terraphase engineering

Memorandum

To: **Mark Detterman, ACDEH**
From: **Andrew Lojo**
Date: **January 11, 2018**

Subject: **Comments on *Comprehensive Summary of Site Conditions* Report, 1700 Jefferson, Oakland, CA, November 2017, Prepared by Applied Water Resources (Fuel Leak Case No. RO0000151)**

Dear Mr. Detterman

Terraphase Engineering Inc. (Terraphase) has reviewed the *Comprehensive Summary of Site Conditions* Report prepared by AWR for the 1700 Jefferson Street site in Oakland, California. We do not concur with several of the conclusions made, including, most importantly, the unsupported theory that a second off-site source caused or is contributing to the northern half of the groundwater plume located north of the ARC site. The report lacks reliable data supporting its theories of an apparent westward groundwater flow direction, or that natural attenuation (now dubbed Natural Source Zone Depletion) may be occurring despite decades of monitoring showing no reduction of benzene concentrations in groundwater over the past 30 years.

The report presents the same conclusions and recommendations made by HLA in 1997 for further testing, additional plume delineation, continued off-site source searching, and further attenuation assessments. After 30 years, the RP should be compelled to recommend remediation of this decades-old problem that remains a threat and nuisance to ARC's neighbors--including many residential occupants.

"Site" cleanup should include the adjacent Jefferson Court Apartments site ("the Jefferson site"), where groundwater and soil-gas data clearly indicate the presence of a significant mass of un-weathered LNAPL. As stated in the October 30, 2017, IRAP, already commented on, AWR recommends conducting a minimalistic SVE pilot test in the immediate UST release area only, rather than focusing resources on a final comprehensive solution for the Site. Sound, effective, and efficient technology to remediate a gasoline release in a sandy subsurface like this has existed for decades. The recommendations made by AWR would bring this site no further to eventual cleanup than Harding Lawson's Corrective Action Plan did twenty years ago (HLA 1997).

There are three primary assertions made in the report that are used as reasons not to move forward with active site cleanup.

<u>Assertion 1: Hypothetical Off-Site Gasoline Source.</u>

The first assertion is that the petroleum contamination located north of the ARC site is not from the ARC site. Thirty inches of product were present in MW-1A, which is located northeast of the USTs and less than 20 feet from the adjacent Jefferson site. Over 3,000 gallons of free product were removed from that area over the first 9 years of site work. Free product was also detected in MW-5. The plume documented at the site is approximately 120 feet long plus an unknown distance likely north of MW-5. The size and shape of the entire groundwater plume north of the ARC release site is well within the typical length of UST release plumes documented in hundreds of similar sites in California (RWQCB 2011b). This new assertion that the ARC plume is less than 100 feet long is not credible given the amount of product initially found at the site, the sandy subsurface, and the length of time the site was an active gas station.

This assertion is founded on erroneous site-specific groundwater elevation data rather than more reliable groundwater chemical concentration data. The groundwater table at the site is relatively flat with less than half a foot of vertical change measured between the high and low monitoring wells, corresponding to a vertical hydraulic gradient of 0.004. It does not take much change in elevation measurements or error in collecting them, to change the interpreted flow direction, and groundwater elevations are the most prone to error of any line of evidence that exists at a site like this. Even when measured correctly, off-site pumping or other factors can change gradients measured in wells temporarily. Many other factors also affect the piezometric elevations measured in wells, including the well's construction, depth, length of screen, depth of screen, lithology, degree of development, and the equilibration time between opening the well and taking the measurements.

The six monitoring wells at the site represent an extremely small area of measurement in comparison to regional groundwater flow data. Such a small network cannot be relied upon to definitively tell which way groundwater is flowing on a regional basis. The attached map, taken from the California Geological Survey's Seismic Hazard Zone report for the Oakland West Quadrangle (CGS, 2003) shows a summary of the maximum depth to water data from hundreds of wells reported by the Department of Water Resources for the Oakland area. The six monitoring wells from the site cover the area of a pin head on a regional basis. This map also indicates that the predominant groundwater flow direction at the site is to the north, which is consistent with the other lines of evidence we have including, most importantly, the groundwater concentration data itself. The variations measured in flow direction over time at the ARC site are more likely the result of data quality problems with the readings, the wells themselves, or temporal effects from localized pumping from building excavations as documented in Harding Lawson's Corrective Action Plan (HLA, 1997), or by historic pumping from the two wells documented in the report (page 7).

MW-6, which has had lower groundwater elevations since it was installed in 1996, is described in the report as both a downgradient well because of its lower piezometric surface measurements (page 6), and a background well because it is clean (page 18). This contradiction strongly indicates that data quality problems exist with the water level measurements. MW-6 could not possibly be clean if it were really down-gradient from a gasoline release that left thousands of gallons of free product in the ground. Terraphase has identified several reasons to doubt the reliability of these measurements. They are taken from wells that: 1) have only been opened twice per year for most of their existence and only four times per year currently; 2) have not been developed in over 20 years to facilitate proper hydraulic communication with the formation (USGS 2001); 3) are not allowed sufficient time to equilibrate before measurement are taken (wells changed by approximately 0.1 foot between first opening and sampling

several hours later during the December sampling event); 4) have not been measured in a consistent manner (some events the water levels were taken immediately before sampling rather than all together before any sampling began, and in most sampling events the change in elevation between initial reading and sampling time was not noted).

Most significantly, the elevation data include measurements collected from wells with "*estimated construction details*" (MW-1 and MW-2), and from MW-6 itself, for which neither well construction logs or lithology information were documented, on which to evaluate its anomalously low water levels. If MW-6 did not encounter the same lithology as the other wells it could be completely anomalous. Furthermore, the written description of the construction of MW-6 indicates that it has a 10-foot-long screen and the top of the screen is 5 feet deeper than the others, which would result in the well screen being completely submerged (HLA 1999). MW-5 on the other hand has a 20-foot-long screen. Therefore, the existing monitoring well network cannot be relied upon to override the other more reliable lines of evidence that indicate groundwater is not flowing toward MW-6 from the ARC site.

No groundwater flow data exists for the Site between 1939 and 1987, when the release occurred. The groundwater chemical data and product removal data clearly show, however, that the release originated from the ARC site and flowed north during that time. It is not reasonable to conclude that such a large gasoline release which created 30 inches of floating product on the water table in the release area did not reach MW-6, which is less than 100 feet away from the UST excavation area if groundwater really flowed that way when the release occurred. In addition, the type of product, the reported lead concentrations, the length of the plume, and the relative BTEX to GRO ratios detected in wells under the Jefferson Court site and in MW-5 are fully consistent with those measured in wells on the ARC site. These more reliable data demonstrate that the plume originated at the ARC site.

Lastly, Sanborn maps and EDR data from the site vicinity reveal no potential historical sources that are located closer to the Jefferson Court site, or MW-5 than the ARC site. Therefore, the notion that an off-site source as far away as the referenced ice skating rink, which is approximately 350 feet west of the site, could have contributed to the ARC plume, while simultaneously claiming that contamination from the ARC site did not migrate even 100 feet to MW-6, is not supported by the site data in the record, especially when SV-23 and SV-24 have significantly lower concentrations than soil-gas samples on the ARC site or Jefferson Court site.

<u>Assertion 2: No Significant Risk to Indoor Air</u>

The second assertion, made in several places, is that the most recent round of sub-slab vapor samples collected at the Jefferson site do not show a "*significant risk to indoor air and human health*" when only two monitoring events have been conducted under the building, and three in the courtyard. Within this limited data set there were benzene detections above ESLs once in SS2, and once in SS7. Therefore, not enough data exists to support a conclusion that there is no significant risk. Sub-slab vapor sample data are often variable and residential site occupants have a conservative opinion of what a "*significant health risk is*". It is important that the public know that protection of their health is the number one priority at any contamination site. While the most recent sub-slab vapor sample results may not show an immediate risk, that limited amount of data does not warrant a conclusion that none exists or warrant further delay in eliminating that risk by cleaning up its source, which is located directly under the residential building.

Soil-gas samples collected 7 to 8 feet deeper are several orders of magnitude higher than the ESL for benzene (48 µg/m^3). The highest (SV16,) was 1,420,860 µg/m^3 in April 2017. The attenuation measured at the Jefferson site between ARC's groundwater plume and the sub-slab samples is consistent with studies suggesting that 8 feet of oxygenated vadose zone is protective (RWQCB 2011a), but there is no margin of safety at the Jefferson site with ground floor residential units. The soil-gas concentrations are significantly above even LTCP criteria, and the significant amount of un-weathered product causing them will pose a continued risk to the Jefferson site occupants for decades unless it is cleaned up.

In addition, the extensive amount of impermeable surface covering at the site could preclude the long-term effectiveness of aerobic biodegradation within the vadose zone because oxygen is being consumed in the process (U.S. EPA 2015). Other than the cores cut into the slabs and the probe installation process itself, no new oxygen is entering the vadose zone under the buildings and pavement. Therefore, the current sub-slab vapor sample data are not sufficient to conclude that no significant risk exists at the site, and cannot justify a delay in planning the cleanup of the source of that risk, which is present directly beneath the Jefferson site.

Assertion 3: Evidence of Natural Attenuation

The third assertion is that natural attenuation or source zone depletion mechanisms will eventually take care of the site cleanup. While aerobic degradation (which could easily be employed as part of an active remediation system) could reduce these concentrations by 50-60% per year once the product source is removed (RWQCB 2012), the benzene concentrations in site monitoring wells show no decreasing trends over time, except for the reductions achieved in the two wells where product was removed from 1988 to 1999 with the operation of the prior product removal system. Review of the groundwater monitoring well sampling forms shows that the site has been anaerobic for decades. While anaerobic degradation is also possible under certain conditions and at a much slower rate, as suggested with the Natural Source Zone Depletion theory, the MNA parameter data discussed in the report is insufficient to support AWR's conclusion that it is occurring. In fact, the petroleum constituent trends in the monitoring wells definitively show that no detectable natural degradation is occurring, whether aerobic or anaerobic.

Conclusion

While historical remedial efforts were successful in removing a large amount of gasoline from the immediate vicinity of the former USTs, the majority of the 30-year history of the ARC site environmental work consists of monitoring and investigation. The twenty years of monitoring conducted since the cessation of remedial work shows no further reduction in petroleum constituents in groundwater present beneath a multi-unit apartment building which is located immediately adjacent to the large gasoline release source. The concentrations of gasoline constituents in groundwater and soil gas clearly show the presence of a large mass of un-weathered product remaining under the building, and it is orders of magnitude above applicable screening levels for the protection of human health as well as LTCP guidance levels.

This *Comprehensive Summary of Site Conditions Report* prepared by AWR is lengthy, but much of it is repetition of old unsupported theories about an off-site source contribution that is not buttressed by historical information or by the most reliable site data. The groundwater measurements cited as reason

for the speculation that petroleum under the Jefferson Apartment building, and in MW-5, are coming from another source are highly suspect as explained above.

Lastly, AWR's conclusion that the recent sub-slab vapor samples collected under the Jefferson Court building do not suggest an unacceptable risk to residents at the property is too vague to be useful as a guide in making remedial decisions at a site that includes both residential and commercial use. The UST Low Threat Closure policy guidance is insufficient for a site like this, and we request that clear, definitive cleanup goals such as current ESLs be set for the site. Site conditions do not even meet LTCP criteria, so we strongly request the issuance of a directive requiring an active, comprehensive remedial effort to address the contamination under both sites as soon as possible. After over 20 years of waiting, cleanup should not be further deferred in favor of continued investigation of completely speculative off-site sources or assessment of NSZD effectiveness. Given the abundance of evidence against either possibility, both are a waste of time and UST fund money. State UST fund resources should be used on actual cleanup of the problem.

References:

Department of Conservation, California Geological Survey (CGS). 2003. Seismic Hazard Zone Report 081, Seismic Hazard Zone Report for the Oakland West 7.5 Minute Quadrangle, Alameda County, California.

Harding Lawson Associates (HLA). 1997. Corrective Action Plan, November 11.

_____. 1999. Groundwater Investigation Blue Print Service Company 1700 Jefferson Street, Oakland, Ca.; July 27

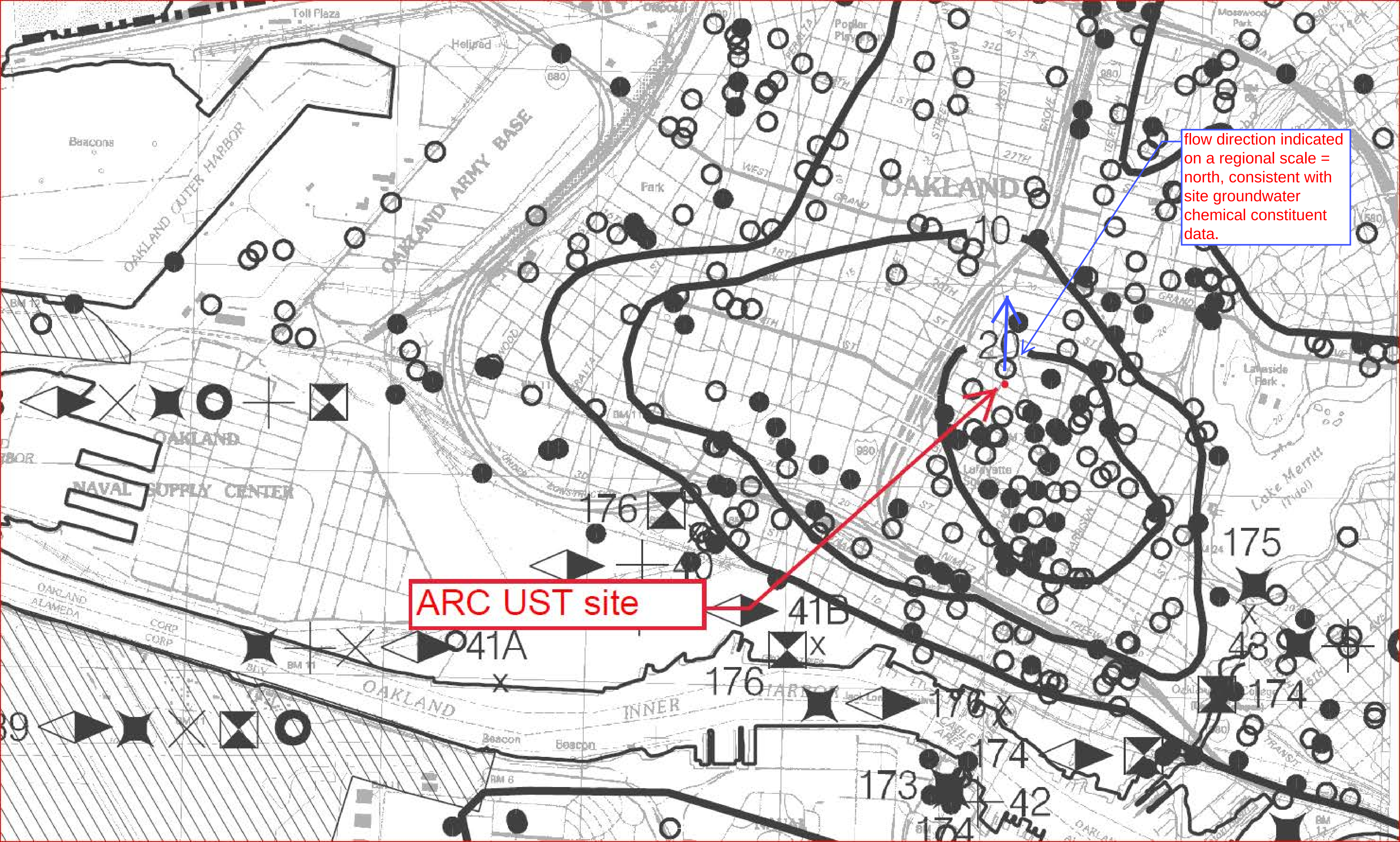
Regional Water Quality Control Board (RWQCB). 2011a. Technical Justification for Low-Threat Closure Scenarios for Petroleum Vapor Intrusion Pathway, June 30.

_____. 2011b. Technical Justification for Low Threat Closure Scenarios for Groundwater Plume Lengths, Indicator Constituents, Concentrations, and Buffer Distances (Separation Distances to Receptors https://webcache.googleusercontent.com/search?q=cache:p-cKOBI5CwYJ:https://www.waterboards.ca.gov/ust/policy/techjust063011.pdf+&cd=1&hl=en&ct=clnk&gl=us

_____. 2012. Technical Justification for Groundwater Media-Specific Criteria for Low-Threat Closure, April 24.

U.S. Environmental Protection Agency (U.S. EPA). 2015. Technical Guide for Addressing Petroleum Vapor Intrusion at leaking Underground Storage Tank Sites, June. https://www.epa.gov/sites/production/files/2015-06/documents/pvi-guide-final-6-10-15.pdf

U.S. Geological Survey (USGS). 2001. Circular 1217, Ground-Water-Level Monitoring and the Importance of Long-Term Water-Level Data. Page 9.



flow direction indicated on a regional scale = north, consistent with site groundwater chemical constituent data.
ARC UST site
OAKLAND
OAKLAND ARMY BASE
OAKLAND OUTER HARBOR
NAVAL SUPPLY CENTER
OAKLAND INNER HARBOR
Toll Plaza
Helipad
Beacons
Lakeside Park
Lake Merritt (Tidal)
Lafayette Square
Poplar Playground
Mosswood Park
10
20
40
41A
41B
42
43
173
174
175
176