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April 1, 1996

MEMORANDUM

To: UST Local Oversight Program Agencies and Other Interested Parties Overseeing UST Cleanup

Subject: Regional Board Supplemental Instructions to State Water Board December 8, 1995, Interim Guidance on Required Cleanup at Low-Risk Fuel Contaminated Sites (Replaces February 29, 1996 version)

This supplemental guidance is intended for the regulatory and technical audience[1] to expand on the interim guidance provided in the December 8, 1995, letter from Mr. Walt Pettit, Executive Director of the State Water Resources Control Board regarding the findings of the report entitled "Recommendations to Improve the Cleanup Process for California's Leaking Underground Fuel Tanks (LUFTs)" issued by the Lawrence Livermore National Laboratory (LLNL). Mr. Pettit's letter urges cleanup agencies to proceed aggressively to close low risk soil only cases and not to require active remediation of low risk groundwater cases.

The LLNL report concludes that natural attenuation of petroleum is an important factor in stabilizing plumes and may be the only remedial activity necessary in the absence of the source. After a review of existing literature, white papers submitted to the SB1764 committee, and a study of selected UST leak cases primarily from Coastal Range sedimentary or valley alluvium hydrogeochemical provinces, the LLNL report found that petroleum plumes tend to stabilize close to the source, generally occur in shallow groundwater and rarely impact drinking water wells in the state.

It is in light of these findings and the "lessons learned" over the past ten years in San Diego Region that the attached supplemental Interim Guidance was developed. This interim guidance document describes what constitutes a "low risk soils only case" and "low risk groundwater case". Strategies are presented for closing "low risk soil only cases" and managing "low risk groundwater impact cases" through natural attenuation as the preferred remedial alternative.

These two classes of sites, low risk soils and low risk ground water, are not intended to include the whole universe of petroleum contaminated sites. There are higher risk sites that may require immediate action and active remediation to protect human health and the environment. The responsibility still lies with the responsible party for investigation of the subsurface to gather the data necessary to make these decisions. It remains the responsibility of the regulator to request that information which is required to make the necessary regulatory decisions regarding the site.

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[1] Additional information is also provided from the Regional Board in the form of a Fact Sheet in a "Question and Answer" format.

It is the responsibility of everyone in the process, particularly consultants and regulators, to keep up with current research on site investigation, fate and transport of contaminants, analytical methods, and other topics that affect the decision making process. Training and education should be a high priority for all parties participating in the site cleanup process. The State and Regional Boards will be providing guidance to the local agencies and others affected.

INTRODUCTION

Subsurface conditions are highly variable and there is always some uncertainty associated with evaluating data for a site. However, the cost of obtaining additional site assessment data must be weighed against the benefit from obtaining that additional data and the effect the data may have on the certainty of decisions made for the site.

The following RWQCB guidance concerning the investigation and management of "low risk" leaking petroleum underground storage tank (UST) sites assumes that the following factors apply:

1) The tank or appurtenant structure that leaked has been repaired or permanently closed per requirements of Article 7, Section 2670 et seq. of Chapter 16 (CHAPTER 16), Title 23, CCR.

2) Free product has been removed to the extent practicable per requirements of Article 5, Section 2655 of CHAPTER 16.

LOW RISK SOILS ONLY CASE

Criteria:

1) **The leak has been stopped and ongoing sources of pollution are removed or remediated to the extent practicable.**

   Sources of pollution may include soil which contains sufficient mobile constituents (e.g., leachable pollutants, vapors, or residual fuel product) to degrade surface or ground water resources in excess of water quality objectives as defined in the RWQCB Basin Plan. Residual fuel contaminated soils which are eroded and transported to storm drains, abandoned or active wells, surface waters, or lands beyond control of the discharger or which create exposures or hazardous conditions, and may pose a significant threat to human health or the environment should also be considered a source.

   For older releases, the absence of current groundwater impact is often a good indication that residual concentrations present in the soil are not a potential source of future pollution. In general, if pollutants within fuel contaminated soil are not in contact, or expected to come in contact, with groundwater, it is unlikely that it is a significant source of pollution.

2) **The site has been adequately characterized.**

   The extent of the subsurface impact should be defined to the degree that is necessary to determine if the site poses a threat to human health, the environment, or other nearby sensitive receptors. The level of detailed data required from a specific site will depend upon the anticipated depth to groundwater, the presence or absence of potential receptors, and exposure pathways. Delineation and characterization of environmental contamination needs to be completed to a sufficient level to accurately document conditions at the site. Delineating environmental contamination to non-detect levels may not be required at all sites.

3) **No groundwater impact currently exists.**

By definition, soils only cases do not have groundwater impacts. Results from contaminant leachability testing (e.g., U.S. EPA Method 1311 - modified TCLP or EPA Method 1312--SPLP) may be useful for responsible parties wishing to make a technical demonstration that residual soluble fuel contaminants do not pose a significant threat to groundwater resources.

4) **No groundwater, surface water, or other sensitive receptors are likely to be impacted.**

5) **The site presents no significant risk to human health.**

Site mitigation strategies which include elements of *"Risk Based Corrective Action"* (RBCA) may provide an acceptable methodology to perform a tiered risk analysis at petroleum release sites. RBCA methodologies usually incorporate elements of U.S. EPA risk assessment practices to determine non-site specific (e.g., generic risk based screening levels) and site specific clean up levels that are protective of human health and environmental resources. The responsible party may wish to propose a RBCA approach for consideration by the regulatory agencies.

Significant risks to human health may also include the creation of fire and explosion hazards from the migration and accumulation of fuel vapors in subsurface utilities (e.g., storm drains, sewer systems, utility vaults, etc) as well as excess lifetime cancer risk due to benzene vapor migration. Further corrective actions at some UST sites maybe necessary to mitigate these hazards as well.

6) **The site presents no significant risk to the environment.**

RBCA methodologies have no specific guidance for evaluating environmental risk although the basic framework is appropriate if site specific exposure pathways and ecological receptors are included. If the site has a potential to create fire and explosion hazards, significantly impact surface water, wetlands, or other sensitive receptors, it should not be considered "low risk."

Management Strategy

Low risk soils cases should be closed when it is determined that site conditions conform to the above criteria. Further remediation or monitoring is not required. If the most sensitive permitted use (e.g., residential) is not protected by the site cleanup levels which are protective of human health and water resources, then engineering (e.g., vapor barriers, caps, etc.) and/or administrative (land use restrictions or notifications) controls may be appropriate for the site. The site status should be re-evaluated when property transfers result in a change in land use (e.g., changes from commercial to residential uses). If fuel contaminated soils are subsequently disturbed, additional remedial or mitigative measures may be necessary and appropriate at the site.

LOW RISK GROUNDWATER CASE

Criteria:

1) **Groundwater has been impacted, the leak has been stopped and ongoing sources (as defined in LOW RISK SOIL ONLY CASE DEFINITION #1), including free product have been removed or remediated to the extent practicable.**

2) **The site has been adequately characterized (see Low Risk Soils Case Definition #2).**

3) **The site is located in a Basin without designated Municipal / Domestic Beneficial Use**

   A site should not be considered "low risk" if current uses of water resources are known to exist but are not identified in the RWQCB Basin Plan.

4) **The site is located in a Basin with Municipal / Domestic Beneficial Use (Outside of a Sensitive Aquifer Boundary).**

   Leaking UST sites located within the San Diego County Water Authority (CWA) service area footprint, not including sensitive aquifer areas, will be considered low risk ground water areas. Designation of "low risk" groundwater sites also depend upon the status of the site with regard to the other criteria discussed in this section. The CWA service area extends approximately 18 miles inland from the coast and from the southern boundary of MCB Camp Pendleton to the U.S./Mexican border. The sensitive aquifer areas are the alluvial groundwater basins as defined by the Department of Water Resources (DWR) within the service area footprint of the CWA. Areas located outside the CWA service area footprint will generally not be considered low risk groundwater areas (see Q&A supplement for further discussion). Sites within a sensitive aquifer boundary and sites located in Riverside and southern Orange Counties will be evaluated on a case-by-case basis.

5) **The dissolved hydrocarbon plume is not migrating.**

   Chemical concentrations of hydrocarbons in groundwater that decrease or do not change with time are the best indicators of a stable plume. Comparison of background and hydrocarbon plume concentrations of dissolved oxygen, iron, nitrate, sulfate, methane, and others, can provide evidence that in-situ biodegradation may be reasonably effective at a given site. These data may or may not be required to determine plume stability but can supplement other lines of evidence.

   Stable or decreasing plumes often display short-term variability in groundwater concentrations. These effects are due to changes in groundwater flow, degradation rates, sampling procedures, and other factors which are inherently variable. This behavior should not necessarily be construed as evidence of an unstable plume but may be the natural variations of a stable plume in the environment.

6) **No water wells, deeper drinking water aquifers, surface water, or other sensitive receptors are likely to be impacted.**

No water wells (e.g., domestic supply, agricultural supply, construction related dewatering wells) located within 1,000 feet of a source or where the source is within the capture zone influenced by the well.

7) **The site presents no significant risk to human health.**

Until the State Water Resources Control Board (SWRCB) policies are modified to give RWQCB staff clear guidance on how to incorporate risk-based corrective action (RBCA) elements into the California corrective action process, RWQCB staff will require ground water clean up to restore beneficial uses and protect future beneficial uses of water resources. For low-risk groundwater cases, RWQCB staff will continue to allow natural attenuation to be considered on a site specific basis, along with other cost effective remedial technologies. In addition, various methods of evaluating contaminant transport may also be acceptable in determining residual levels of contaminants which are protective of human health and the environment.

Other factors to consider in evaluating this criteria include threats to human health (e.g., fire and explosion hazards, exposure to fugitive vapors, see Low Risk Soils Case Definition #5).

8) **The site presents no significant risk to the environment.**

The site specific evaluation must also include consideration of risks to sensitive environmental and ecological receptors as well. If the site has a potential to create fire and explosion hazards, or significantly impact beneficial uses of water resources, wetlands, or other sensitive environmental or ecological receptors, it should not be considered "low risk" (see Low Risk Soils Case, Definition No. 6).

Management Strategy

In general, sites located in "low risk" groundwater areas may cease active remediation (with agency approval) and natural attenuation (passive bioremediation, etc.) should be the preferred remedial alternative unless there is a compelling reason to do otherwise. A partial list of reasons that may justify active remediation are listed below:

- Groundwater within an impacted aquifer is likely to be used before natural attenuation is projected to complete the cleanup.

- Sensitive aquifers and/or sensitive receptors have been identified and are anticipated to be adversely impacted.

- The plume is migrating significantly.

Generally, if any of these conditions or others deemed to be compelling are met, a more aggressive remedial approach may be appropriate. The following criteria further refine the goals and objectives for managing "low risk" sites:

1) **Sites located in a Basin <u>without</u> designated Municipal / Domestic Beneficial Use.**

a.) *Groundwater impacted sites which are located more than 1,000 feet from a marine surface water (e.g., bay, coastal lagoon, or ocean).* These sites can be closed when adequate information is presented to demonstrate that site conditions are protective of human health and the environment and that natural attenuation is effectively controlling and reducing the spread of dissolved fuel contaminants from the site.

b.) *Groundwater impacted sites which are located less than 1,000 feet from a marine surface water (e.g., bay, coastal lagoon, or ocean).* Sites located in these areas may be closed when adequate information is presented to demonstrate that existing site conditions are protective of human health and the environment and the contaminant concentrations in groundwater have been reduced to those levels listed in Table 1.

2) **Sites located in a Basin <u>with</u> designated Municipal / Domestic Beneficial Use.**

a.) Dischargers with sites located within the service area footprint of the CWA and which do not overlie sensitive aquifers (e.g., recharge areas, probable future ground-water use aquifers) may request the lead regulating agency to allow implementation of a natural attenuation remedial strategy. Long-term ground water monitoring will be required to verify the effectiveness of the natural attenuation site mitigation strategy at these sites. The specific wells to be included in the monitoring program and the frequency of sampling will be determined on a site by site basis.

b.) Due to the reliance of inland communities on the use of groundwater resources for municipal/domestic water supplies, sites with fuel contaminated groundwater resources in areas outside the service area footprint of the CWA are **not** classified as "low risk" by the RWQCB. Sites which meet the criteria for "low risk" for inland communities will be evaluated on a case-by-case basis.

c.) Sites in Orange County under the jurisdiction of the San Diego Regional Water Quality Control Board that do not overlie sensitive aquifers are generally considered to be low-risk groundwater cases. However, in addition to the location of contaminated sites with respect to sensitive aquifers, the sites will be rigorously evaluated with regard to the following: current and future water use plans of the water districts, potential for hydrocarbon plumes to contaminate sensitive aquifers (including sites that may contaminate surface waters that may recharge sensitive aquifers), ecological concerns, as well as health and safety concerns. Further evaluation of factors other than groundwater protection may indicate that the site does not qualify as being low risk.

3) **Monitor the site to determine plume stability and the site-specific effectiveness of the natural attenuation remedial strategy.**

Ground water monitoring is necessary to determine if site conditions will remain stable or improve over time. One hydrologic cycle (four quarters) of monitoring data is usually considered to be the minimum necessary to determine site conditions. This assumes depth to groundwater has significant seasonal variation and that no longer term variation occurs. If little seasonal fluctuation is expected, then one year of monitoring may not be required. Conversely, if depth to groundwater is expected to change significantly from year to year due to droughts, adjacent pumping, or other factors, then one year of monitoring may not be adequate.

Data from adjacent or nearby sites may be useful in determining groundwater fluctuations and other regional aquifer characteristics. Frequency of monitoring and the number of monitoring points may be adjusted after site characterization is completed. At many existing sites, these data may already have been collected.

This Interim Guidance document may be modified as additional recommendations become available from the State Board through the overall UST regulation review process (SB1764 Committee) and may be further refined to specifically address portions of Orange and Riverside Counties.

Coordinated &
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Table 1. Interim Cleanup Goals for Ground Water Within 1,000 Feet of a Marine Surface Water (Revised July 23, 1996)

CONSTITUENT	CONCENTRATION	SOURCE
Benzene	400 ppb	U.S. EPA "Quality Criteria for Water 1986", EPA 440/5-86-001 Protection of Human Health through Ingestion of Contaminated Aquatic Organisms and Prop 65 Risk Values
Toluene	5,000 ppb	U.S. EPA "Quality Criteria for Water 1986", EPA 440/5-86-001 Chronic Toxicity to Saltwater Aquatic Life
Ethylbenzene	430 ppb	U.S. EPA "Quality Criteria for Water 1986", EPA 440/5-86-001 Acute Toxicity to Saltwater Aquatic Life
Xylenes	10,000 ppb	U.S.EPA "Health Advisories or Suggested No-Adverse-Response Levels (SNARLS)"
Naphthalene	2,350 ppb	U.S. EPA "Quality Criteria for Water 1986", EPA 440/5-86-001 Acute Toxicity to Saltwater Aquatic Life
PNAs[2]	300 ppb	U.S. EPA "Quality Criteria for Water 1986", EPA 440/5-86-001 Acute Toxicity to Saltwater Aquatic Life

[2]acenaphthylene, anthracene, 1,2-benzanthracene, 3,4-benzofluoranthene, benzo[k]fluoranthene, 1,12-benzoperylene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluorene, indeno[1,2,3-cd]pyrene, phenanthrene, and pyrene.