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Alameda County
Environmental Health

August 11, 2008

VIA ALAMEDA COUNTY FTP UPLOAD

Mr. Paresh Khatri
Alameda County Environmental Health
1331 Harbor Bay Parkway, Suite 250
Alameda, California 94502

Re: **Corrective Action Plan Addendum**
5175 Broadway, Oakland, California, ACEH Fuel Leak Case No. RO0000139

Dear Mr. Khatri:

On behalf of Rockridge Heights, LLC, Pangea Environmental Services, Inc (Pangea) has prepared this Corrective Action Plan Addendum (CAP Addendum) in response to Alameda County Environmental Health (ACEH) directive letter dated July 31, 2008.

INTRODUCTION

I'd like to first thank you very much for your prompt review of our FS/CAP. Your July 31, 2008 letter states that the "ACEH generally concurs with the proposed remedial alternatives based on the potential site development scenarios. However, prior to CAP approval, ACEH requests that you address the following technical comments…" Since there are no specific ACEH comments about the insitu DPE/AS alternative (in the event subgrade development is not performed), Pangea understands you do not have any concerns about this alternative approach. By addressing ACEH's comments on the CAP, ACEH should have sufficient information to approve the CAP and CAP Addendum in a timely manner. Thank you for your assistance.

RESPONSE TO ACEH TECHNICAL COMMENTS

In preparing our response to ACEH comments, Pangea contacted the RWQCB regarding their soil reuse guidance document and contacted Mr. Jeff Delgado of the UST Cleanup Fund. Information from these conversations is presented below.

COMMENT No. 1 - SOIL REUSE FOR EXCAVATION ALTERNATIVE #1

To address this first ACEH comment, Pangea presents herein our proposed methodology to adequately characterize any PHIS prior to reuse. Before presenting this methodology, however, Pangea offers information about the applicability of the RWQCB guidance and the appropriateness of site-specific oversight by ACEH for soil/rock reuse.

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Discussion with Designated RWQCB Contact for Soil Reuse Guidance Document

To better understand the RWQCB's guidance document for soil reuse, I spoke with Mr. Alec Naugle, the designated RWQCB contact within the Draft Technical Reference Document entitled *Characterization and Reuse of Petroleum Hydrocarbon Impacted Soil (PHIS) as Inert Waste* dated October 20, 2006. Mr. Naugle offered the following information indicated that ACEH can allow soil reuse with their oversight:

- The soil reuse guidance is not policy or regulation, and was intended to streamline a process for soil reuse with or without regulatory oversight.

  > *(This statement is consistent with the technical document, which states "This document is not intended to establish policy or regulation. Use of this document is entirely optional on the part of the user. This document provides conservative guidance to streamline the request/approval process for on-site soil reuse." This language in the 2005 guidance document about not establishing policy or regulation was an update from prior documents, added to emphasize this fact and discourage its treatment as policy or regulation. The document continues "This document is intended to establish a 'self-certification' process whereby the property owner and waste discharger retain the required compliance documentation, but no formal approval by Regional Board staff is provided.")*

- Mr. Naugle wants to further amend, update, or revise the guidance document to clarify its intent and remove words like "must", and to discourage agency 'strict interpretation of the guidance' and treating it as an '*ordinance or regulation*'. He said the tool was intended to be very *flexible*. He said he receives approximately one call a week about soil reuse and his guidance document.

- When agency oversight is provided for a site, the agency can use the guidance as a general tool and the agency evaluates site-specific decisions to allow soil reuse in a manner that safeguards human health, the environment, and potential beneficial uses.

  > *(This statement in consistent with the technical document, which states "The intent of this document is to assure that the reuse of PHIS is protective of human and environmental health and the beneficial uses of waters of the State… Site-specific decisions made by the Water Board or other lead agencies regarding reuse of PHIS and/or the management of impacted or suspect soil may supercede the guidance provided in this document.")*

- An agency can rely on the following items when allowing soil reuse: 1) active remediation is planned at the site that can target reused impacted soil, 2) residual groundwater impact would cause any imported clean material to become PHIS anyway, and 3) low groundwater yield limits the potential for beneficial use of site groundwater. He added that PHIS is often reused during UST removal projects where future remediation can target impacted material reused at a site.

  > *(All three of these items are applicable at this site. The proposed biosparging cell is specifically designed to actively remediation any reused PHIS and to remediation residual hydrocarbon impact. The average groundwater yield from site wells during DPE testing was below 200 gallons per day.)*

- An agency can rely on prior history of soil reuse at a site. It is important to note that ACEH previously allowed soil reuse within the former UST excavation area for 700 tons of material. This material was impacted source area material, and was likely significantly more impacted than the shallower overburden material proposed for reuse in the CAP. The reused material extended to beneath the former USTs (approximately 12 ft depth), which is within site groundwater.

Mr. Naugle also offered this other important information:

- The PHIS document does not apply to non-impacted soil. Therefore, shallower soil beyond the source area that is not impacted can be considered 'construction soil' and is not subject to regulatory oversight or to the guidance document. Such non-PHIS can be used at any depth, regardless of proximity to groundwater.

  (If ACEH does not allow reuse of any soil with low hydrocarbon impact, the site owner can use non-impacted site soil/rock as backfill material within the biosparging cell. The cost estimate for excavation alternative #1 has been revised to incorporate this statement.)

Discussion with UST Fund Reviewer Jeff Delgado

During my lengthy telephone conversation with Mr. Jeff Delgado August 7, 2008, Mr. Delgado said he has spoken with you and that you both generally approved of the two remedial approaches. I relayed the above information from Mr. Naugle to Mr. Delgado. We discussed the fact that your July 31, 2008 letter states that the proposed soil reuse within 5 feet of the high water table elevation "violates the RWQCB's soil reuse guidelines". He believed that your agency would likely allow soil reuse upon clarifying the soil characterization prior to reuse. I hope Mr. Delgado is correct and that ACEH follows the precedent for PHIS reuse at the site, as it allowed during the UST removal phase.

Revised Cost Estimate

As requested by ACEH, Pangea has revised the cost estimate for the excavation alternatives as shown on the attached revised Table 6. Based on the above RWQCB input, it is more clear that overburden soil or other shallow non-impacted soil can be used as fill in the deeper biosparge cells. Therefore, the revised cost estimate for the subgrade development/excavation scenario is lower than the initial CAP cost estimate. For excavation alternative #1, our revised cost estimate of **$447,000** assumes reuse of only 1,720 tons of overburden material. In the event that ACEH does *not* allow reuse of overburden soil/rock with low hydrocarbon impact, the cost increases by **$60,000** for the offsite disposal of 1,720 tons of material. Note that no rock import cost is included since non-impacted bedrock from elsewhere at the site can be used as fill material, consistent with Mr. Naugle's statement that the RWQCB guidance does not apply to the use of non-impacted material as 'construction material'. As shown below, the revised costs for alternative #1 are below or very similar to the alternative #3 estimated costs of **$524,000** for insitu DPE/AS.

The revised alternative #1 costs are as follow:

$447,000 (1,720 tons of soil/rock reuse)
$497,000 (1,720 tons reuse + $50,000 for contingent SVE/GWE)
$507,000 (0 tons reuse)
$557,000 (0 tons reuse + $50,000 for contingent SVE/GWE)

The revised estimated costs for excavation alternative #2 (which assumes no subsurface development) are higher than alternatives #1 and #2 as shown on revised Table 6.

Proposed Soil Characterization Methodology Prior to Reuse

Our proposed soil characterization and soil management approach involves the following for excavation alternative #1:

1. **Direct Offhaul of Known Impacted Material** – For soil with known impact above cleanup levels based on available or future characterization borings (if such borings are conducted for soil profiling), Pangea plans to arrange direct loading and offhaul to minimize soil handling and related costs.

2. **Soil Segregation and Stockpiling** – Any soil not directly offhauled and subject to potential reuse shall be segregated and stockpiled. Pangea anticipates one stockpile for overburden rocky soil with no odor or visible staining, and another stockpile for suspect material that does have a limited odor or staining. Material closer to the former USTs and closer to the water-bearing zone has a greater chance to be impacted, and therefore is more likely to be stockpiled within the suspect soil stockpile.

3. **Sampling of Stockpiled Soil** – Excavation alternative #1 includes an estimated 2,580 cubic yards (3,870 tons) of overburden material within 0-9 ft depth for the initial excavation area. Due to space limitations, Pangea anticipates that the excavation will be completed in a few stages, and will include stockpile sizes in the range of 500 to 1,000 cubic yards (cy). Consistent with PHIS guidance for this stockpile size, Pangea proposes to collect twenty (20) discrete soil samples and one additional discrete sample for every 100 cy over 500 cy. This equates to 20 samples for a 500 cy stockpile and 25 samples for a 1,000 cy stockpile. (Note that the PHIS guidance prefers discrete analysis over composite analysis). Sample locations will be random within a grid on the stockpile. The grid approach will allow additional sampling for reuse, resegregation, or profiling for soil offhaul.

4. **Sample Analyses** – All discrete samples will be analyzed for TPHg, BTEX and MTBE by EPA Methods 8015/8021. Consisent with PHIS guidance, the laboratory reporting limit shall be no greater than 10 mg/kg for TPHg and no greater than 5 ug/kg for BTEX/MTBE compounds.

5. **Reuse Criteria** – Stockpiled soil within each grid subarea with concentrations below the proposed cleanup level shown on CAP Table 5 will be deemed acceptable for reuse, assuming only a few of the stockpile sample results exceed the ESLs. (The proposed cleanup levels are the final ESLs protective of drinking water beneficial use, which include 83 mg/kg TPHg and 0.044 mg/kg benzene). If several samples exceed the ESLs, Pangea will discuss with ACEH the appropriateness of additional sampling and selective use of the remaining stockpiled soil where concentrations are below the applicable ESLs. At such time Pangea will consider using the 95% Upper Confidence Level (UCL) and potential leachability testing specified within the tiered evaluation approach of the PHIS guidance document. Due to planned remediation within the reuse zone, Pangea will request ACEH leniency regarding soil reuse criteria. Finally, Pangea may request modification to the above methodology if no soil staining or hydrocarbon odor is observed during the excavation of overburden soil, and if the bedrock material limits the ability to analyze stockpiled material or to conduct leachability testing.

6. **ACEH Approval -** Pangea will only reuse impacted soil with ACEH approval.

COMMENT No 2 – POTENTIAL GROUNDWATER & SOIL VAPOR MIGRATION

ACEH is concerned about the potential for proposed and contingent biosparging to cause hydrocarbon migration within groundwater and soil vapor. ACEH has requested permanent soil vapor monitoring points, a contingent soil vapor extraction (SVE) system, and a discussion of potential migration issues.

CAP Proposes Permanent Monitoring Points/Wells

As clarified in an August 5, 2008 email to ACEH, the CAP does indeed propose monitoring of existing groundwater monitoring wells, existing permanent soil vapor monitoring points, and proposed soil vapor monitoring points to evaluate potential migration during biosparging. Soil vapor monitoring locations and SVE piping are shown on Figures 18 through 22 within the CAP. Figure 18 shows six permanent vapor monitoring points and Figure 19 shows a vent stack/soil vapor monitoring location that would be installed at the edge of the property within the biosparging cell/building fill material. The conceptual model figure (Figure 22) also shows a soil gas monitoring location. While Pangea does present these monitoring locations, the CAP has only a limited discussion about controlling vapors created by biosparging. The discussion below is designed to further address ACEH concerns.

CAP Proposes Contingent SVE

As also clarified in the August 5, 2008 email to ACEH, the CAP does indeed propose a contingent SVE system. Furthermore, the CAP proposes a contingent groundwater extraction (GWE) system if necessary to expose subslab SVE piping for active use for SVE. The vapor extraction piping for contingent SVE is shown on Figures 19, 20 and 21. The conceptual model figure (Figure 22) also shows the contingent vapor collection piping.

Please also note that Table 6 of the CAP included cost estimates for contingent SVE (and for contingent GWE). Your July 31 comment letter incorrectly states that such costs were not included in Pangea's feasibility study (FS). Revised Table 6 presented in this CAP Addendum also includes the cost for contingent SVE and/or GWE.

Minimal Potential for Hydrocarbon Migration within Biosparging Cells

Pangea believes the potential for causing hydrocarbon migration during biosparging within the treatment cells is very low to minimal. That is because the biosparge cells will have a much higher permeability than the surrounding native stiff clayey soil and bedrock, and any fugitive vapors created within the biosparge cells would vent to the atmosphere via the proposed subgrade vent piping and baserock/other permeable material to be installed beneath and surrounding the subgrade parking structure. Any fugitive vapors would follow the path of least resistance within the vent piping and permeable material rather than through adjacent low permeability clay or bedrock. In addition, air sparging would be performed a low flow rates to oxygenate groundwater, not to create significant vapor flow within the subsurface. With the significant difference in permeability between the native and biosparge cell materials (and with the low air injection pressure required to sparge in a couple feet of water), there is insufficient pressure or 'driving force' to cause migration of vapors or dissolved hydrocarbons.

The actual 'driving forces' will be for contaminant migration *toward* (not away from) the treatment cell. By remediating source area concentrations, the biosparging will create a *concentration gradient* beneath the site. Higher concentrations within the surrounding native soil will tend to diffuse toward the lower concentration within the biosparge treatment cell. Similarly, the biosparging will increase dissolved oxygen concentrations and create a *dissolved oxygen concentration gradient*, which will encourage oxygen diffusion into the surrounding materials. This dissolved oxygen will help stimulate biodegradation of residual petroleum hydrocarbons. Monitoring and contingency plans regarding potential migration are discussed below.

Limited Potential for Hydrocarbon Migration with Contingent Biosparging Wells

If contingent biosparge wells are required for injection of compressed air beneath the biosparge cell into deeper native materials, there will be a limited potential for causing short-term hydrocarbon migration. The greatest potential for contaminant migration is within the fractures of the bedrock. However, the potential for migration will be controlled by the relatively shallow depth of the biosparge wells beneath the biosparge cell, and by locating the wells within the overlying biosparge cell area. Also, the low permeability of the native materials (shallow soil is clayey) will help limit the upward migration of vapor-phase contaminants toward potential sensitive receptors. Finally, any hydrocarbon migration issues would likely be temporary. The sparging process tends to dilute source area contamination while supplying oxygen to stimulate biodegradation of hydrocarbons. This biodegradation remedial process is called 'biosparging' within the groundwater/saturated zone and is called 'bioventing' within the vadose-zone/unsaturated soil zone. Pangea understands that bioventing is a preferred method used by the US Air Force to remediate jet fuel impact in site soil.

Proposed Monitoring and Contingency Plans to Limit Migration

Pangea proposes to monitor existing groundwater monitoring wells and existing/proposed permanent soil vapor monitoring points to evaluate potential migration during biosparging. Groundwater monitoring will be performed on a quarterly basis. Soil gas/vapor monitoring will be performed periodically (e.g., weekly) at the initiation of biosparging, and will be performed quarterly (as merited) to further evaluate potential migration and to determine if soil gas cleanup levels have been achieved. To control cost, soil gas/vapor monitoring will be performed using an organic vapor analyzer (OVA) in the field. This process will establish baseline soil gas/vapor concentrations for comparison to concentrations during biosparging. After completion of initial site remediation (e.g., six months of biosparging), soil gas samples will be collected using Summa canisters following DTSC guidance for soil gas sampling. Additional Summa canister analyses will be performed if field OVA measurements indicate that soil gas concentrations have exceeded baseline conditions by 50% or greater for more than 1 week. These soil gas results will be compared to prior soil gas concentrations and cleanup levels.

ACEH has inquired about distinguishing between vapor concentrations created by biosparging from previously detected vapor concentrations. Our proposed plan for OVA measurement and Summa canister analyses presented above addresses this concern.

The following techniques will be used to limit the potential for contaminant migration, especially if field measurements and laboratory analyses suggest contaminant migration may be occurring:

1. The air injection flow rate and duration can be limited.

2. Biosparging can be primarily or exclusively performed within wells nearest the center of the site and in the northeastern corner of the site (these areas are farthest from potential offsite gas receptors).

3. Biosparging can be primarily or exclusively performed within the treatment cell piping, with little or no biosparging in the deeper contingent biosparge wells.

4. Contingent soil vapor extraction (SVE) can be implemented from proposed subslab piping beneath parking garage. (Extracted vapor would be treated with activated carbon, if necessary to comply with requirements of the Bay Area Air Quality Management District).

5. Contingent groundwater extraction (GWE) can be implemented as required to expose sub-garage vapor collection piping. (Extracted groundwater would be treated with activated carbon, aeration or other method as necessary to comply with requirements for permitted discharge of water. GWE may also be performed by the developer to limited groundwater infiltration into the garage; the final dewatering scheme and/or water barrier will be determined by the civil engineer firm prior to site development).

6. As a last measure, additional vapor extraction and/or groundwater extraction wells can be installed at the site. These wells could be installed horizontally from the garage basement, if required, and plumbed to the contingent SVE and/or GWE systems.

In conclusion, the proposed plan addresses ACEH concerns regarding the potential for contaminant migration. Although the potential for contaminant migration appears to be limited, Pangea has a monitoring plan and contingent techniques to address potential concerns.

CLOSING

To help facilitate ACEH expeditious approval, I am more than willing to come meet with you to address any questions or concerns you may have. If you have questions for Mr. Alec Naugle, he can be reached at (510) 622-2510. Mr. Delgado of the Fund indicated he would provide cost pre-approval this week upon review of this CAP Addendum.

Thank you in advance for your assistance on this time-sensitive project. If you have any questions, please email me or call me at (510) 435-8664.

Sincerely,
Pangea Environmental Services, Inc.

Bob Clark-Riddell, P.E.
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
ROBERT G. CLARK-RIDDELL
No. C 049629
Exp. SEPT 2008
CIVIL
STATE OF CALIFORNIA

cc: Rockridge Heights, LLC, C/O Gary Feiner, 34 Schooner Hill, Oakland, California 94618
Mr. Jeff Delgado, California UST Cleanup Fund

ATTACHMENTS

Table 6 (Revised) – Comparison of Remediation Alternatives (Revised Soil Reuse Assumptions)

Table 6 REVISED – Comparison of Remediation Alternatives: 5175 Broadway, Oakland – REVISED SOIL/ROCK REUSE ASSUMPTIONS (Revisions in Red)

	Alternative 1 Excavation / Biosparging with Subgrade Mixed Use Development (Contingent SVE and GWE in Sparge Cells)	Alternative 2 Excavation / Biosparging for Commercial Use – No Subgrade Development (Contingent SVE in Sparge Cells)	Alternative 3 DPE / AS (No Subgrade Development)
Remediation Description	Excavate subgrade area and deeper impacted soil. Two biosparge cells. (Contingent SVE to capture sparge vapors and GWE to expose SVE screen)	Excavate impacted soil. Same as Alternative 1 except reuse more overburden and import backfill to return site to grade.	DPE/AS for 2 Years. 13 DPE wells and 6 AS wells
Unsaturated Soil Cleanup	●	●	◯
Saturated Soil + Groundwater Cleanup	◯	◯	◯
Fastest to Closure	●	●	◯
Most Cost Effective	●	○	◯
Design, Permit, Oversight, Reporting	$25,000	$25,000	$35,000
Excavation Analytical Costs	$10,000	$15,000 (higher for soil reuse analyses)	$0
Shoring	$0 (Development Benefit)	$0 (None used; may limit exc. extent)	$0
Excavate Overburden/Garage (0-9 ft)	$25,000 (5 days @$5k/day)	$25,000 (5 days @$5k/day)	$0
Excavate Impact (9-15 ft)	$25,000 (5 days @$5k/day)	$25,000 (5 days @$5k/day)	$0
Overburden Impacted Soil Offhaul (0-9 ft) (Assume 1,720 tons of 3,870 tons reuseable)	$75,000 (2,150 tons @$35/ton for <50 ppm TPHg)	$75,000 (2,150 tons @$35/ton) ($0 w 100% reuse)	$0
Impacted Soil Offhaul (9-15 ft bgs) 2,580 tn	$116,000 ($45/ton, >50 ppm TPHg)	$116,000 ($45/ton, >50 ppm TPHg)	$0
Stockpile/Handle for Reuse (0-9')	$ 0 (None; Development Benefit)	$ 25,000 (5 days @$5k/day) ($50,000 for 100% reuse)	$0
Backfill Import 0-11 ft (2,580 tons to replace offhauled impacted soil from 9-15 ft)	$ 0 (None; Development Benefit)	$ 165,500 (4,730 tons @$35/ton) ($90,000 w 100% overburden reuse to offset 2,580 tons offhauled)	$0
Backfill Labor 0-11 ft (4,730 tons w/reuse)	$ 0 (None; Development Benefit)	$ 50,000 (10 days @$5k/day)	$0
Backfill 11-15 ft (Assumes all 1,720 t reused)	$ 0 (Use overburden or other unimpacted site soil)	$ 0 (Use overburden or other unimpacted site soil)	$0
Backfill Labor 11-15 (1,720 tons of reused)	$ 25,000 (5 days @$5k/day) (Added 2 days for reuse)	$ 25,000 (5 days @$5k/day) (Added 2 days for reuse)	$0
System Installation	$ 50,000 (Biosparge+Contingent Wells)	$ 50,000 (Biosparge+Contingent Wells)	$ 285,000 (45k Wells/30k Util Install/120k Install/90k Equip)
System O&M (Labor, Utility, Fee, Rpt)	$ 24,000 (2 years Biosparge) ($1,000/month)	$ 24,000 (2 years Biosparge) ($1,000/month)	$ 100,800 (2 yrs DPE/AS) ($4,500/month)
GW Monitoring Cost ($6,000/qtr)	$ 72,000 (3 Years)(Starts 1 yr before other alts)	$ 96,000 (4 Years)(1 yr delay til start excavation)	$ 96,000 (4 Years=1 yr plan/prep, 2 yrs O&M, 1 yr gw mon)
Total Estimated Cost	***$ 447,000*** *($ 473,000 prior unrevised cost)* *[+$60,000 if NO soil reuse=1,720 tons x $35/ton]*	***$ 716,500*** *($591,000 with 100% overburden reuse)*	***$ 524,000***
Contingency Cost	$ 50,000 Extra Excavation $ 50,000 SVE/GWE + O&M	$ 50,000 Extra Excavation $ 35,000 SVE Install + O&M	$ 100,000 DPE/AS Expansion or Longer Operation
Total Cost w/ Contingency	***$ 547,000*** *(+$60,000 if NO soil reuse allowed)*	***$ 801,500*** *($676,000 with 100% overburden reuse)*	***$ 624,000***
Active Remediation Time / Time Til CLosure	2 years / 3 years	2 years / 4 years	2 years / 4 years
Advantages	• Faster and more reliable than insitu treatment by directly removing source material. • Savings for select costs paid by development. • Shoring allows excavation near impacted property line • Allows exposure of subsurface to determine impact area in clayey soil + bedrock fractures. Helps target residual.	• Faster and more reliable than insitu treatment by directly removing source material. • Allows exposure of subsurface to determine impact area in clayey soil and bedrock fractures. • Help target any residual secondary impact.	• Provides site cleanup without extensive soil excavation. • Can be performed before, during or after site development. • Additional cost savings if less than 2 years of operation required.
Disadvantages	• Requires extensive soil handling. • Contingent remediation may be required for residual	• No costs paid by development since no subgrade work. • Significant costs for import and compaction of backfill. • No shoring to better target impact near property line.	• High energy and utility costs. Requires well + system install. • Slower than excavation for primary contaminant removal. • Ongoing noise and air emissions from equipment
Recommended Alternative	● (Rec for Subgrade Development)	○ (Not Recommended)	◯ (Rec if No Subgrade Development)

● = Very Effective, High Rating ◯ = Moderately Effective, Moderate Rating ○ = Not Applicable, Not Effective, Not Recommended