than appropriate given the Water Board's decision making history with other projects.

The LARWQCB is at a pivotal moment in the clean up on this site. Action must be taken, and it must be taken NOW. This is the perfect opportunity for the LARWQCB to set the tone for the Remedial Action Plan to come. The City of Carson appreciates the opportunity to comment on this important document. If you have any questions concerning these comments, or if we may otherwise be of assistance in connection with this matter, please do not hesitate to contact the undersigned.


Respectfully,



Mayor Jim Dear



Mayor Pro Tempore Elito M. Santarina



Councilmember Mike A. Gipson



Councilmember Lula Davis-Holmes



Councilmember Albert Robles

Enclosures

cc: City Manager





SOIL / WATER / AIR PROTECTION ENTERPRISE
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June 7, 2013

Mr. Samuel Unger, P.E.,
Executive Officer
California Regional Water Quality Control Board
Los Angeles Region
320 West Fourth Street; Suite 200
Los Angeles, California 90013

Subject: Comments on Site-Specific Cleanup Goal Report for Residential Properties
at the Former Kast Property Tank Farm Site in Carson, California

Dear Mr. Unger:

Soil / Water / Air Protection Enterprise ("SWAPE") has prepared this comment letter concerning the *Site-Specific Cleanup Goal Report*¹ for the former Shell Oil Company ("Shell") Kast Property Tank Farm Site (the "Site") in Carson, California. This letter specifically comments on the merits of Shell's site-specific cleanup goals ("SSCGs") and overall cleanup plan for the Site. The information presented herein demonstrates that Shell's SSCGs are unacceptable and should be rejected by the California Regional Water Quality Control Board, Los Angeles Region (the "Regional Board"). If the current SSCGs are approved, the Regional Board will be allowing Shell to "clean up" the Site to sub-par standards and will be breaching their own *Cleanup and Abatement Order* ("CAO").²

We reference our previous letter³ to the Regional Board, which criticized Shell's overall remediation approach for assessment and cleanup of properties in the Carousel neighborhood. Our April 3, 2013 letter and the comment letters from other experts highlighted numerous, unacceptable aspects of Shell's remediation approach. The many inadequacies of the proposed cleanup plan remain unanswered by the

¹ Site-Specific Cleanup Goal Report - Former Kast Property, Carson, California. Geosyntec Consultants, Inc. February 22, 2013.

² Cleanup and Abatement Order No. R4-2011-0046 - Requiring Shell Oil Company - To Cleanup and Abate Waste Discharged to Waters of the State Pursuant to California Water Code Section 13304 at the Former Kast Property Tank Farm, Carson, California. Regional Water Quality Control Board, Los Angeles Region. March 11, 2011.

³ Letter to Samuel Unger, P.E. - re: Comments on Completion of Excavation Pilot Testing Program and Proposed Site-Specific Cleanup Goals for Residential Properties at the Former Kast Property Tank Farm Site in Carson, California. Soil / Water / Air Protection Enterprise. April 3, 2013.



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Regional Board today. Shell's proposed SSCGs are now at issue and in the hands of the Regional Board to approve or deny. These unacceptable SSCGs are contestable, but just one part of a flawed cleanup plan that has been designed by Shell to evade appropriate site assessment and remediation targets at the impacted residential properties.

This present letter discusses Shell's proposed SSCGs in relation to existing Regional Board policy and cleanups that have been approved at other petroleum hydrocarbons ("TPH") remediation sites across the region. The record demonstrates that Shell's proposed SSCGs are too high compared to TPH soil cleanup standards established and used by the Regional Board for other TPH-impacted sites across the region. Furthermore, the proposed SSCG's do not conform with the stated requirements of the CAO. It is also inevitable that land use restrictions will be necessary, which calls into question the entire cleanup approach. Shell's SSCGs are unacceptable and must be rejected.

SOIL CLEANUP GUIDANCE

The soil cleanup plan for the Site must be consistent with policies and past practices of the Regional Board and the State of California for site assessment and cleanup of TPH-impacted sites. Otherwise, the residents will not enjoy equal protections that the State has allowed for cleanups at other properties. Standard guidance for conducting TPH cleanups in the region was established in the Regional Board's 1996 *Interim Site Assessment & Cleanup Guidebook*.⁴ The 1996 *Guidebook* is the most widely-used guidance for assessment and cleanup of TPH-impacted sites and is used by the Regional Board today. This standard, containing TPH cleanup levels, is also the first listed guidance in the CAO.⁵

The Regional Board's 1996 *Guidebook* was intended for setting common standards for protection of groundwater and "... people from exposure when they come in contact with the chemicals..."⁶ The *Guidebook* indicates Maximum Soil Screening Levels ("MSSLs") for TPH-impacted sites, which are standards that have been mandated at numerous cleanup locations in the region. These MSSLs have been consistently used at both residential and industrial Sites in the region for almost two decades. The residents of the Carousel neighborhood are entitled to have their properties cleaned up to standards that have been enforced by the Regional Board elsewhere in the region. Otherwise, they are harmed.

Chapter 4.0 of the *Guidebook* states a fundamental policy of applying the cleanup standards, where "... the Regional Board should make every effort to ensure that the standards are consistent across all programs under its jurisdiction..." In order to be consistent with the Regional Board's existing policy and cleanup

⁴ Interim Site Assessment & Cleanup Guidebook. California Regional Water Quality Control Board, Los Angeles and Ventura Counties, Region 4. May 1996.

⁵ See Page 11 (Section 3.c.II.i) of the Cleanup and Abatement Order No. R4-2011-0046. March 11, 2011.

⁶ *Ibid.*, p. 3-9.



standards, the SSCGs for the Site must be as protective as the MSSLs listed in the Regional Board's 1996 *Guidebook*. However, the proposed SSCGs greatly exceed the applicable MSSLs for the Site:

TPH Range	Shell's SSCG	Regional Board MSSL (GW 20-150 feet) ⁷	Regional Board MSSL (GW >150 feet) ⁸
TPHg - Gasoline (C4-C12)	<i>66,000</i>	500	1,000
TPHd - Diesel (C13-C22)	<i>110,000</i>	1,000	10,000
TPHmo - Motor Oil (C23- C32)	<i>190,000</i>	10,000	50,000

As shown above, the 1996 Regional Board MSSLs are much more protective (lower standards) than the cleanup levels that Shell has proposed for TPH at the Site. For example, Shell's SSCG for gasoline range TPH in soil (TPHg) is more than *60 times higher* than the least protective Regional Board MSSL. Meanwhile, the above MSSL's have been used as standards for industrial sites where no residential homes will ever be built in the future. So, under what rationale can the Regional Board allow Shell to use standards that are less protective than those used for industrial properties? Clearly, Shell's proposed cleanup levels grossly exceed the existing Regional Board standards and cannot be accepted.

The Regional Board's March 2011 CAO⁹ clearly indicates that the Remedial Action Plan ("RAP") for the Site shall apply "...soil cleanup goals set forth in the Regional Board's *Interim Site Assessment and Cleanup Guidebook, May 1996.*" The revised and final CAO also allowed Shell to submit "...site-specific cleanup goals for residential (i.e., unrestricted) land use..." Proposed SSCGs are required to "...include detailed technical rationale and assumptions underlying each goal. However, there is no rationale to allow Shell's excessive SSCGs for residential properties at the Site when the Regional Board has previously required more protective MSSL's at residential and industrial sites in the region.

For the proposed cleanup plan to be protective, the Regional Board must also assure residents that the Site (i.e., each residential property) has been thoroughly characterized and that the lateral and vertical extent of soil contamination has been defined. Comment letters^{10,11} already submitted to the Regional Board in

⁷ The listed MSSLs (see Table 4-1 of 1996 *Guidebook*) in units of milligrams per kilogram ("mg/kg") are applicable to sites with groundwater ("GW") existing at depths between 20 and 150 feet below ground surface. The depth to groundwater at the Site is approximately 60 feet; therefore the MSSLs listed here are the most appropriate.

⁸ The listed MSSLs are applicable to sites with groundwater existing at greater than 150 feet below ground surface.

⁹ See Page 11 (Section 3.c.II.i) of the Cleanup and Abatement Order No. R4-2011-0046. March 11, 2011.

¹⁰ Letter to Samuel Unger, P.E. - re: Comments on Completion of Excavation Pilot Testing Program and Proposed Site-Specific Cleanup Goals for Residential Properties at the Former Kast Property Tank Farm Site in Carson, California. Soil / Water / Air Protection Enterprise. April 3, 2013.

¹¹ Letter to Samuel Unger, Executive Officer - re: Former Kast Tank Farm - Comments on Completion of Excavation Pilot Testing Program and Site-Specific Cleanup Goal Report. L. Everett & Associates. April 3, 2013.



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April 2013 and concurrently with this comment letter demonstrate that complete characterization has not been accomplished. Therefore, the entire cleanup plan is flawed.

There are numerous examples of TPH-impacted sites in the Los Angeles region that have been remediated using the Regional Board's 1996 standards. Two such sites, the Valero Refinery in Wilmington and East Bluff Residential Site in Signal Hill, were both described briefly in our April 3, 2013 comment letter.¹² These two examples both demonstrate that the Regional Board's 1996 *Guidebook* maximum soil screening levels (MSSLs) were used to establish cleanup goals for TPH-impacted soils at both a large industrial site (oil refinery) and a residential development.

At the Valero Refinery, the Board approved site-wide cleanup standards of: 1,000 mg/kg for TPHg, 10,000 mg/kg for TPHd, and 50,000 mg/kg for TPHmo.¹³ In the instance of the East Bluff Residential Site in Signal Hill, the Regional Board approved a set of TPH cleanup criteria consisting of: 1,000 mg/kg for TPHg, 5,000 mg/kg for TPHd, and 15,000 mg/kg for TPHmo.¹⁴ These examples, among many others, demonstrate that the Regional Board has applied consistent TPH soil cleanup standards in accordance with the 1996 *Guidebook*. Yet, the Regional Board is now considering approval of Shell's relaxed SSCGs that have no basis in existing policy and practice used elsewhere.

The Regional Board's consideration of cleanup standards that are much less protective than those required for other TPH-impacted residential sites in the same jurisdiction is an inequity and a insult to the residents of the Carousel neighborhood in Carson. The Board's consideration of cleanup standards that are less protective than those required for cleanup at an oil refinery is unconscionable. The State's Geotracker (www.geotracker.com) website contains the records for hundreds of TPH-impacted sites, where the 1996 *Guidebook* has been used. The Regional Board must therefore reject the proposed SSCGs.

LAND USE RESTRICTIONS

The CAO clearly implies that the proposed SSCGs submitted by Shell shall be for unrestricted¹⁵ residential land use. The fact that TPH and other contaminants will be left in-place at virtually all of the residential parcels at the Site suggests that land use restrictions are inevitable based on the proposed cleanup plan. Under the proposed cleanup plan and SSCGs, the need for land use restrictions is a damage to the future use, enjoyment and value of the properties. The proposed cleanup plan is therefore

¹² Letter to Samuel Unger, P.E. - re: Comments on Completion of Excavation Pilot Testing Program and Proposed Site-Specific Cleanup Goals for Residential Properties at the Former Kast Property Tank Farm Site in Carson, California. Soil / Water / Air Protection Enterprise. April 3, 2013.

¹³ Conceptual Site Model for Valero Wilmington Refinery, 2402 E. Anaheim Street, Wilmington, California. Environmental Engineering & Contracting, Inc. June 29, 2011.

¹⁴ Letter to Signal Hill Petroleum, Inc. re: No Further Requirements - Signal Hill Petroleum/Hilltop, East Bluff Residential Development Site (Q Lots), Tract 53467, Lost 1-23, Signal Hill, California. March 1, 2005.

¹⁵ See Page 13 (Section 3.c.III) of the Cleanup and Abatement Order No. R4-2011-0046. March 11, 2011.



incompatible with unrestricted use of the properties and is unacceptable. Indeed, Shell should remediate all subsurface areas of properties or unrestricted use of the properties cannot be possible.

Recorded land use restrictions are land use covenants which will specify requirements and/or limit the use of the properties and affect the titles to the properties. Land use restrictions will be recorded at the county recorder's office so that they are found during a title search of county records. The purpose of the recorded land use restrictions is to protect the public health and safety on the contaminated Site due to residual contamination. The contamination in this case would be the toxic substances that are left in-place left in place as part of the proposed remedial action.

Shell's proposed cleanup plan limits remediation to only portions of parcels that are not covered by homes and hardscape (e.g., concrete drives and patio areas, etc.) and proposes to leave large portions of the properties uncharacterized and unremediated. Land use restrictions therefore must be recorded for the properties at the Site, which would limit current and future home owner's rights to conduct some desired improvements. Without land use restrictions, some improvements requiring subsurface excavation activities could cause exposures to contaminants that are present in areas that have not been characterized or remediated. This is an unacceptable scenario, whereby the properties are tainted by restrictions and unknown hazards for decades. Clearly, the proposed plan is not a cleanup plan at all.

Current residents and future owners of the properties at the Site may desire to perform a variety of improvements to properties. However, because unknown volumes of contaminants at potentially high concentrations are proposed to be left in-place, regulatory restrictions on the land are necessary to protect current and future residents and workers from exposures. For example, any Site resident will be restricted from installing a pool or basement at their property because they will likely uncover contamination. Land use restrictions will also likely limit residents from growing fruits and vegetables in areas that have not been remediated.

Land use restrictions "run with the land," i.e., and will be binding on current and subsequent property owners, and will remain in effect until they are formally removed or modified. Therefore, current residents will be limited concerning future property improvements and will need to disclose the contamination concerns at their properties for future buyers. The damage of land use restrictions and necessary requirements pertaining to any improvements desired in areas of uncharacterized and unremediated land is a liability to all current and future owners of properties at the Site.



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CLOSURE

The Regional Board's cleanup objectives at the Site should be consistent with past policies and cleanup standards that have been used at other TPH-impacted properties in the region. The cleanup criteria that Shell is proposing grossly exceeds existing Regional Board standards in the 1996 *Guidebook*. Shell's proposed SSCGs are even higher than soil screening levels used by the Regional Board at industrial sites (e.g., Valero Refinery in Wilmington) where no residential land use is proposed or even possible in the future. Therefore, the proposed SSCGs are entirely unreasonable and should be rejected.

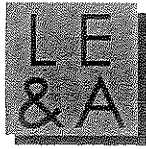
The Regional Board must require a cleanup plan that provides the residents with equal protections offered to other private property owners in the region. Furthermore, the Site cleanup plan and SSCGs must be revised so that land use restrictions are not necessary. Otherwise, under the proposed plan, residents will likely be tainted by restrictions and liabilities that affect the future use, enjoyment and value of their properties. At a minimum, the Regional Board should require Shell to clean up the Site to standards that are consistent with the existing guidance. The approval of any relaxed cleanup standards for Shell to remediate the Carousel Tract neighborhood is a liability to the homeowners now and into the future.

Very truly yours,



Paul E. Rosenfeld, Ph.D.





L. EVERETT & ASSOCIATES

ENVIRONMENTAL CONSULTANTS

June 7, 2013

Samuel Unger, Executive Officer
California Regional Water Quality Control Board
Los Angeles Region
320 West Fourth Street; Suite 200
Los Angeles, California 90013

Subject: Former Kast Tank Farm
Comments on Site-Specific Cleanup Goal Report

Dear Mr. Unger,

When the owner of a property in Hawthorne discovered contamination from a former service station, (case number T0603717633) the Los Angeles Regional Water Quality Control Board ("The Board") imposed a cleanup standard of 500 mg/kg for gasoline-range total petroleum hydrocarbon (TPH_g) and 1,000 mg/kg for diesel-range (TPH_d). These are the standards called for in The Board's Interim Site Assessment and Cleanup Guidebook.¹ This standard was applied to all soil with no exception for soil under buildings or sidewalks. The story is much the same for the owner of an orchard in Monterey County (T0608797961) and a family trust in Temecula (T0606501135; TPH_g and TPH_d in soil remediated to levels below 100 mg/kg). Indeed, similar soil cleanup standards have been and continue to be applied at dozens if not hundreds of sites across the state under the regulatory authority of the regional water quality control boards.

Shell is demanding more lax soil cleanup standards than were applied at the sites noted above. Approving Shell's proposed cleanup standards would not only be a mistake on technical grounds, it would be a blow to the concept of fairness and consistent application of government rules and policies. Faith in government stems from citizens' belief that the rules are applied consistently: the millionaire or politician is just as likely to get a speeding ticket as the rest of us. By proposing lax cleanup standards, Shell is demanding special treatment. This has serious implications. Shell has the resources to commission its own science to allegedly back up its proposal whereas families and small businesses are stuck following the stricter rules because they don't have the money, influence or wherewithal to make the rules bend for them. What is the net result? The appearance that the State grants favorable treatment to giant corporations that allows for less costly cleanups while families and small businesses strain to follow the rules as written.

¹ Depth to groundwater at the Hawthorne site is between 20 and 50 feet below ground surface (bgs). For shallower groundwater, the standards are 100 mg/kg for TPH_g and TPH_d and 1,000 mg/kg for heavier oil.



This letter provides comments on the February 22, 2013 Site-Specific Cleanup Goal Report for the Former Kast Property in Carson, California. The report was prepared by Geosyntec Consultants on behalf of Shell Oil Products, US. This 44-acre site was operated as a petroleum storage facility from approximately 1923 to the 1960's with three very large oil reservoirs² and other petroleum handling and storage appurtenances. These were huge storage reservoirs, spanning 4 to 6 acres each, allegedly with concrete-lined earthen floors and walls and wood-frame roofs. This long history of petroleum operations led to widespread subsurface contamination. The site was redeveloped as a residential neighborhood beginning in 1967. The subsurface contamination was not remediated at the time of redevelopment, nor has any meaningful remediation been performed in the intervening 46 years.

Elevated levels of soil, soil gas and groundwater contamination extend across essentially the entire Carousel neighborhood. By proposing to limit removal of contaminated soil to shallow exposed patches of ground and by proposing permissive cleanup standards, the RWQCB is being led down a path that will allow Shell to leave most of this contamination in the ground. In essence, Shell is building a case for a "low-threat" closure for this site. In this letter, I will argue that the Carousel neighborhood is not suitable for low-threat closure status and a more conventional (thus more thorough) remediation strategy is necessary.

For soil between 2 and 10 feet bgs, Shell proposes the following cleanup standards:

- 66,000 mg/kg for TPH_g
- 110,000 mg/kg for TPH_d
- 190,000 mg/kg for TPH in the range of motor oil (TPH_{mo}).

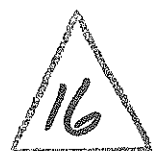
It is essentially impossible for soil to be more contaminated than these proposed standards. By approving these standards, The Board would be setting a precedent that virtually no petroleum hydrocarbon contamination deeper than 2 feet ever requires cleanup. The theoretical upper limit of soil contamination (the highest amount of contamination possible) would be if all pores spaces in the soil were filled with pure petroleum product.³ The corresponding theoretical maximum TPH concentration varies because it depends on porosity, bulk density and other factors. However, for a heavy oil in a typical sandy soil (porosity = 25%; dry bulk density of soil = 1.5 g/cm³; product specific gravity = 0.8) the theoretical maximum concentration is approximately 120,000 mg/kg. The proposed cleanup standard of 190,000 mg/kg is higher than what is physically possible under most (if not all) subsurface conditions; thus for heavier TPH, no physically-possible degree of soil contamination would trigger a cleanup requirement under Shell's plan as long as the soil is deeper than 2 feet.

Plan is inconsistent with SWRCB Low Threat Closure Policy

Low threat closure is a concept that generally allows higher levels of contamination to remain in the subsurface than might otherwise be allowable if it can be shown that the residual chemicals would pose a sufficiently low risk to human health and the environment. The SWRCB issued its Low Threat

²One reservoir has a capacity of 2,000,000 barrels and there were also two 750,000 barrel reservoirs. 2,000,000 barrels corresponds to about 84 million gallons.

³In the real world, contaminated soil would never reach this extreme because at least some of the pore space would be filled with water and some would be filled with air.



Closure Policy for petroleum contamination at underground storage tank (UST) sites in 2012. The plan being developed by Shell for the Carousel Tract is inconsistent with the SWRCB policy in a number of ways. First, the Board needs to determine if a large non-UST site like the Carousel Tract even qualifies for consideration for low-threat closure.

It is permissible to apply low threat closure criteria to non-UST sites:

“This policy may still be used to evaluate whether a petroleum-only site that is not associated with USTs is low-threat as long as the exposure assumptions are equivalent to those in this policy, or are shown to be low-threat by a site-specific analysis.”
(SWRCB, 2012, Leaking Underground Fuel Tank Guidance Manual, p. 17-7, discussing Low Threat Closure Policy).

However, the SWRCB did not intend low-threat closure criteria to be applied to large sites with widespread contamination:

“For example, sites with petroleum releases from natural gas/oil field operations, pipelines, or aboveground storage tanks (ASTs) may be evaluated using this policy as long as these sites meet all of the criteria *and the impacted soil is less is than 82 feet by 82 feet in areal extent*⁴ (to meet the direct contact CSM), or a site-specific risk assessment shows that the impacted soil is low-risk for the direct contact pathway.”
(SWRCB, 2012, Leaking Underground Fuel Tank Guidance Manual, p. 17-7; emphasis added).

Free Product

Concentrations like 66,000 mg/kg for TPHg and 110,000 mg/kg for TPHd are levels that clearly indicate the presence of free product in soil. It is inconsistent with decades of policy and practice in this state to allow LNAPL to remain in soil with no remediation. A fundamental component of any cleanup strategy for petroleum hydrocarbons is that if free product is present, it should be actively cleaned up:

- California LUFT Manual, 2012: “Federal UST Regulations (40 Code of Federal Regulations [CFR] 280.64), State Regulations (CCR, Title 23, Division 3, Chapter 16, Section 2655(a), and the Case Closure Policy state that ‘free product’ (light-nonaqueous-phase liquid, or LNAPL) shall be removed ‘to the maximum extent practicable.’” (p. 18-4, emphasis added).
- LARWQCB Interim Site Assessment and Cleanup Guidebook: “sites are ready for closure when: The leak has been stopped and ongoing sources, **including fuel-saturated soil and soil which contains mobile fuel components** have been removed or remediated. (p. 4-9, emphasis added).

⁴ Normally a site like the Carousel Tract would be considered a single operable unit and cleanup decisions would be made holistically for the entire site. Shell’s insistence that the risk assessments and cleanup decisions be made on a home-by-home basis (i.e. splitting up the site into 285 operable units) allows it to argue that each operable unit is small enough to meet the criteria low threat closure. The RWQCB should not allow Shell to slice the site into 285 pieces considering that the ultimate result of such a decision is to obscure that fact that the contamination is as widespread as it truly is, thus justifying a low threat closure strategy.



The California LUFT Manual provides guidelines for “residual saturation” or concentrations above which the product may be mobile (See California LUFT Manual Table 13-3). Under every soil type and for every hydrocarbon range tabulated by the SWRCB, the residual saturation is well below the proposed cleanup standards proposed by Shell for “deep” soil between 2-10 feet. This comparison shows that Shell is proposing to leave free product in the soil. Thus the cleanup standards proposed by Shell do not satisfy the essentially universal requirement that (if present) free product should be remediated.

Inappropriate cleanup levels and depth intervals for individual constituents in soil

In the 2012 Low Threat Closure Policy, the SWRCB published soil screening levels for individual petroleum hydrocarbon compounds for 0-5 feet below ground surface (bgs) and 5-10 feet bgs. Shell’s proposed cleanup goals are inconsistent with the state’s policy because they are segregated into different depth intervals (0-2 feet bgs and 2-10 feet bgs). This might seem like an innocent discrepancy, but it has huge implications for cost and for risk to human health. In a low threat closure scenario, deeper soil generally has higher (i.e., more permissive) cleanup standards. Thus, by classifying the deeper zone as 2-10 feet instead of 5-10 feet, Shell is seeking to apply more permissive cleanup standards to soil between 2-5 feet, in clear violation of the SWRCB policy, and saving Shell millions of dollars.

In addition to arbitrarily shifting the depth intervals in its favor, Shell is proposing cleanup standards for the deeper soil that significantly exceed the State’s own screening levels, as shown on the table below.

Chemical	SWRCB Low Threat Closure Soil Screening Level: Residential 5-10 feet bgs (mg/kg)	Cleanup standard proposed by Shell for Carousel Tract 2-10 feet bgs (mg/kg)
Benzene	2.8	19
Ethylbenzene	32	420
Naphthalene	9.7	350

Although mostly a problem in deeper soil, the low threat closure soil screening level for PAH in shallow soil is 0.063 mg/kg but Shell’s proposed shallow soil cleanup goal for just one PAH, benzo(a)pyrene is 0.16 mg/kg. Even if this site is found to qualify for a low threat closure strategy, (not an obvious call) at minimum the Shell cleanup goals should comply with the State’s policy.

Not accounting for nuisance levels for TPH in soil

A nuisance is defined by the Water Code as anything that meets all of the following requirements:

- Is injurious to health, or is indecent or offensive to senses, or an obstruction to free use of property, so as to interfere with comfortable enjoyment of life or property,



- Affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of annoyance or damage inflicted upon individuals may be unequal
- Occurs during, or as a result of, the treatment or disposal of wastes (petroleum release in this case)

This definition could almost have been written specifically for the Carousel Tract: it is clear that the petroleum saturated soil at this site meets the criteria for a nuisance condition. Shell's proposed cleanup goals are too high because they neglect this important factor. While the Water Code does not provide numerical guidelines for how much contamination constitutes a nuisance, I believe that the levels of contamination currently found at the Carousel Tract constitute a nuisance and (more importantly) the nuisance would remain even after Shell's cleanup if the proposed cleanup levels and excavation criteria are allowed. The San Francisco RWQCB⁵ defines a ceiling level for nuisance and other gross contamination concerns as 100 mg/kg for TPH(gasoline and middle distillates⁶) in shallow soil in a residential land use scenario and 500 mg/kg for TPH(residual fuels).⁷

These nuisance guidelines from the San Francisco RWQCB are generally consistent with policies of other states around the country. For example, Massachusetts incorporated an analysis of nuisance in establishing a soil cleanup standard of 200 mg/kg for TPH.⁸ New York defines nuisance characteristics for petroleum-contaminated soil as presence of petroleum-type odors and concentrations of individual contaminants in soil greater than 10,000 ppb (10 mg/kg). By contrast, Shell is proposing significantly higher cleanup standards for TPH in shallow soil. These proposed standards are too high because they ignore the nuisance aspect of high levels of petroleum contamination in soil. The following table provides a comparison.

Petroleum Range	RWQCB Nuisance ESL for Residential Soil (0-10 ft bgs)	Shallow Soil Cleanup Standard Proposed by Shell (0-2 ft bgs)	Deeper Soil Cleanup Standard Proposed by Shell (2-10 ft bgs)
TPH _g	100 mg/kg	760	66,000
TPH _d	100	1,300	110,000
TPH _{mo}	500	3,300	190,000

⁵ San Francisco RWQCB, 2007, Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Interim Final, p.8-6. In this document, "shallow soil" is defined as less than or equal to 3 meters or about 10 feet bgs.

⁶ This encompasses the compositional range of TPH_g and TPH_d as reported at this site.

⁷ TPH(residual fuels) encompasses the compositional range of TPH_{mo} as reported at this site.

⁸ Massachusetts Department of Environmental Protection, 1997, Characterizing Risks Posed by Petroleum Contaminated Sites.



The proposed cleanup standards for TPH in soil are clearly too permissive. Even if acceptable from a toxicological perspective (a dubious assumption at best, considering the data gaps in site characterization: see below), leaving these very high levels of petroleum in the soil would ignore the nuisance characteristics of this contamination and would result in an inadequate cleanup for a residential land use scenario.

Underreporting contaminant concentrations in soil

The casual reader might be led to believe that Shell is agreeing to clean up all soil that exceeds the proposed cleanup standards presented in the Site Specific Cleanup Goal Report. This is actually not true. Another trick employed by Shell is to apply the cleanup standards to a statistical construct, not to the concentrations at specific locations from specific samples:

“The chemical-specific SSCGs will be used with the 95[%] Upper Confidence Limit (95UCL) chemical concentrations calculated for each property and depth interval being evaluated to estimate chemical-specific risks and noncancer hazards.”
(Geosyntec, 2013, Site Specific Cleanup Goal Report, p. 27).

Take, for example, 24612 Marbella Avenue. Between 0-2 feet, TPH_d was found in soil at this home at concentrations up to 7,200 mg/kg: well above Shell’s (already high) proposed cleanup standard of 1,300 mg/kg. One might conclude that soil at this home needs to get cleaned up on the basis of TPH_d in shallow soil. But if Shell’s plan is approved, this home would actually not need to be cleaned up because Shell factors in other sample locations with lower levels of TPH_d and calculates an exposure point concentration (EPC) of only 905.2 mg/kg for the 95% UCL. Even though this home has TPH_d more than five times higher than the proposed cleanup standard (and 70 times higher than the more appropriate cleanup standard of 100 mg/kg that would account for the nuisance factor), Shell uses statistical sleight-of-hand to reclassify this site as being sufficiently clean. Shell and its consultants are using the appearance of dispassionate science to methodically carve away at their cleanup obligations and minimize their cost at the expense of the residents of the Carousel Tract. This is not an isolated anomaly: under Shell’s proposed protocol, 55 homes have an EPC greater than 1,300 mg/kg so they would presumably qualify for soil cleanup. However, at least 60 more homes have TPH_d concentrations at individual locations greater than the proposed cleanup standard of 1,300 mg/kg but would be considered acceptable and not in need of remediation because Shell calculates an EPC of less than 1,300 mg/kg for these homes.

Similarly, 70 homes contain TPH_{mo} in 0-2 foot soil in excess of the proposed cleanup standard of 3,300 mg/kg but Shell would decline to remediate the soil because the calculated 95% UCL for these homes is allegedly less than 3,300.⁹ For example, 24728 Neptune Avenue has up to 11,000 mg/kg TPH_{mo} in shallow soil (0-2 feet bgs). However, Shell calculates an EPC for this home of only 2,893 mg/kg, (under the 3,300 mg/kg limit) thus by Shell’s logic, there’s no problem at this home and no remediation would be offered based on TPH_{mo} levels.

There is nothing wrong with the theory underlying upper confidence limits and other statistical methods, however, as proposed here, cleanup decisions would be based inappropriately on average

⁹ This is based on the incomplete site characterization results collected thus far. The real number of homes in this category is likely much larger.



concentrations rather than maximum concentrations in soil at these homes. The opportunity for mischief with the proposed protocol should not be underestimated. Since the cleanup decisions would be based on an average concentration calculated from an arbitrary number of samples from arbitrary locations, these averages are not statistically significant. Consider a hypothetical residential property where half of the shallow soil is impacted with TPH_d of 2,000 mg/kg (above the proposed cleanup standard of 1,300) and shallow soil on the other half of the property is clean. Since the cleanup decision is based on an average of the samples I happen to collect (which is not the same as the true average concentration of all soil on the site) all I need to do is collect enough samples from the clean half to drive the overall average below 1,300 mg/kg and I can “prove” that this site doesn’t need to be cleaned up. Using common sense, most reasonable people would conclude that the contaminated half of the property should be remediated, but Shell’s proposed plan would not require it.

Insufficient site characterization considering heterogeneity of contaminant distribution

Much of the health risk identified thus far comes from petroleum-contaminated soil. Because of the nature of the original releases and reworking of the soil during grading for the redevelopment, the distribution of contamination in the soil is quite variable. On the scale of a single yard, the shallow contamination seems to consist of small hot spots and broader zones with lower levels of contamination. The distribution of hot spots should be considered essentially random, thus unpredictable. An intensive site characterization effort is required if all (or even most) of the hot spots are to be identified.¹⁰ 24533 Ravenna provides a good case study of this problem. This home had a very high cancer risk index of 260¹¹ due largely to a hot spot in the back yard with PAHs and other contaminants in soil. In its excavation pilot test at 24533 Ravenna, Shell excavated soil from a 9-ft x 9-ft x 5-ft deep patch in the backyard, which apparently removed most of this contaminant hot spot. When the risk calculations are redone to account for this removed soil, the health risk will presumably be much lower, but this would be based on the sparse data collected at this home and is not a valid representation of the contamination that may remain in undetected hot spots.

If an unacceptable risk level can be triggered by an occurrence as small as 9 x 9-ft (or smaller) then one can never be sure you’ve found all these occurrences unless the sampling density is approximately 9 x 9-ft, too (or ideally less). The incomplete nature of the site characterization is illustrated in Figure 1. This map of 24529 Ravenna Avenue is directly next door to 24533 Ravenna (the home with high health risk due to a soil hot spot). As shown in Figure 1, soil samples have been collected from six locations at this home and some soil contamination has been detected. However, to insure that a small (but potent) hot spot can be found, the sampling density needs to be approximately the same size as the dimensions of the target (in this case: a 9 x 9-ft soil hot spot). For this and most of the other homes in the Carousel Tract, it would require about 60 sample locations (and samples from multiple depths at each location) to achieve the appropriate sampling density. Soil samples have been collected from only six locations at 24529 Ravenna which is about typical for homes in the Carousel Tract and is about ten

¹⁰ The (more prudent) alternative is to acknowledge that the hot spots in soil cannot all be found and the entire soil column requires remediation. At large sites like the Carousel Tract, this alternative is often more cost-effective because the cost of intensive characterization sampling would be very high.

¹¹ URS, November 21, 2012, Follow-Up Phase II Indoor Air and Sub-Slab Soil Vapor Sampling Report for 24533 Ravenna Avenue Carson, California.



times too few to achieve an adequate characterization considering the heterogeneous nature of the contamination.

Slow Pace of Work

Unlike many contaminated sites that are in industrial settings, the Carousel Tract, is occupied by 285 homes, thus hundreds of families are potentially exposed to the site contaminants on a daily basis. The presence of the homes and families in such close proximity to soil, soil gas and groundwater contamination not only presents special logistical challenges for remediation, it also requires a sense of urgency to resolve this environmental problem in a manner that is timely and protective of the health of the hundreds of residents of this neighborhood. Considering that unsafe levels of contamination persist in the subsurface to this day, 46 years after homes were first built and five years after the contamination was "rediscovered," it is sadly clear that the residents of the Carousel neighborhood have not been well-served by our system of environmental protection.

The slow pace of this project has largely been justified by Shell as necessary and typical for an environmental project of this magnitude and complexity. This argument may have had some merit if hundreds of residents were not being exposed to toxic chemicals on a daily basis. The slow pace of the work may have been justified if the residents were not repeatedly inconvenienced by noise, dust and intrusive sampling on their private property. The slow pace of the work may have been justified if residents' free use of their property was not impinged by warnings against digging in their gardens or allowing children to play in their yards. There are several reasons for the slow pace of the work and none of them are technical necessities. One reason for the slow pace of the work is cash flow: it's cheaper for Shell to drag out studies and pilot tests year after year than to initiate what is destined to be a very expensive remediation project. For example, Shell took more than 20 months to evaluate the feasibility of excavation as a strategy for soil remediation at this site.¹² If we were to review LARWQCB files for other cases involving shallow soil contamination, it's doubtful we would find any other sites for which anyone felt a need to perform an excavation pilot. It is such a straightforward method that pilot testing is generally not required to evaluate the feasibility of digging dirt out of the ground and it certainly should not take 20 months to figure this out.

Another reason for the slow pace of the work is that Shell and its consultants need time to build a (faulty) technical justification for leaving most of the contamination in the ground. Finally, the slow pace of this work is a testament to limitations of our system of environmental protection. It is true that the protocol for characterizing and cleaning up contaminated sites in this country has evolved into a complex and methodical process. However, when there is an imminent and substantial endangerment to human health on the massive scale seen at this site, our system should be capable of responding promptly and with appropriate concern for the well-being of our fellow citizens.¹³

¹² The Pilot Test Work Plan was issued in May 2011; Shell had completed some of the proposed excavation pilot testing in February 2013 and suggested that completing the rest of the proposed work was not necessary. We would assert that none of the excavation pilot testing was necessary. This is such a well-established, low-tech method for soil remediation: there's not much to be gained from digging a hole and calling it a pilot test.

¹³ It is disconcerting the pace of this project has been so slow even though rapid cleanups can and do occur in California. When a contaminated commercial property is slated for major redevelopment, environmental investigation and cleanup can be accomplished relatively quickly. This shows that a financial incentive



Summary and Conclusions

The cleanup standards proposed in the February 22, 2013 Site-Specific Cleanup Goal Report are too high because they are inconsistent with the state's cleanup policies and are not protective of human health or the environment. The proposed cleanup goals for soil:

- do not insure that LNAPL is remediated, where present,
- do not account for the profound nuisance aspect of petroleum-contaminated soil;
- do not abide by State of California policy for depth intervals that may be suitable for more permissive cleanup standards;
- Seek to disqualify contaminated homes from remediation by using statistical averaging rather than maximum contaminant levels.
- Do not honor the urgency for resolving this problem considering that 285 homes overlie the contamination and 285 families live in this contaminated neighborhood every day.

The Cleanup Goal Report is a step toward Shell's ultimate goal of limiting remediation to hot spot excavations for exposed patches of shallow contaminated soil. It is not clear that this approach could ever reliably reduce the environmental risks at this site. However, in our opinion, it is certainly unacceptable considering the level of site characterization completed thus far and the uncertainty that remains regarding the small-scale distribution of soil contamination, especially under the homes. However, for the piecemeal excavation approach that Shell appears to be promoting, there would need to be significantly lower cleanup goals (applied to all occurrences in soil, including under the homes) and a much more thorough site characterization program that is capable of actually finding all the so-called soil hot spots.

Thank you for the opportunity to provide our comments on this important project.

Sincerely yours,
L. EVERETT & ASSOCIATES, LLC



James T. Wells, PhD, PG

(returning a property to economic use) is a stronger motivational factor than protecting the environment, which is perhaps understandable from the perspective of the responsible parties, but it's harder to justify regulatory agencies' acquiescence to these discrepancies in the pace of environmental cleanups.



Figure 1 Incomplete characterization: Soil Sampling Example

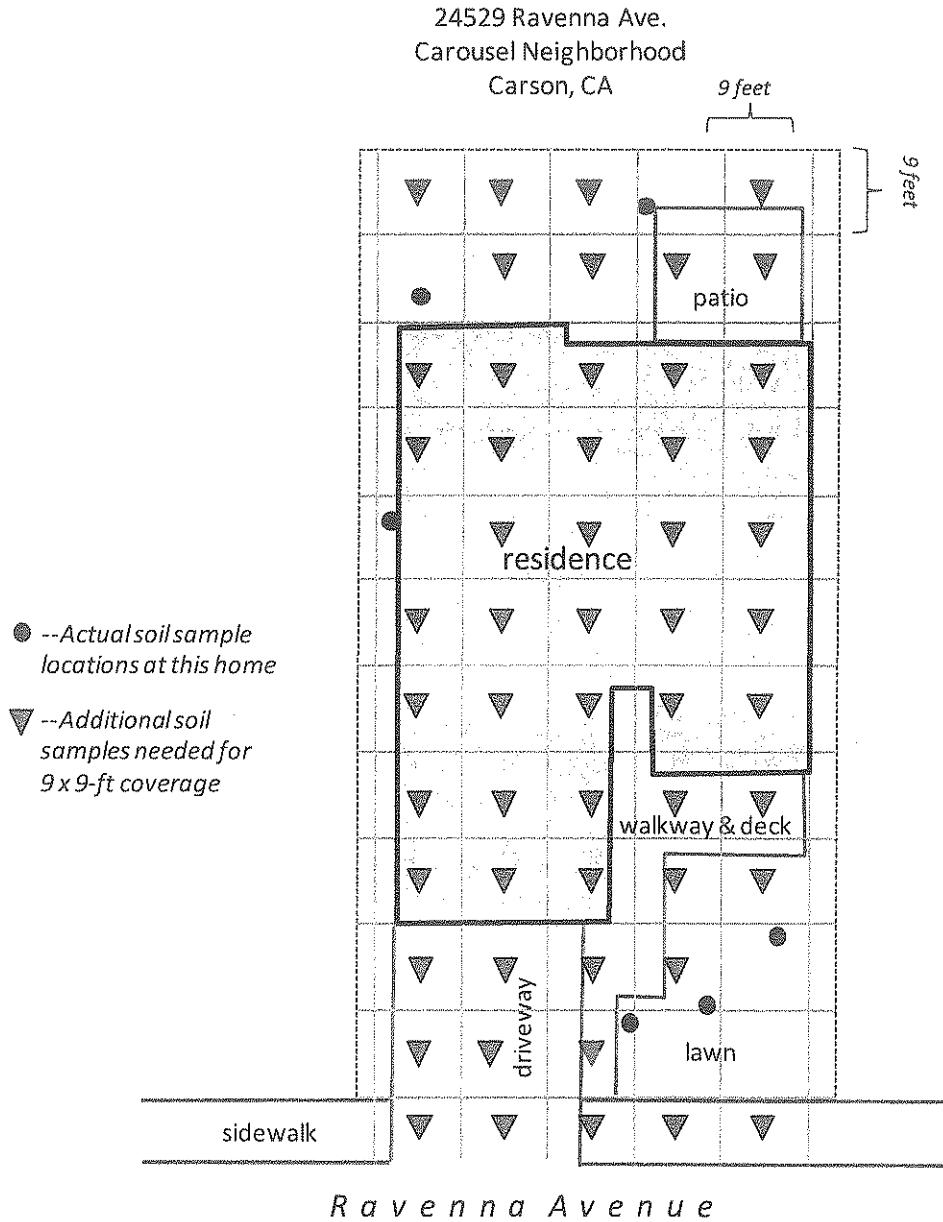


Figure 1. Sampling on a 9 x 9 foot grid would require approximately 60 soil sampling locations at each home. With six soil sample locations, this home is typical of the level of characterization actually conducted.

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L. EVERETT & ASSOCIATES

ENVIRONMENTAL CONSULTANTS

June 7, 2013

Samuel Unger, Executive Officer
California Regional Water Quality Control Board
Los Angeles Region
320 West Fourth Street, Suite 200
Los Angeles, California 90013

Subject: Former Kast Tank Farm
Comments on Site-Specific Cleanup Goal Report

Dear Mr. Unger,

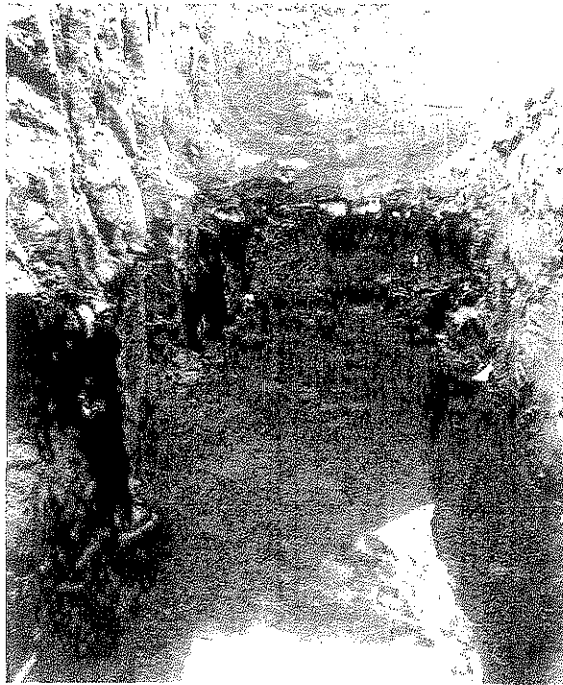
I have reviewed the above referenced cleanup goal report and have prepared the following comments. Further, I have extensively studied the available documentation on the former Kast Tank property site and have participated in different meetings with the Los Angeles Regional Water Quality Control Board. My comments will focus primarily on the vadose zone soil contamination and the vadose zone soil gasses and soil moisture. Further, I will comment on the almost complete lack of soil gas and indoor air data. My comments are based on over 40 years of working in the vadose zone, dealing with soil gas behavior in response to external parameters such as soil moisture. My subsurface experience is documented in my books below.



3700 State Street, Suite 350 • Santa Barbara, California 93105
805-880-9300



In order to understand the petroleum hydrocarbon releases at the Carousel Tract, I have provided below a picture of a limited exploratory soil excavation at the Tract showing petroleum hydrocarbons at 18 inches below the land surface oozing out into the excavation. Please note that the waste oil oozes at variable rates, variable locations and variable depths all of which are completely unpredictable and which can only be remediated by complete excavation. Clearly this highly viscous, high density liquid waste will not permit gasses to migrate through this material, thereby precluding soil vapor extraction technologies.



Background and Qualifications for Lorne G. Everett Ph.D., DSc., PH, PHG, CGWP

I am a retired Research Professor/Hydrologist (Level VII) in the Donald Bren School of Environmental Science and Management at the University of California at Santa Barbara. The University of California has reserved Level VII for "scholars of great distinction."

I am a Fellow of the American Society of Civil Engineers (ASCE), a Fellow of the American Water Resources Association (AWRA), and a Fellow of the American Society for Testing and Materials (ASTM). The Title Fellow recognizes the highest earned honor bestowed by a Professional society.

I have a Ph.D. in hydrology (1972) from the University of Arizona. I am a registered hydrologist, #164, and a registered hydrogeologist #836, with the American Institute of Hydrology. I have served on the Board of Registration for the American Institute of Hydrology. I am a Certified Groundwater Professional, #293, by the American Association of Groundwater Scientists and Engineers. Lastly, I am a former Registered Environmental Assessor II, by the California Environmental Protection Agency, Department of Toxic Substances Control. DTSC declared that the REA II registration was the highest environmental registration recognized in the State of California.

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I am the Past Director of the Vadose Zone (Soils) Monitoring Laboratory at the University of California. For over 15 years I directed leading edge research on liquid and gaseous migration in both the saturated and unsaturated (vadose) zone.

For 18 years I have been the Charter D18.21.02 Chairman of the American Society for Testing and Materials (ASTM) task committee on Vadose Zone Monitoring. I was a centennial member of the ASTM Board of Directors and received the ASTM, Award of Merit, the highest honor bestowed by the society for writing National Groundwater and Vadose Zone Standards. As chairman of ASTM's Vadose Zone Task Committee, I was responsible for developing all of the current national ASTM D18.21.02 Vadose Zone standards. I have received ASTM Standards Development Awards including the award for Comparison of Field Methods for Determining Hydraulic Conductivity and the Standards Development Award for the Standard Guide for Pore-Liquid Sampling. I received the A. Ivan Johnson Outstanding Achievement Award in 1997 for "Outstanding and Significant Contributions" to the hydrogeologic understanding of soil and rock.

Of direct relevance to soil gas sampling and vapor intrusion issues in this letter, I Chair the ASTM committee (D18.21.02) which developed the following soil gas monitoring national standards:

- D5314-92 (2006) Standard Guide for Soil Gas Monitoring in the Vadose Zone
- D7758 (2011) Practice For Passive Soil Gas Sampling in the Vadose Zone for Source Identification, Spatial Variability Assessment, Monitoring, and Vapor Intrusion Evaluations
- D7648 (2012) Practice For Active Soil Gas Sampling for Direct Push or Manual-Driven Hand-Sampling Equipment
- D7663 (2012) Practice for Active Soil Gas Sampling in the Vadose Zone for Vapor Intrusion Evaluations

Further, on January 30, 2013, I chaired an international ASTM symposium (see below) entitled: Continuous Soil Gas Measurements: Worst-Case Risk Parameters. This symposium is directly related to the vapor intrusion issues in this letter.

**ASTM International Symposium
Continuous Soil Gas Monitoring: Worst Case Parameters
Jacksonville, Florida, January 31, 2013**

by
Chairman Lorne G. Everett and Co-Chair Mark L. Kram

Symposium Recommendations

• Current regulations and protocol focus on single time step assessment campaigns, as it has been assumed that subsurface conditions are static;
• Recent findings at more than 60 sites over the past 18 months suggest dynamic risk conditions can exist;
• Correlations between risk and barometric pumping, soil moisture,

• Since we now know it is possible to encounter dynamic VI risks, in order to avoid missing worst case scenarios, we recommend that continuous monitoring be performed for at least a few selected site locations (e.g., data collection points, DCPs) prior to implementation of an alternative non-continuous geospatial soil vapor survey campaign in the encroachment zone;
• Continuous monitoring field campaigns should be performed when barometric pressure changes are anticipated so that practitioners can establish whether risks are dynamic through a range of atmospheric pressure conditions;...

• If practitioners do not have the luxury or flexibility in their field deployment schedule, then an alternative strategy for testing worst case scenarios would be when a low pressure dominates the site region...

• Changes in soil gas concentrations can be very rapid, and can fluctuate multiple times within a day;

• Soil moisture can significantly impact soil gas concentrations and ranges, changes over time and space, regional vapor flow....

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In 1996, I received a Doctor of Science Degree (Honoris Causa) from Lakehead University in Canada for Distinguished Achievements in Hydrology. In 2002 I received the C. V. Theis Award, the highest award given by the American Institute of Hydrology (AIH) for major contributions to groundwater hydrology.

I have authored, edited, and contributed chapters to over 12 books, published over 150 professional papers and reports, hold several patents, and developed numerous standards on the subject of groundwater and vadose zone characterization and remediation. My book entitled "Groundwater Monitoring" was endorsed by the EPA as "establishing the State of the Art used by industry today" and was recommended by the World Health Organization for all developing countries. I was an invited Charter member of the Editorial Board of the journal, Environmental Forensics, a quarterly peer-reviewed scientific journal of national and international circulation. In this role, I evaluated the work of others through peer-review of manuscripts submitted for publication to the journal. I also participated in publication decisions, as well as establishing and maintaining the editorial direction of the journal.

For my contributions to the science of hydrogeology I was elected (No. 300-H3) to the Russian Academy of Natural Sciences. Based upon my original contributions to the science of hydrogeology, I received the Russian Academy's highest honor entitled the "Kapitsa Gold Medal". The Medal was presented by the Head of the Russian Academy's Water Problems Institute, on October 29, 1999 at the Beau Rivage Palace in Lausanne, Switzerland in front of an audience Chaired by Nobel Laureates.

My book entitled "Subsurface Migration of Hazardous Waste" is widely used in contamination investigations. With the Russian Academy, I was the English editor of a 2002 book entitled Groundwater and the Environment-Applications for the Global Community. My book entitled "Vadose Zone Monitoring for Hazardous Waste Sites" has been sold out. My book entitled, "Handbook of Vadose Zone Characterization and Monitoring" has been deemed a best seller by Lewis Publishers. As a tribute, the United States Department of Energy (DOE) in 1999, asked me to endorse their book entitled "Vadose Zone Science and Technology Solutions. DOE further asked me to frame the research needs of the book and to write the Foreword (I), Forward (II) was written by Dr Paul A. Witherspoon, UC Berkeley. My endorsement appears on the back-cover of the 1540 page, two-volume book.

Based upon my many years of experience, I have participated on the Executive Committee of the United States Department of Energy's DOE Complex Wide Vadose Zone Science and Technology Roadmap.

As a further part of my contributions to federal agencies, I was a charter member of the Science Advisory Board of the United States Department of Defense (DOD) National Environmental Technology Test Site. For my contributions to the science advisory board on petroleum characterization and remediation, I received the United States Navy's Medal of Excellence in October, 1999.

I am a co-author of the Lawrence Livermore National Laboratory reports entitled; "California Leaking Underwater Fuel Tank (LUFT) Historical Case Analysis" and "Recommendations to Improve the Cleanup Process for California's Leaking Underground Fuel Tanks". This was the largest analysis of petroleum hydrocarbon migration characteristics that has ever been undertaken.

I was on the US Navy "Gatekeeper Review Panel" which evaluated the latest research on petroleum and chlorinated hydrocarbon characterization and remediation.

At the request of UNESCO in Paris, I was the English editor of a Monograph entitled Groundwater Resources of the World and Their Use. The Monograph published in 2004 looks at drinking water issues throughout the World and was distributed by UNESCO to every water resources-research centre in the World. The US National Association of Groundwater Scientists and Engineers published a second

printing of the book in 2006. The book was translated into Russian and reprinted by the Russian Academy of Sciences in 2007.

On behalf of EPA/DOE/DuPont I co edited a State of the Art book entitled: Barrier Systems for Environmental Contaminant Containment and Treatment that was released in 2006 by CRC press.

For the past 24 years I have been continuously invited by Dr Antonio Zichichi, a Science Advisor to the Pope, to participate in Planetary Emergency meetings held in southern Italy wherein I am the Chairman of the World Federation of Scientists Pollution Panel. In the fall a second meeting is often held at the Pontifical Academy of Sciences in the Vatican.

For over three decades I have been involved in consulting and advising the US Department of Energy on environmental issues. I have peer reviewed, visited, consulted, lectured, and been an advisor at the following DOE sites: Lawrence Livermore National Laboratory, Hanford Washington, Rocky Flats Colorado, Idaho National Engineering Laboratory, Fernald Ohio, Paducah Kentucky, Savannah River, Argonne National Laboratory and DOE Headquarters in Washington DC. I have been on DOE Roadmap committees as a member and Executive reviewer.

I have given mock trial training programs to environmental lawyers at the invitation of Carmen Trutanich Esq., the former Los Angeles City Attorney.

From 2000 -2009 I was the Chancellor of Lakehead University in Thunder Bay, Ontario, Canada. For my contributions to Canada, I received the Gold Medal from the Governors General of Canada in 2002.

I have given invited court room training to the Environmental Protection Agency, Criminal Investigation Division. My Criminal Investigation Division award states: "For your invaluable support and notable contribution to the mission of the Criminal Investigation Division".

Report Comments

As was pointed out at the last Regional Water Quality Control Board meeting on March 7, 2013, Shell's consultants indicated that the majority of the homes in the Carousel tract had only one indoor air sample taken and less than a dozen homes had more than one subslab soil gas samples taken. Shell has noted that their soil gas investigation follows the DTSC vapor intrusion guidance. However, the DTSC final vapor intrusion guidance recommends time series data, as follows:

Page 6 "For sites subject to vapor intrusion, permanent vadose monitoring points for sample collection should be installed to evaluate the long term behavior of contaminated soil gas. Soil gas may need to be monitored through time, in a fashion similar to groundwater, to ascertain representative subsurface conditions, to detect seasonal variations and other temporal changes, and to determine long term stability of contaminant concentrations."

Page 8 "Soil gas may need to be monitored through time to ascertain representative subsurface conditions, to detect seasonal variations and other temporal changes, and to determine long term stability of contaminant concentrations."

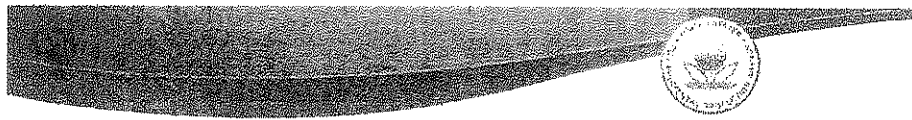
Page 22: "Permanent sampling points should be installed and an appropriate number of sampling events should be conducted to characterize the temporal variability of subsurface conditions."

Page 33: "Discreet samples collected in most indoor air investigations may not adequately address temporal variations in contaminant concentrations."



Page G1: "When evaluating sub slab soil gas for a building, DTSC recommends that permanent sampling points be installed so that repeated sampling can be conducted, as necessary, to evaluate seasonal or temporal variations."

Clearly Shell is in violation of the very state guidance document that it purports to satisfy. Soil gas migration is highly variable and subject to changing soil moisture/capillary pressure conditions. The rate of soil gas migration may be highly dependent on barometric pressure changes and temperature changes. Clearly Shell's position of taking one or two samples at the homes in the Carousel Tract is not only insufficient, it shows a patent disregard for the health and safety of the families who reside on the Kast Tank Farm site. This point was clearly recently made by EPA below.



Implications of Variability

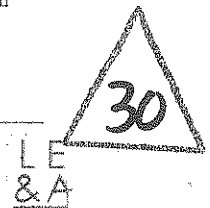
- Reinforces the historic practice of assessing on a building-by-building basis.
- A single indoor air or subsurface sample has limited information value by itself.
- Additional samples and other lines of evidence (e.g., geological), considered together, increase confidence in decision-making.

November 26, 2012

U.S. Environmental Protection Agency

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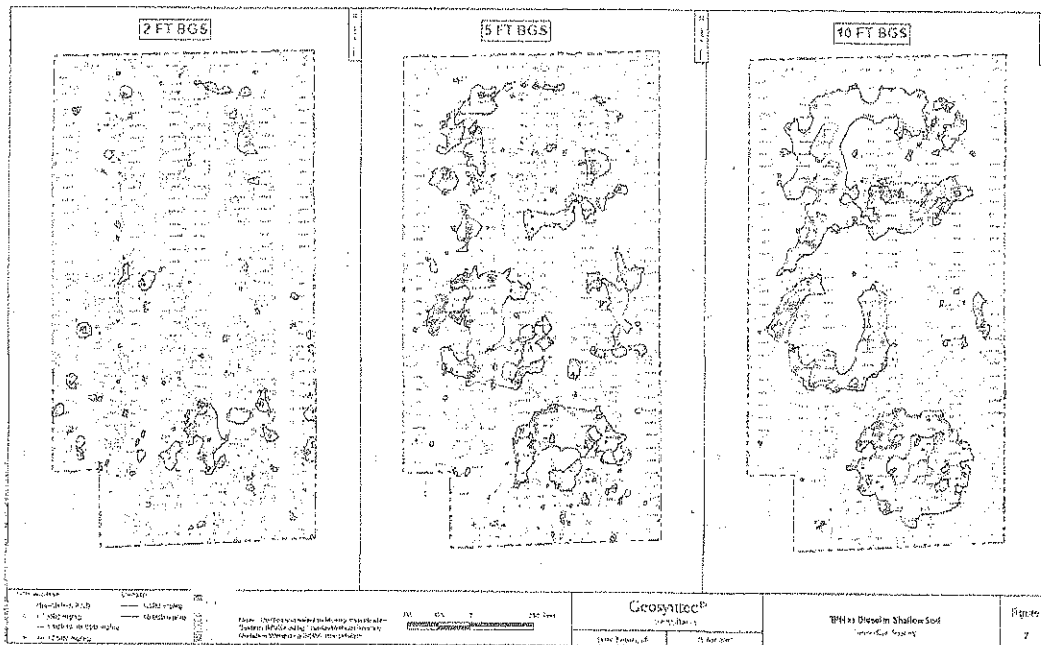
Shell's complete disregard for the current understanding of the dynamic behavior of soil gas was recently made clear in comments from Helen Dawson, Chief of the Science Policy Branch in EPA's OSWER's Superfund office after the AEHS sampling workshop in March 2013. Ms. Dawson said that "vapor intrusion guidance remains the subject of internal deliberations. And that recent studies with continuous monitoring have shown traditional sampling methods of sampling over a 24 hour period are insufficient to account for vapor variability". Dawson said, "studies have shown variability ranges from two-four orders of magnitude at any site and that discreet measurements will be below the long term average by one order of magnitude making it likely that current sampling methods will miss high concentrations". Dawson said that measures of variability depend on the monitoring approach, and she called continuous monitoring the "gold standard" of sampling. Clearly, Shell is not following the California State DTSC vapor guidance and certainly not following the spirit of EPA's position on continuous monitoring. One or two indoor air samples could hardly be expected to address any site specific cleanup goal regardless of their ultimate level.



EPA recently (September 2012) released a new research and development document entitled "Fluctuation of Indoor Radon and VOC Concentrations Due to Seasonal Variations"-EPA/600/R-12/673. EPA in its conclusion section on page 1-2 stated "Lower VOC concentrations were observed in indoor air in summer. These VOC concentrations in indoor air are controlled not only by 'building envelope-specific' factors but they are also significantly influenced by seasonal variations in subsurface concentration distributions, especially in shallow/sub slab soil gas where a weaker seasonal trend was observed." Further, on page 1-3 of the EPA report under the title "Relationship between Subsurface and Indoor Air Concentrations", EPA notes there is a strong seasonal component to PCE and chloroform indoor concentrations at the study site. The seasonal component appears to be related to the strength of the stack effect but it is not the only variable that controls indoor air concentrations. Further, EPA said that a repeatable seasonal effect of higher concentrations during winter was seen however, each winter tends to be different climatically and therefore the VOC concentrations will vary depending upon the year in question. Further, the EPA document concluded that high concentrations of VOCs were seen directly under buildings in sub slab and 6 foot soil gas depth however, these concentrations were not seen at similar depths external to the buildings; therefore soil gas samples taken outside of the foot print of the building are not representative of what is found underneath the building. Shell's characterization of the family homes in the Carousel Tract do not even begin to address the seasonal variability of subsurface gases and indoor air concentrations identified by EPA's latest research and development document. Variables such as HVAC system effects, diurnal temperature and wind effects, barometric pumping and weather fronts, water table fluctuations, soil and groundwater temperature changes, vadose zone moisture changes, and stack effects relative to heating and cooling seasons simply cannot be quantified by taking one sample in a family home and pronouncing that the family (including the kids) are at no risk now or in the future.

Methane Risk

The petroleum hydrocarbons which were released from the three huge storage reservoirs on the Carousel Tract provide an abundant, well understood, source of food for bacteria to utilize. This process can



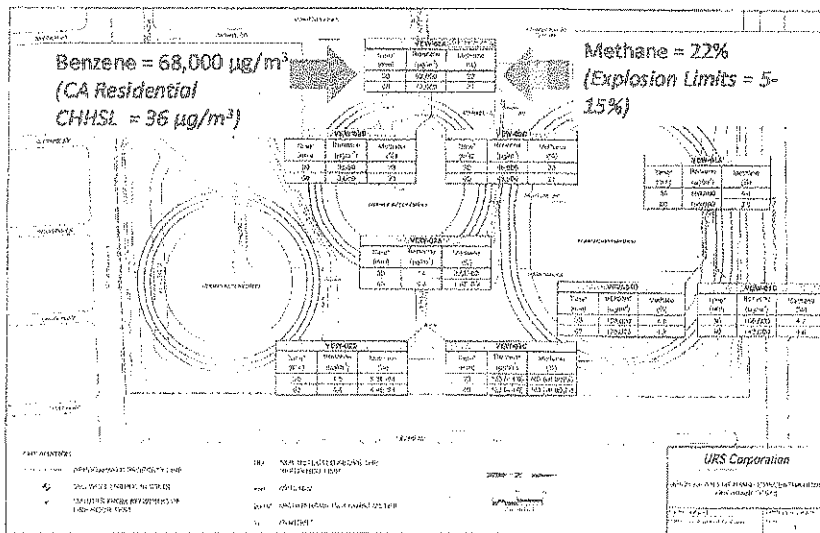
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produce dangerous levels of methane in the subsurface.

I am particularly familiar with the degradation of petroleum hydrocarbons by bacteria since I was the co-author of the EPA national guidance document entitled: Permit Guidance Manual on Unsaturated Zone Monitoring for Hazardous Waste Land Treatment Units, EPA/503-SW-86-040. Throughout America, one of the main ways of treating waste petroleum hydrocarbons is through the process called land farming or land treatment. I had been selected by EPA in Washington on a sole source basis to develop this hydrocarbon guidance document since I had demonstrated a lengthy career in evaluating hydrocarbon sites.

The Occupational Safety and Health Administration (OSHA) states that the lower explosion limit for methane is 5%. If methane is present below 5% and a match is lit then no explosion will occur. The upper explosion limit for methane is 15%. If methane gas exists between 5% and 15% and an ignition source is present, an explosion is expected to occur. If the methane concentrations are greater than 15% an explosion will not occur because of the lack of oxygen however, if these methane rich gasses leak into sewer lines, utility lines, gas lines, or home foundations, and the concentration dilutes to below 15% then an explosion can occur. As noted in the figure below presented by Shell's consultants, the methane concentrations below the Carousel Tract at 5 feet are as much as 22% methane. Clearly, this concentration is higher than the upper explosion limit for methane and therefore constitutes a long term source of explosive gas.



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As bacteria degrade petroleum hydrocarbons they utilize all of the available oxygen thereby driving the system anaerobic. These bacteria then begin to look for other energy sources to degrade the petroleum hydrocarbon. Often the microbes will strip oxygen from nitrate groups resulting in the generation of

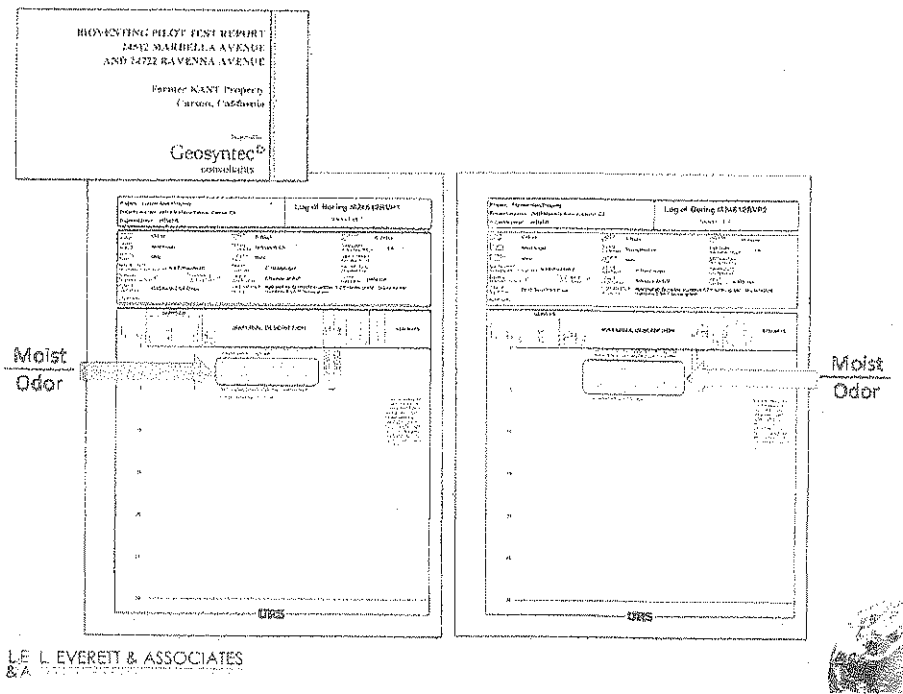


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methane gas. Methane is an explosive gas that is found in many locations across the Carousel Tract site. To put this concentration in perspective, I refer to the, OSHA-3115-06R-2003 criteria which state that a competent person must test all underground work areas for methane and other flammable gases... The OSHA document states that if 20% or more of the lower explosive limit for methane (1% methane) or other flammable gasses is detected in any underground work area or in the air return, all employees must be evacuated to a safe location above ground (except those employees required to eliminate the hazard). Electrical power, except for acceptable pumping and ventilation equipment) must be cut off to the area until concentrations reach less than 20% of the lower explosion limit. The OSHA guidance goes on to say if 10% or more of the lower explosive limit for methane gas (.5% methane) or other flammable gases is detected near any welding or other hot work, the work must be suspended until the concentration is reduced to below 10% of the lower explosion limit. Further, OSHA says when 5% or more of the lower explosive limit for methane (.25% methane) or other flammable gases is detected in an underground work area or in the air return, steps should be taken to increase ventilation air volume or otherwise control the gas concentration. Clearly methane concentrations above 5% are high risk and concentrations of 22% are completely unacceptable.

Soil Moisture

I have reviewed numerous boring logs for subsurface investigation at the Carson Tract sites. As noted in the figure below, the majority of the boring logs indicate moist conditions in the top 5 feet of lithology.



Having studied soil moisture effects on soil gas migration for decades, I am well aware that elevated soil moisture will reduce the flow of soil gas in the subsurface. It is my considered opinion that the soil moisture tied up in the fine grained silts, sands and clays located close to the surface at the Carousel Tract

curtail the flow of both explosive and toxic gases into the homes in the development. Soil moisture varies relative to rainfall events, seasonal events, and long term climate behavior. Further soil moisture varies with soil type, landscape irrigation, leaking pipes, and artificial permeabilities from sewer line trenches, gas line trenches, electrical trenches etc. Since the soil moisture varies for each home based on sprinkler usage and seasonal effects, for example, it is impossible to predict future soil moisture levels across the Carousel Tract and therefore impossible to predict the soil gas concentrations or soil gas migration across the Tract.

Global climate change will dramatically change water use and costs in Southern California. Aquifer depletion, the dramatic reduction in flows in the Colorado River, reduced rainfall distribution etc. all point to a dryer soil moisture regime over time. Clearly any protection offered to these families based on the apparent low levels of explosive gases and toxic gases in these homes will be diminished in time as the soil moisture begins to be reduced and the soils dry out. We know that highly toxic chemicals at very high concentrations are found at 5 feet and we know that explosive levels of methane are found at 5 feet and as such, I believe that there is an unacceptable risk to families living over these threatening gasses. An example of a family home destroyed by methane gas is provided below.



Recent Volatile Gas Research

In the United Kingdom (UK), all Brownfield sites must be evaluated over the long term for the generation of methane. In response, British scientists have developed new sensors which measure methane on a continuous basis along with a number of other in-situ parameters. In the United Kingdom Research Bulletin RB13 dated February 2011, the opening title reads: The Utility of Continuous Monitoring in Detection and Prediction of "Worse Case" Ground Gas Concentration (see figure below).

research bulletin

CL:AIRE research bulletins describe specific, practical aspects of research which have direct application to the characterisation, monitoring or remediation of contaminated soil or groundwater. This bulletin describes how continuous monitoring, rather than a periodic measurement approach, can reduce uncertainty in ground-gas risk assessment.

Copyright © CL:AIRE (Contaminated Land: Applications in Real Environments)

The Utility of Continuous Monitoring in Detection and Prediction of "Worst Case" Ground-Gas Concentration

1. INTRODUCTION

Many environmental parameters show high temporal variability; therefore, their representative measurement requires multiple measurement. In the case of ground-gas monitoring, some of the existing multiple measurement approaches have been identified in the literature and are subject to continuing correction (e.g. Wilson *et al.*,

Monitoring wells are the preferred method to sample sub-surface gas; therefore, the IC504 and the sensitivity of the end use well guide:

- i) the number and location of monitoring wells,
- ii) the position of their response zones.

Previous guidance has suggested minimum numbers of monitoring

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Based on this new methane sensing technology, it was quickly realized that worse case conditions for these explosive gases can only be determined through continuous monitoring of methane. As shown in the figure below, the methane concentrations are dramatically reduced when the barometric pressure increases and further, the methane concentration dramatically increases when the barometric pressure is reduced.

CL:AIRE (Contaminated Land: Applications in Real Environments) Feb 2011

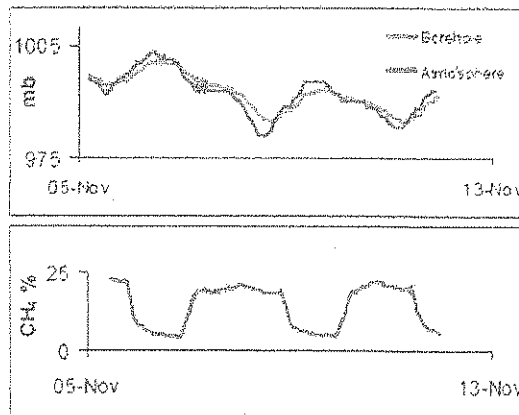


Figure 5. The delayed response of borehole pressure to atmospheric pressure and the coincidence of gas migration with the consequential differential pressure.

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This research done in the UK expressly shows that methane concentration can be very dynamic in response to barometric pressure changes. This new information will substantially change how we evaluate methane sites in particular with respect to determining those conditions under which explosive gasses could wreak havoc to a development. At the Carousel Tract, one or two methane samples have been taken at each home, which is entirely inadequate to provide any assurance to the home-owners or to provide any measure of the dynamic range of these methane gasses.

My personal experience with explosive concentrations of methane gasses at military bases resulted in the developer jacking up all of the homes, moving them off of their slabs, excavating the shallow contamination under the homes, re-pouring the slabs and relocating the homes back to their original locations. Clearly, on our military bases, the developer was not willing to take the risk of these shallow explosive gasses devastating military families. We should expect no less from Shell for the Carousel Tract families. The sequence of excavating under homes on a military base is provided below.



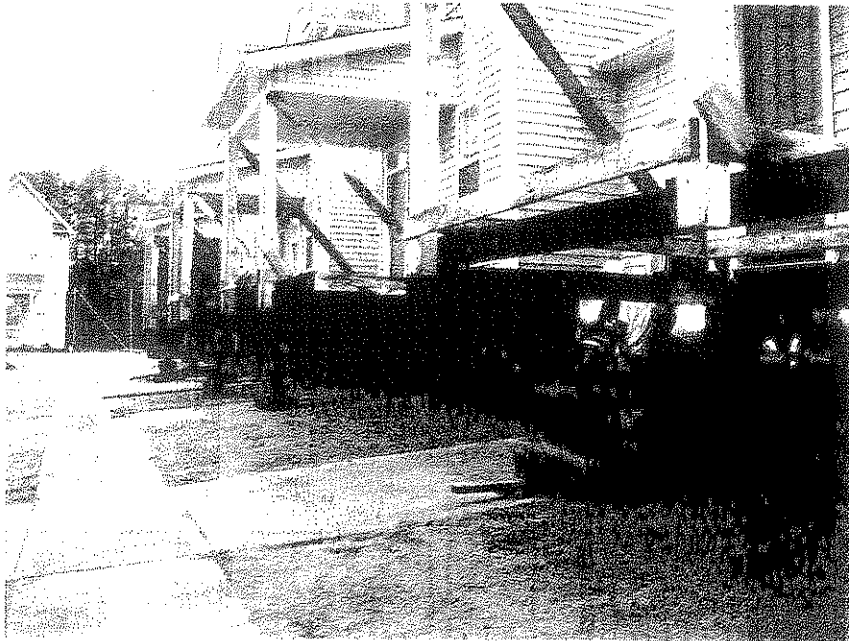
Bandolier Circle, 1357, All Support Beams Installed, 09/12/08

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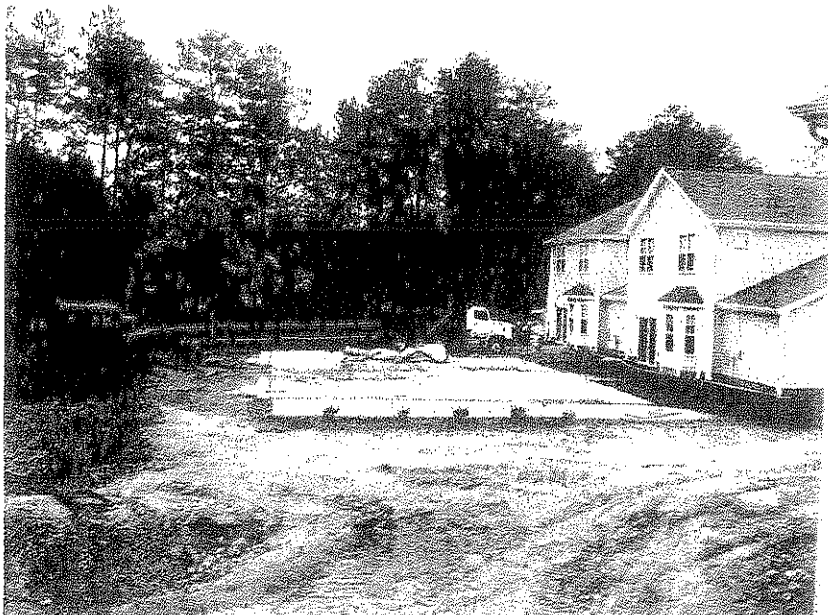
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Bandolier Circle, 1357 1st Move D, 09/26/08

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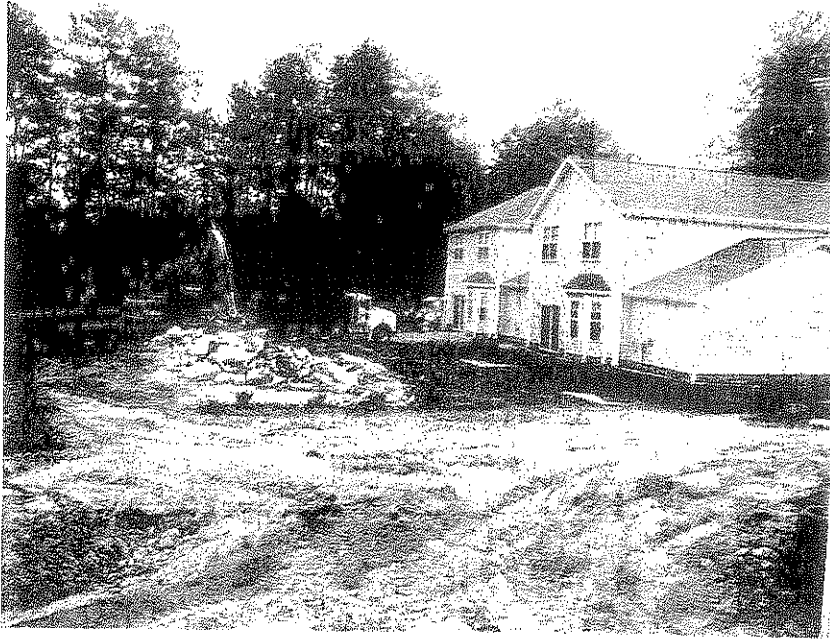


Virginia Place, HH-VP-34-36, Initial Demo Pad, Picture 1,

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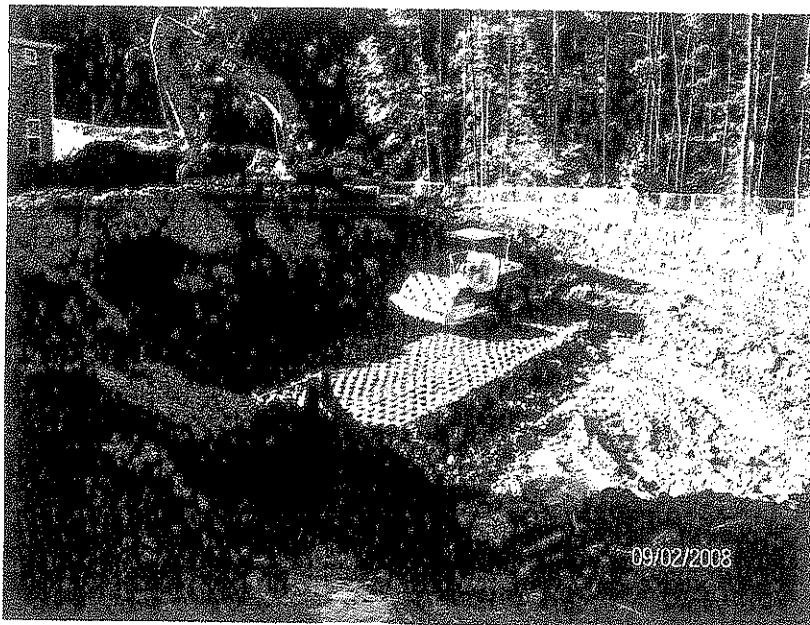
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Virginia Place, HH-VP-34-36, Picture 3

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Virginia Place, HH-VP-34-36, Compacted Backfill, Picture 09

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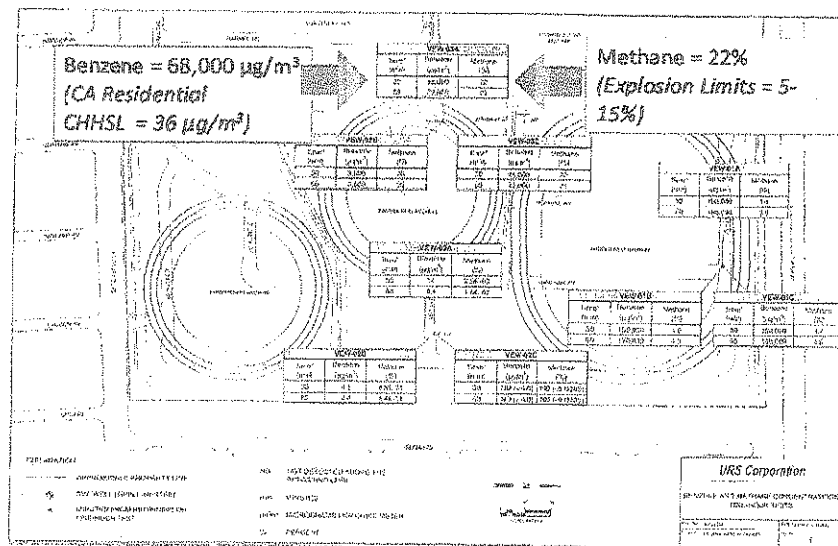


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Benzene Gas

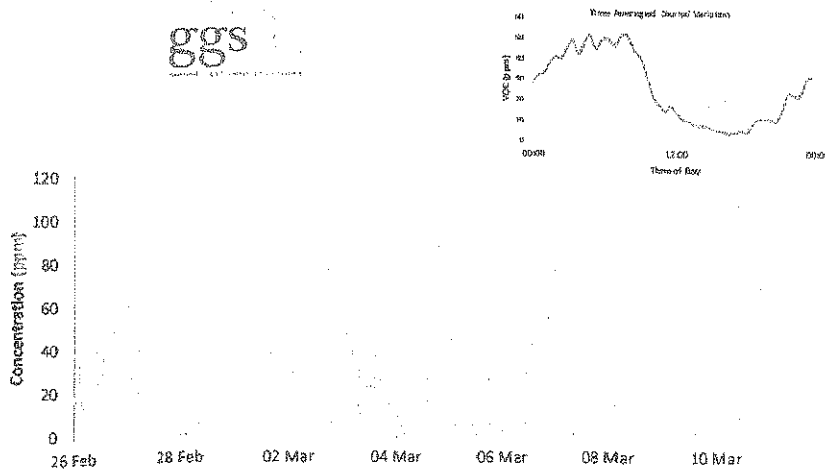
Benzene is a volatile component of petroleum hydrocarbons and is a known human carcinogen. The California Human Health screening level for benzene is $36 \mu\text{g}/\text{m}^3$. Above this level, human health is at risk and a proactive approach is required to reduce the human health risk. As noted in the figure below, the benzene concentration in the Carousel Tract at location VEW-03A at 5 feet is $68,000 \mu\text{g}/\text{m}^3$. At location VEW-01A the benzene concentration is $190,000 \mu\text{g}/\text{m}^3$. It defies all reasonable expectations that these extremely high concentrations of a soil gas would be allowed to remain at a 5 foot depth below these homes. Allowing concentrations of a known human carcinogen at a 5 foot depth which is 6,000 times the level deemed to be safe in California, is unconscionable.



As noted in the figure below the concentration of VOCs in a home next to a petroleum station can show wide swings in concentration. These wide swings in concentration vary by the hour, by the day, by the season, and over the years.

Shell on the other hand would have us believe that taking one sample in the majority of the homes in the Carousel Tract is sufficient to protect these families from highly carcinogenic gases at any time during the next day, week, month, or many years into the future. Characterizing the VOCs as safe in homes immediately adjacent to extremely high concentrations of cancer causing gases is an expression of the total disregard for the health of the adults and children who live in these homes.

House Adjacent to Petrol Station



Shell Remediation Pilot Test Results

Shell has a long history and understanding of petroleum hydrocarbon remediation technologies. Consequently, when Shell proposed four separate remediation technologies for testing at the Carousel site, the Regional Water Quality Control Board approved the pilot test plans. The result of the four separate pilot tests however were a complete failure, as extensively documented by Shell. The in-situ chemical oxidation (ISCO) pilot test failed and the consultants to Shell stated, "Therefore, field pilot testing of ISCO using sodium persulfate does not appear effective. The field pilot testing of ISCO using ozone is not recommended." Shells own consultant's felt that in-situ chemical oxidation should not be considered and therefore recommended that testing of this technology be discontinued.

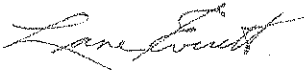
The second technology recommended by Shell was the use of bioventing. Bioventing involves the enhancement of oxygen to encourage the biological degradation of the petroleum hydrocarbons. Based on the test results, Shell concluded that it would take several decades to clean up this site assuming that the average biodegradation rates determined by Shell would hold. Clearly requiring these families to live for several decades (more than a generation) before homes would be livable is completely unacceptable and thus the bioventing remediation approach failed.

The third technology proposed by Shell was to surgically excavate in the streets, alleys, parts of yards but not under the homes. This technology also completely failed because it is unrealistic to think that contamination directly under homes somehow is reduced by excavating areas outside of the home foot print. As noted by EPA's latest research and development on soil and gas discussed earlier, soil gases measured external to a home have very little bearing on the concentrations found under a home. Clearly the partial excavation approach would fail to reduce the risk to the families in the Carousel Tract.

The fourth remediation pilot test involved soil vapor extraction to cause the volatile components to be removed from the subsurface. The extraction range for the soil vapor extraction program ranged from 5 feet to a radius of 10-15 feet in some locations. Based on my years of experience, this extraction range is very low and is understandable based on the high soil moisture content and the fine grained sediments involved. Based on a radius of 5 feet or even 10 feet, the number of extraction wells associated with any home or yard would be completely intrusive, unacceptable, and unworkable in a home environment. Thus simply based on the site conditions the soil vapor extraction program is a failure.

It is important to point out that in-situ chemical oxidation, bio venting, surgical extraction, and soil vapor extraction are applicable technologies for petroleum hydrocarbon remediation under the appropriate conditions. The conditions to support those technologies simply do not exist at the Carousel Tract. It is important to point out that Shell's Westhollow Technology Center in Houston is one of the most sophisticated hydrocarbon research facilities in the world and when they vetted the above four technologies they were clearly presenting the best suite of technologies available to them. Since all four of the technologies failed it is unreasonable to think that alternative technologies could come along to remediate this site. Rather than recognize the failure of the technologies, Shell has preferred to introduce delay after delay after delay in anticipation that at some stage a case could be made for leaving excessive levels of contamination in the subsurface.

Sincerely,



Lorne G. Everett, PhD, DSc.
F.ASCE, F.AWRA, F.ASTM
Chief Scientist & CEO
L. Everett & Associates, LLC

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