May 18, 2009

VIA ALAMEDA COUNTY FTP UPLOAD

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

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

Dear Mr. Khatri:

On behalf of property owner Rockridge Heights LLC, Pangea Environmental Services, Inc (Pangea) has prepared this Addendum Final Corrective Action Plan (Final CAP). This Addendum was prepared in response to Alameda County Environmental Health (ACEH) directive letter dated April 16, 2009. The ACEH's April 16, 2009 letter requested implementation of the CAP as approved by the ACEH directive letter of August 22, 2008 directive letter. However, the April 16, 2009 letter also requested technical justification for the proposed cost control measures in the Final CAP and required submittal of a 'Final CAP' by May 18, 2009. This Addendum provides the requested technical justification and helps demonstrate our efforts to control corrective action costs, as encouraged by the California UST Cleanup Fund.

TECHNICAL JUSTIFICATION

In an effort to save costs, Pangea has proposed to install fewer remediation wells by utilizing existing groundwater monitoring wells for dual phase extraction (DPE) or air sparging (AS). The ACEH letter requests a discussion of the appropriateness of existing well construction for DPE. The ACEH also requests information regarding the increase in the depicted DPE radius of influence from 15 ft to 20 ft. Our technical justification is provided below.

1. Existing Wells are Amenable to DPE and AS

Pangea's Final CAP proposed DPE in existing wells MW-3A, MW-4A, MW-6A, MW-7B and MW-8A. The April 2007 feasibility testing conducted DPE on four of these five site wells and confirmed that existing wells are amenable to DPE. During the testing, the hydrocarbon removal rate peaked at *51.2 pounds per day* while extracting simultaneously from four existing wells. This peak extraction rate was observed shortly after air sparging in existing site wells. This test information confirms the effectiveness of using existing wells for site remediation.

2. Existing Wells are Constructed Similar to Previously Proposed Wells

The well construction for the existing and proposed new wells are summarized on attached Table 1. As shown on Table 1, the existing well screen intervals are very similar to the proposed well screens, and the existing well diameter is identical for the proposed DPE wells (2" diameter). Remedial effectiveness using the existing wells would likely be very similar to the effectiveness from any new wells. Given our

understanding of site conditions and prior feasibility test results, remediation from the existing wells should effect the subsurface similarly to remediation from the previously proposed wells.

3. Design Radius of Influence (ROI) is Conservative

The Draft CAP assumed a *very* conservative ROI of 15 ft per DPE well, while the Final CAP assumed a less conservative ROI of 20 ft per DPE well. Note that both of these ROI are conservative for DPE, especially for sites using liquid-ring vacuum pumps capable of up to 28 inches of mercury vacuum. For other sites within Oakland, Pangea has used ROI for design purposes that ranged from 20 to 40 ft.

During DPE testing at the subject site, the well spacing was insufficient to fully evaluate smaller ROI, since most wells screened to similar depth were located approximately 30 to 55 ft apart. Despite the well spacing, the feasibility testing did observe influence up to 31 and 47 ft away from DPE locations. Pangea suspects that during implementation of a dedicated DPE and AS system the influence area would tend to increase over time as the site dewaters, and as oxygen permeates the site subsurface. Also note that despite the slightly increased design ROI, the total number of DPE wells is very similar. The Final CAP proposes 11 DPE wells compared to the 13 DPE wells proposed by the Draft CAP.

Table A below compares remediation well quantity for the Draft CAP and Final CAP, and presents potential cost savings associated with the Final CAP approach.

Table A – Remediation Well Summary and Potential Cost Savings

Item	Draft CAP	Final CAP	Comments
Proposed DPE Well Locations	13	11	Only 2 less DPE wells with Final CAP.
Proposed Air Sparge Well Locations	6	7	One more AS well with Final CAP.
Total Quantity of Remediation Wells	**19**	**18**	**Only 1 less remediation well with Final CAP.**
Proposed Quantity of New Wells	**19**	**7**	**12 less wells with Final CAP**: 6 new DPE wells and one new AS well. Well installation costly at very rocky site located in "Rockridge".
Potential Installation Cost Savings	---	$40,000	For 12 less wells, save on installation permits, well installation, geologist oversight, soil analytical, well development, drummed waste storage, waste disposal, surveying, and reporting. Assumes slow installation due to rocky soil.
Potential GW Monitoring Cost Savings	---	$20,000	Periodic groundwater monitoring and reporting for 12 new wells could cost up to $5,000 per event. Assumes 4 sampling/monitoring events: 1 pre-remediation, 2 during remediation, and 1 post-remediation.
Potential Well Destruction Savings	---	$12,000	Assumes well overdrilling would be required to destroy the 12 additional wells. Includes permits, driller, field oversight, disposal and reporting.
Total Potential Cost Savings	---	**$72,000**	

4. Contingency for Additional Well Installation

Pangea plans to implement remedial action and evaluate remediation effectiveness after an initial period of operation. If additional DPE wells are merited after this evaluation, new wells can be installed at that time. This approach of contingent well installation provides cost savings now, with additional well installation only if necessary. This dynamic approach helps control overall remediation costs.

CONCLUSION

Since the April 2007 feasibility testing confirmed remedial effectiveness using existing wells, it does not appear cost effective or necessary to install the new wells previously proposed within the Draft CAP. The existing wells are constructed similarly to previously proposed wells. Using existing wells for site remediation can save considerable cost, as encouraged by the California UST Cleanup Fund. Finally, additional wells can be installed on a contingency basis as merited after remedial effectiveness evaluation. Therefore, Pangea recommends implementation of the Final CAP as clarified in this Final CAP Addendum.

Pangea and Rockridge Heights LLC appreciate your assistance on this project. If you have any questions or comments, please feel free to 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 2010
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

ATTACHMENT

Table 1 – Proposed Well Use and Construction Details

Table 1 – Proposed Well Use and Construction Details–5175 Broadway, Oakland, CA

Well ID	Total Depth of Well (feet bgs)	Screened Interval (ft bgs)	Well Casing Nominal Diameter (inches)	Sand & Slot Size
DPE – Existing Wells				
MW-3A (DPE)	14	9-14	2	#2/12 – 0.01 Slot
MW-4A (DPE)	15	8-15	2	#2/12 – 0.01 Slot
MW-6A (DPE)	17	8-17	2	#2/12 – 0.01 Slot
MW-7B (DPE)	18.5	15.5-18.5	2	#2/12 – 0.01 Slot
MW-8A (DPE)	15	8-15	2	#2/12 – 0.01 Slot
DPE – Proposed New Wells in Final CAP				
DPE 1 – DPE 6† (†=omits DPE 7-DPE13 from Draft CAP)	15 – 20*	10-15/20* (*shallower if rocky)	2	#2/12 – 0.01 Slot
AIR SPARGING – Existing Wells				
MW-1 (AS)	23	13-23	4	8x20 – 0.02 Slot
MW-2C (AS)	23	18-23	2	#2/12 – 0.01 Slot
MW-3C (AS)	27	22-27	2	#2/12 – 0.01 Slot
MW-5B (AS)	20	17-20	2	#2/12 – 0.01 Slot
MW-7C (AS)	25	20-25	2	#2/12 – 0.01 Slot
MW-8C (AS)	25	20-25	2	#2/12 – 0.01 Slot
AIR SPARGING – Proposed New Well in Final CAP				
AS-1†† (††= omits six AS wells from Draft CAP)	20**	16-20** (**deeper if not rocky)	1	#2/12 – 0.01 Slot
GROUNDWATER MONITORING ONLY				
MW-5A	14	10-14	2	#2/12 – 0.01 Slot
MW-5C	27	22-27	2	#2/12 – 0.01 Slot
MW-9A	15.5	7.5-15.5	2	#2/12 – 0.01 Slot
MW-9C	21	17-21	2	#2/12 – 0.01 Slot
MW-10A	18	8-18	2	#2/12 – 0.01 Slot

bgs = below ground surface