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Section 4
Site Assessment Process

I. INTRODUCTION

A site assessment is a comprehensive environmental investigation. Site assessments typically include contaminant characterization, sampling of soil and groundwater, investigation of the site's lithologic and hydrogeologic conditions, and identification of man-made subsurface structures and sensitive environmental receptors. Sufficient knowledge of the site's history and existing uses provides an essential framework for conducting a comprehensive environmental investigation. Ultimately, the information gathered during a site assessment is presented in a site conceptual model, which is also known as a site assessment report.

II. SITE ASSESSMENT OBJECTIVES

A site assessment should accomplish the following objectives:

- Characterize the types of contaminants present at the site
- Develop a comprehensive understanding of site geology and hydrogeology
- Delineate the extent and distribution of contamination within the subsurface environment
- Characterize the actual and potential migration paths of the subsurface contamination
- Identify and assess the actual and potential adverse effects to public health and the environment

For sites contaminated by an unauthorized release from an underground storage tank (UST), the site assessment and corrective action process that is defined in the California Code of Regulations (CCR), Title 23, Division 3, Chapter 16, Article 11, must be followed. According to Article 11, a "soil and water investigation" must be completed where there is evidence that surface water or groundwater has been or may be affected by an unauthorized release from a UST system. The soil and water investigation phase includes the following activities:

- Collecting and analyzing data necessary to assess the nature and the horizontal and vertical extent of the release, as well as determining a cost-effective method of cleanup, and

- Using the information obtained during the investigation to propose a Corrective Action Plan (CAP). A CAP consists of activities that are determined to be cost-effective, that will protect human health, safety, and the environment, and that will restore or protect current or potential beneficial uses of water.

The site assessment requirements and guidelines herein apply to investigations at all contaminated sites where the San Diego County Department of Environmental Health (DEH) is providing oversight for site assessment and site cleanup. For UST unauthorized release sites, the requirements of the soil and water investigation phase will be met by following the site assessment requirements and by completing and submitting to DEH a comprehensive Site Assessment Report and a CAP.

In general, DEH recommends that sites contaminated by something other than UST releases should follow the corrective action process outlined in Article 11 referenced above. Figure 4-1 on the next page provides a general overview of the corrective action process.

III. WORKPLANS

DEH requests that a workplan be submitted for review and comment prior to initiation of the site investigation work at any contaminated site where DEH is providing oversight. This practice will streamline the investigation by making sure the Responsible Party (RP), consultant, and regulator understand the information required in that phase of work.

All corrective action in San Diego County should to be completed under an approved workplan. Workplans are required for the following activities:

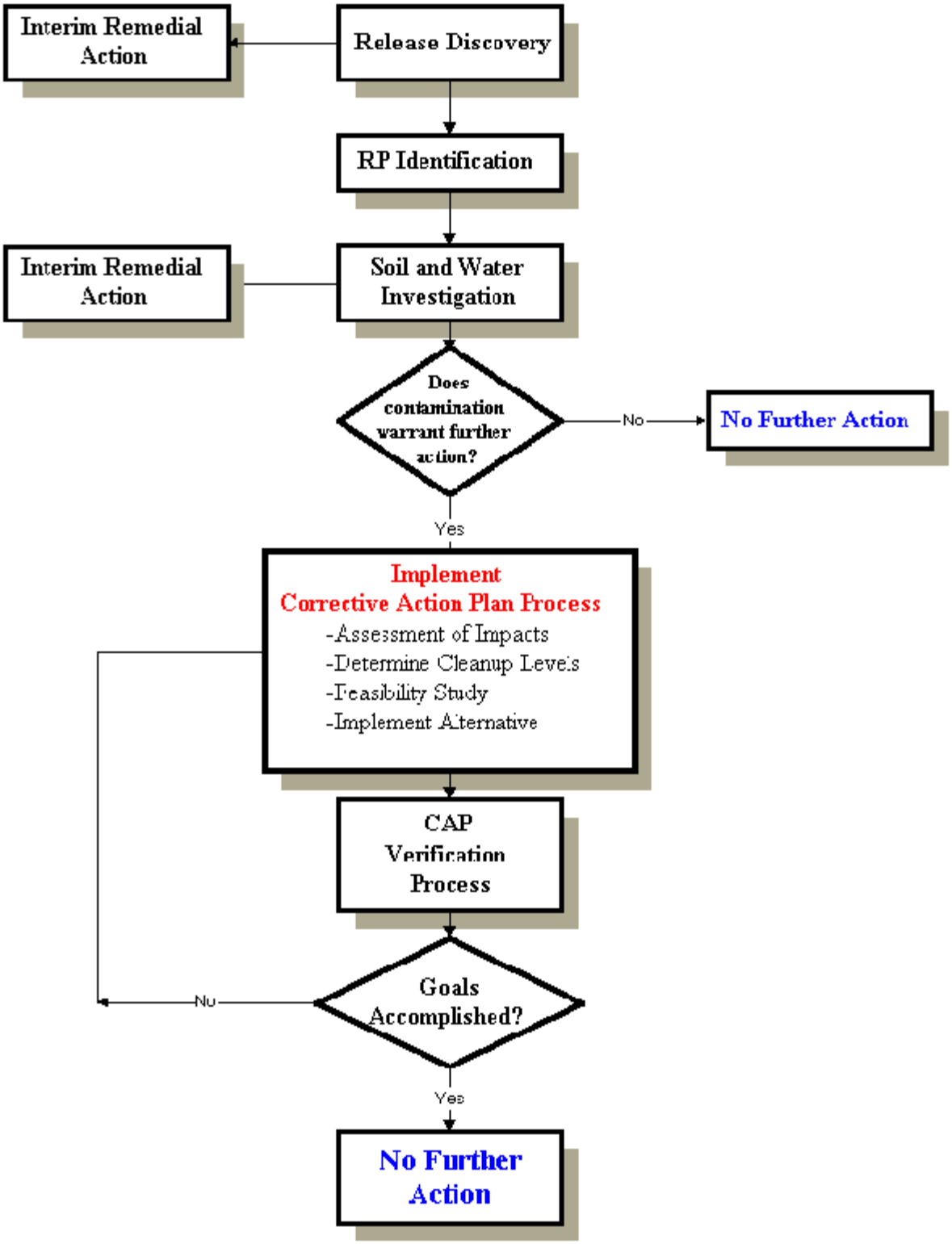
- Post tank removal corrective actions
- Interim remedial actions
- Preliminary site assessments
- Soil and groundwater investigations
- Corrective action plans
- Verification monitoring programs

A workplan must be submitted for review and comment prior to initiation of site investigation or remediation work at any contaminated site. Section 2722 of Article 11, CCR Title 23, requires that a workplan be submitted to the local regulatory agency (DEH) prior to implementing any phase of corrective action associated with regulated UST systems. DEH staff will respond to workplans in writing within 60 days after receipt or the workplan is automatically approved. A workplan that is disapproved must be modified as necessary at the direction of DEH staff.

Where possible, workplans should reference relevant sections of this Manual rather than restating information from the existing guidelines. A workplan should address the items discussed below. A Community Health and Safety Plan may also be a necessary part of the workplan. Refer to Section 4.IV for a discussion of community health and safety issues which may be appropriate. Depending on the type of activity planned, modification of an existing Stormwater Pollution Prevention Plan (SWPPP) or preparation of a new SWPPP may also be required. Information regarding SWPPP requirements is provided in Appendix N. Contact the DEH specialist assigned to the specific case to discuss proposed work that may require a Community Health and Safety Plan.

FIGURE 4-1

CORRECTIVE ACTION PROCESS



A. Purpose and Scope of Proposed Work

1. Narrative

The narrative section includes site identification, DEH case number, and current site conditions. Provide a brief description of the objective(s) of the proposed work and how the proposed work will accomplish the objective(s).

2. Illustrations

Provide clear illustrations to document the location and area of the site, current site conditions, and the proposed work. Include locations of existing features (e.g., utilities, wells, excavations, UST systems, adjacent property uses) location of proposed work (monitoring wells, borings, trenches, and/or excavations), and the horizontal/vertical extent of known contamination as determined from previous site investigation work.

B. Description of Proposed Work

The following information is required in the description of proposed work.

1. This is a description of the work to be performed (soil excavation/trenching, installation of soil borings and/or monitoring wells, etc.). Provide the following specific information as appropriate.

   a. Drilling method, soil sampling interval, and anticipated total depth of soil boring(s)

   b. Anticipated total depth and screened interval of monitoring well(s)

   c. The estimated extent of proposed excavation(s) and/or exploratory trenches, and the estimated volume of soil to be excavated

   (Note: Well permits must be obtained prior to drilling on-site.)

2. Include a description of the sampling strategy and protocol to be followed in the field. Indicate the laboratory analyses (along with federal/state method number) to be performed on the soil and/or groundwater samples collected. For soil samples, also indicate the sample extraction procedure followed by the laboratory. Regulatory acceptance of the analytical results from proposed laboratory methods not included in US EPA SW-846, or sanctioned by the California EPA, must have prior approval of DEH.

3. Include a description of the protocol to be followed for preservation and transport of soil and/or groundwater samples (Section 5.VI). Discuss procedures to be used for decontamination of sampling equipment.

   (Note: Items 4, 5, and 6 below should be used as needed)

4. Include a description of how contaminated soil and/or groundwater will be managed on-site and off-site. If stockpiled containerized soils and/or drums of contaminated liquid are to be

stored on-site, identify the storage locations on a site plot plan and describe how these materials will be marked/labeled and safely managed at the site (Section 5.XI).

5. Provide the name, address, telephone number, and contact name for the site where contaminated soils and/or liquids will be transported for treatment/disposal. Provide a time schedule for removal of waste(s) and contaminated media. Wastes must be properly disposed at off-site treatment/disposal facilities. Documentation (manifests, receipts) must be provided to DEH to demonstrate proper treatment and disposal of any contaminated wastes.

6. Provide a description of the protocol used to sample and characterize contaminated soil stockpiles for disposal (Section 5.XI). Alternative on-site uses of contaminated soils, which will not impact public health or the environment, may also be proposed to DEH staff.

7. Provide a description of the stormwater management practices to be implemented on-site. If a stormwater pollution prevention plan (SWPPP) has been prepared for the site, attach it to the workplan. If a SWPPP has not been prepared complete the Stormwater Management Practices Standard Project Form (Table N-3) included in Appendix N and attach it to the workplan. Ensure that at a minimum the stormwater management practices information provided includes a description of the activities to be addressed (drilling, soil stockpiles, etc.); best management practices (BMPs) to be implemented; and monitoring to be implemented to ensure proper application and maintenance of BMPs. Include the location of BMPs on a site map or other illustrations used in the site workplan as appropriate. Common stormwater symbols for use on site maps are included as Figure N-2 at the end of the Appendix N. See Appendix N for more detailed information.

IV. Schedule of Proposed Work

Provide a detailed schedule for implementation and completion of proposed work.

V. Interim Remedial Actions

Appropriate methods for interim remedial actions are specified in the regulations for corrective action (CCR Title 23, Division 3, Chapter 16, Article 11, Section 2722). The minimum information that must be included for a description of any proposed interim remedial action(s) is listed in Section 7.V.

IV. COMMUNITY HEALTH AND SAFETY PLAN

DEH has the responsibility to promote a safe and healthy environment for the public in areas where soils and other materials contaminated with hazardous substances are excavated, removed, or handled. It is the legal responsibility of property owners, RPs, contractors, and consultants to conduct all on-site activities so as not to create public health and safety hazards or nuisances. Every precaution must be taken to prevent impacts to the surrounding community. RPs (and their consultants and contractors) are expected to comply with applicable fire, health and safety, building, and construction laws and regulations.

To promote public health and safety, corrective actions must be performed in accordance with a site-specific Community Health and Safety Plan (Plan) that has been approved by DEH. A Plan must be submitted as part of any workplan.

The primary objective of the Plan is to promote a safe and healthy environment for the public by:

- Minimizing community exposures to hazards from site activities and/or releases which may migrate off-site, and

- Assuring community awareness.

The Plan should be developed in close coordination with the RPs. All persons conducting on-site activities should be familiar with the content and responsibilities described in the Plan. The community (or public) refers to anyone who is not an RP for the release and/or is not conducting specific activities relative to the site investigation or remediation.

DEH is committed to reviewing and commenting on Plans in a timely manner. Other agencies, such as local fire departments, may also require review and approval of a Plan prior to starting any site activities.

Please be advised that DEH has no authority to regulate worker health and safety. While there are similarities between a "worker health and safety plan" and a Community Health and Safety Plan, one should not be substituted for the other, and both should be kept separate. Do not submit "worker health and safety plans" to DEH. They are not required by DEH and will not be reviewed by DEH.

A Plan should adequately address the following topics. If any of the following informational requirements are not relevant to the work being proposed, please state that fact clearly in the Plan. While this section discusses a Plan as though it were a stand-alone document, it may actually be incorporated into a workplan, depending on the scope of work performed.

A. Site Identification and Location

Provide the DEH case number, site name, address, and assessor's parcel number (APN).

B. Plot Plan

Provide a detailed plot plan that identifies all on-site and surrounding structures, topography, prevailing wind directions, all surrounding land uses, nearby populations, and environments and/or receptors of special concern.

C. Evaluation of Potential Public Exposure to Hazards

Provide a description of the potential public health hazards and exposure pathways resulting from site activities, including vapors, dust, noise, fires, explosions, and physical hazards. Consider both immediate and long-term hazards.

D. Monitoring Equipment

Provide a description of site monitoring equipment and protocol to be used. Choose equipment that is capable of detecting the hazard of concern within an acceptable margin of error. In general, DEH suggests that fugitive organic chemical vapors be monitored with an Organic Vapor Analyzer (OVA) or equivalent along the entire site perimeter at 15-minute intervals. At most

UST sites involving petroleum, a reading of 25 parts per million (ppm) or greater on an OVA or equivalent device at the down-wind perimeter of the site is the recommended level for taking corrective measures. The OVA, or equivalent device, must be calibrated in accordance with manufacturer specifications. Monitoring records must be maintained and made available for on-site review at the request of DEH or other local agencies.

E. Control Methods

Provide a discussion of the administrative and/or engineering controls that will be implemented to prevent or minimize public exposure to hazards. Control methods are necessary to prohibit public access, prevent fugitive dust and vapors, and reduce noise.

1. Site Security

Describe the method(s) that will be used to exclude the public from, or limit public access to, the work area and the site in general.

2. Vapors

Describe the method(s) that will be used to minimize public exposure to potential vapor emissions resulting from the proposed activities. Engineering and construction practices can typically reduce such emissions. Acceptable control methods include pumping out non-aqueous phase liquids (NAPL), covering off-gassing excavations or stockpiles, backfilling off-gassing excavations, using off-gassing stockpiles as backfill, misting excavations or stockpiles with water, covering excavations or stockpiles with foam or other vapor suppressing agents, locating stockpiles away from and/or downwind of public receptors, and stopping work.

3. Dust

Describe the method(s) that will be used to minimize potential public exposure to dust generated as a result of the proposed activities. Control methods include covering sources, misting sources with water, reducing the pace of site activities, and halting activities altogether.

4. Noise

List the hours during which site activities will be performed or during which equipment will be operating. Every effort should be made to minimize noise. Noise standards are generally enforced from 7 p.m. to 7 a.m. weekdays, depending on the city and zoning. Noise standards may be even stricter during the weekend.

5. Open Excavations

Discuss the management of any excavations that may result from the proposed activities. Open excavations present a clear risk to the community. It is important to have adequate site security. Even with the best site security, DEH recommends that excavations be backfilled at the end of the workday. If not immediately backfilled, open excavations should be completely and securely fenced off to prevent public access. If the excavation is filled with

waste liquid (petroleum or a combination of petroleum and water), the liquid must be pumped out before the excavation is backfilled.

6. Stockpiled Soil

Discuss the soil management procedures. Discuss the proposed disposition of the soil and the time frame during which final disposition will occur. Stockpiled soil should be handled and stored in accordance with Section 7.VI. Stockpiled soil should be contained within berms and covered to prevent runoff and vapor and dust exposures. Stockpiled soil should be stored in a secured area of the site to prevent public access.

7. BMPs

Describe what controls will be implemented at the site to prevent or minimize the transport of pollutants to receiving waters. Also describe how the controls will be maintained during active or inactive phases of the proposed work.

F. Site Safety Manager

Provide the name and telephone number of a site safety manager who will be available 24 hours a day and who will have the knowledge and authority necessary to shut down all on-site activities in the event of an emergency. In the event of a sudden release of a substance, the site safety manager must initiate the immediate cessation of all site activity contributing to the release. The site safety manager is also responsible for notifying the appropriate emergency response agencies as well as DEH.

G. Emergency Planning

Provide a description of the methods and equipment that will be used to address possible community emergency situations. The ponding of a flammable or combustible substance, and the build-up of explosive concentrations of vapors, are two examples of community emergency situations that must be addressed.

H. Public Notification

Provide a description of the Public Notification Program. The program should include the preparation and distribution of notices to residences and businesses adjacent to, or in the vicinity of, potential impacts from the site or area where work is being performed. Notices must also be posted around the perimeter of the site. At a minimum, the notification should contain the following information:

1. List the name and 24-hour telephone number of the site safety manager. Also list the name(s) and 24-hour phone number(s) of the person(s) to contact regarding problems (i.e., odors, dust, and noise). The consultant or RP is typically listed as the primary contact.

2. Provide a brief description of the proposed activities.

3. Provide the dates and times that the work will be conducted and an estimate of when the work will be completed.

4. Include any requisite Proposition 65 warnings. Proposition 65 (Section 25249.6 of the Health and Safety Code) requires that a warning be given to any individual who is exposed to a chemical known to cause cancer. Check the current Proposition 65 list for chemicals requiring such warnings.

V. SITE INVESTIGATIONS

The primary goal in a site investigation is to characterize a site or release to assess the extent, concentration, and mass of contamination; to assess the human health and environmental risk resulting from the contamination; and to provide recommendations for any further investigation or remedial actions.

It is important to identify likely receptors that may be impacted by the release. These receptors should be considered early on in the investigation planning process. The probable scenarios would include the migration of light non-aqueous phase liquid (LNAPL), dense non-aqueous phase liquid (DNAPL), and/or dissolved phase contamination into various receptors, such as the capture zone of a commercial or domestic water supply well, or an environmental receptor such as a creek or the ocean. The potential for vapor phase migration from soil or groundwater into an overlying structure should also be assessed.

Workplans should include provisions to collect information that will be required to properly implement a remedial plan, to perform a risk-based closure, or to recommend no further action. Site assessments should consider the most probable remedial options and provide for the collection of sufficient geotechnical and other samples/analyses to provide information to implement the desired remedial option and/or risk-based decision option.

For some sites, the appropriate remedial action may consist of natural attenuation if sensitive receptors are not threatened, if remediation options are excessively expensive, and if there is a high probability of reaching target cleanup levels in a reasonable time. The monitoring-only option, if applicable, must be supported with sufficient site characterization to:

- Assess the site stratigraphy and hydrogeologic setting,
- Assess receptors and pathways, and
- Conduct fate and transport modeling.

Site assessment efforts to define the extent of immiscible liquid contamination (LNAPL and/or DNAPL) may or may not be required, depending on the nature of the release, site conditions, receptors, and pathways. If it is impracticable to remediate the entire site, selected contaminant removal actions in LNAPL- and/or DNAPL-contaminated areas may be the preferred approach. In any event, the goal of site activities is to implement a comprehensive plan that will allow for an appropriate assessment of the extent of contamination and the identification and mitigation of future risk to the public and the environment.

When modeling programs are used, sensitive model output parameters should be identified before the data are collected. A few analyses that can be useful are grain-size distribution, porosity, degree of saturation, bulk density, total organic carbon, and permeability. Analyzing soil and groundwater samples for physical properties can reduce the need for additional site investigation.

Site characterization is an ongoing, iterative process. The investigation approach is dependent on the type of contamination being investigated. Since a chemical's behavior in the environment can vary significantly, we have provided a summary on the investigative approach for fuel, chlorinated solvents, metals, pesticides, and burn ash-contaminated sites.

A. Fuel-Contaminated Sites

Petroleum hydrocarbons are the most commonly used group of chemicals in society today. Petroleum hydrocarbons encompass a wide range of compounds including, but not limited to, fuels, oils, paints and non-chlorinated solvents. These compounds are used in all facets of modern life.

The investigation of sites that are suspected to be or that have been impacted by petroleum hydrocarbons should focus on what are considered to be the source areas at the site. The investigation needs to address both soil and groundwater contamination.

Due to the physical properties of petroleum hydrocarbons, contamination is commonly limited to shallow groundwater aquifers and generally has limited vertical impacts. Since petroleum hydrocarbons have a specific gravity that is less than that of water, they tend to float as an immiscible liquid (LNAPL) on the water table and/or on the capillary fringe of an unconfined aquifer. The vertical migration of dissolved contamination is uncommon except on sites located in groundwater recharge areas or where production wells are located.

Traditionally, an inside-out strategy has been used for the investigation of most fuel-contaminated sites. Drilling is typically done in source areas first, and then the lateral extent of contamination is determined. This type of strategy should not be used when dealing with chlorinated hydrocarbon releases.

B. Chlorinated Hydrocarbon Contaminated Sites

The most prevalent groundwater contamination problems with waste disposal sites in the United States are caused by a specific subset of halogenated hydrocarbons, known as chlorinated hydrocarbon compounds (CHCs). CHCs are uncharged, non-polar compounds that are good solvents for similar substances such as oils, greases, and paints. CHCs are commonly used in many commercial businesses, such as factories, storage operations, transport operations, electronics manufacturers, metal products manufacturing, and dry cleaners.

CHC releases to the environment behave differently than petroleum hydrocarbon releases due to their different physical properties. Because of this, an investigation of a site that is potentially impacted by CHCs is generally more complex than a typical petroleum hydrocarbon release site, and requires careful design. A thorough knowledge of the historical use of CHCs on and around the site is critical for a sound site investigation. The investigation should focus on those areas where materials were used, treated, stored and/or disposed. However, the determination of a contaminant source can be difficult, as the age and location of releases may not be well defined or documented.

1. Behavior in the Environment

Given the physical properties of CHCs, the conventional approaches to investigate petroleum hydrocarbon sites are not appropriate. Since CHCs have specific gravity values greater than water, they tend to sink through the groundwater column as a dense non-aqueous phase liquid (DNAPLs) and may vertically impact more than one aquifer. In addition to the individual chemical's physical characteristics, the physical properties and continuity of subsurface soil and geologic materials also govern subsurface migration. Recognizing the higher potential for migration, particularly vertical migration, the development of a comprehensive understanding of site stratigraphy and hydrogeology is essential.

Continuous coring and careful geologic logging are important aspects of identifying the locations of lithologic changes and determining their continuity. Due to the mobility of CHCs, the coring activities should include soils and geologic materials above and below the water table. Grain-size analyses should also be performed on representative samples to confirm field identification of lithologic units. Where layers of low permeability are encountered, it is important to identify their horizontal extent and continuity as well as their direction of dip, when possible. Because CHC migration can be driven more by gravity than by groundwater flow, dipping low permeability lithologies can cause DNAPL to migrate in unexpected directions. In this way, dipping discontinuities can create migration pathways that do not follow the groundwater flow patterns.

Investigations in fractured igneous or metamorphic rock terrain, which is common in San Diego County, are even more complex. Fractured subsurface materials provide conduits for direct and rapid groundwater and contaminant movement. Fractured rock aquifers are among the most difficult to characterize. As a result, they require more intensive investigations. Consequently, the focus of any investigation should be to obtain sufficient site information to make informed decisions on any risk assessment or remedial strategy that might be applied to the site.

2. Investigative Precautions

When the source area is being investigated, appropriate precautions should be taken to prevent the investigation process from causing a vertical mobilization of DNAPL contamination. Non-intrusive methods should be used first to develop and improve the site conceptual model and the probability of the presence of DNAPL. For investigating groundwater impacts at CHC-impacted sites, the best approach is the “outside-in” strategy. This strategy consists of drilling outside of source areas first to evaluate the site's geology and its stratigraphic relationships.

The drilling of exploratory borings or installation of monitoring wells in the DNAPL-impacted zones can exacerbate the migration of DNAPL in the environment. The drilling method used and the construction of the wells can increase the potential for downward migration of DNAPL or dissolved CHCs. Appropriate drilling techniques and well construction must be used to prevent this from occurring. Improper destruction of wells or borings may also provide vertical conduits. Without adequate precautions, the site characterization activities that include drilling, well construction, groundwater sampling, aquifer testing, and packer testing may cause DNAPL migration, thus increasing remediation costs (Mercer and Cohen, 1993).

Actual observation of DNAPL in monitoring wells has been relatively rare. Monitoring wells must be specifically located and designed to retain DNAPL that flows into the well. The determination of the presence of DNAPL should be based on core analyses, groundwater

concentrations, and observation of DNAPL in monitoring wells. Since DNAPL can desiccate clay minerals, the exclusive use of clay seals is not recommended. Additionally, the use of plastic (polyvinyl chloride or PVC) well casing is not recommended, as PVC breaks down in the presence of DNAPL.

The workplan for investigation of areas where DNAPL is suspected should specify the drilling techniques and grouting methods that will be used to prevent downward migration of DNAPL. Drilling in DNAPL-impacted areas should be discontinued when DNAPL is first encountered or when a low permeability unit is encountered. If deeper drilling is required, cased wells should be installed to prevent downward migration of DNAPL. Specially designed monitoring wells should be installed to facilitate accumulation and collection of DNAPL (Niemeyer et al., 1993).

3. Site Investigation

A number of aspects of conducting an investigation of a CHC release differ markedly from those of a petroleum hydrocarbon investigation. Many of these differences stem from the behavior of CHCs in the subsurface. The migration patterns of CHCs vary significantly in the saturated zone. CHC releases tend to have poorly defined sources and result in less predictable soil contamination plumes.

The investigation of sites in San Diego County generally has shown low concentrations of CHCs in soil, and erratic distribution of contamination. This has been primarily because sampling has been done in areas away from the source and CHCs tend to move in narrowly defined paths through porous soil. Due to the difficulty in obtaining reliable soil samples, it is unclear how much sampling is adequate to accurately characterize soil impacts. Due to the variability of soil data, most of the time it is best to define the soil impacts qualitatively as "present" or "absent."

At sites that were initially investigated because of a petroleum hydrocarbon release, soil sampling for CHCs is not recommended. Efforts should instead focus on the investigation of groundwater by using both the existing wells installed for the petroleum hydrocarbon investigation and wells tailored for a CHC assessment. Once the groundwater impact is characterized sufficiently to allow for speculation about the source of the impact at the site, attempts to backtrack soil contamination to a source may be useful.

For the sites where a known or suspected source exists, limited soil sampling should be performed to verify if any significant residual soil contamination exists in the vadose zone below the known or suspected source. Sampling would not necessarily follow the same frequency or distribution as in a petroleum hydrocarbon investigation, because of the smaller signature CHCs tend to leave behind in soil. Additionally, in the absence of a groundwater impact, extensive vertical sampling may not be required.

If groundwater contamination is suspected, a "qualitative" assessment of groundwater conditions (use of depth-discrete sampling devices [e.g., Hydropunch™-type devices]) should precede a more comprehensive approach. This approach is best used at sites where there are no previously confirmed CHC impacts to groundwater. During installation of the wells and/or exploratory borings, continuous cores should be obtained to assist in defining site lithology and aid in the final well construction design.

Assuming that contamination in the vadose zone will eventually reach groundwater, it may be necessary to install one or more monitoring well(s). If the groundwater has not been impacted, it may be necessary to continue monitoring for an extended period of time to ensure that CHCs do not reach the groundwater. Fate and transport studies may help define how long such monitoring is necessary. Caution should be exercised in using transport models for the vadose zone, since they have been unreliable.

If the groundwater is contaminated with CHCs, this does not necessarily indicate that the CHCs originated from the suspect site. Groundwater is often found impacted with CHCs at low concentrations in urbanized areas. Groundwater samples may have to be obtained up-gradient of the site to determine if the contamination originates on- or off-site. A thorough site history, as in Phase I reports, can help to locate potential CHC release areas. A detailed history should be obtained at the start of a CHC site investigation. Secondary inputs to groundwater, such as from sewer line leaks, must also be considered.

Technology to effectively clean up most CHC releases to current regulatory levels, such as the maximum contaminant levels (MCLs), is limited. Consequently, investigation of the extent of the release showing where CHCs are present and where possible future receptors are located may be necessary to predict where/when point source treatment might be required. A detailed assessment, beyond simply finding and monitoring the boundaries of the plume, provides the ability to manage and perhaps contain the spread of contamination, even if the site cannot be remediated to a final solution (e.g., MCLs).

C. Metal Contaminated Sites

The investigation of a suspected metal contamination site needs to be designed to identify and address all areas where these materials were stored, handled, and/or processed. Attention should be given to historic uses and processes on the site. The investigation should include the full spectrum of materials used so that potential impacts are understood.

The most complicated issue relative to investigation of metal contamination is the analysis of metals for the Total Threshold Limit Concentration (TTLC) or the Soluble Threshold Limit Concentration (STLC). These are described in CCR, Title 22, Article 2. In general, an STLC analysis should be completed when the TTLC result is 10% greater than the STLC action level.

D. Pesticide Contaminated Sites

The investigation of suspected pesticide contamination should be designed to identify and address all areas where the materials were stored, handled, and mixed. In addition, the historic methods of application used on the fields and the type of crops that were grown should be identified. The investigation must include the full spectrum of chemicals used so the potential impacts are well understood.

Investigation of pesticide impacts on properties has become common due to the change of agricultural lands to residential use. The investigation and any remedial actions related to pesticide contamination should focus on elimination of human or environmental exposure.

The most complicated issue relative to pesticide-contaminated sites is the definition of a hazardous waste. Even though the concentrations in soil may exceed the Title 22 levels for a hazardous waste, legally applied pesticides, and the resulting in situ residues in soil, are not

regulated as hazardous waste unless transported off the subject property (Calif. H&S Code Section 25117).

It is often necessary to conduct both a site assessment and a risk assessment to adequately evaluate the risk to human health from pesticide impacts.

E. Burn Ash Contaminated Sites

Numerous burn sites exist in San Diego County. These sites are from the time when open burning was the primary method used to dispose of solid waste. This method was used mostly from 1940 to the late 1960s. Unfortunately, the records on these sites and their existence are poor at best.

Burn ash residues exist at many of these sites and at sites where ash was ultimately moved and disposed. Without appropriate care, burn ash and burn ash-contaminated soil have a potential for causing public health and environmental impacts. The primary pathways for public health and environmental impacts include dust migration, surface erosion, and groundwater and surface water contamination.

Ash from the open burning of municipal solid waste is the most common, but not the only, source of burn ash. Historically, most solid waste was burned at municipal burn dumps; however, open burning and low temperature incineration did occur with specific commercial waste streams, which were often disposed at the business location. Ash from these sites could have very different characteristics from ash from municipal solid waste. It was common for the burn ash to be commingled with other solid wastes, including incompletely burned refuse.

Environmental issues and concerns about the management of burn ash sites are numerous. Certain chemical constituents become absorbed and/or chemically bonded to ash particles and, if disturbed, have the potential for dust migration. These chemical contaminants commonly include metals and various organic contaminants including polychlorinated dibenzodioxins and polychlorinated dibenzofurans. The organic compounds are typically low in concentration, but metals can exceed California criteria for hazardous waste. Additionally, where solid waste is commingled with burn ash, biological decomposition may result in the generation of flammable and toxic gases, as well as liquid leachate containing organic and inorganic contaminants.

Burn ash sites and other solid waste issues are regulated by DEH's Local Enforcement Agency (LEA), the Regional Water Quality Control Board (RWQCB), and the California Integrated Waste Management Board (CIWMB). Please refer to Appendix E.III for the most recent guidance developed by the CIWMB. Contact the LEA (619-338-2222) for further information.

VI. SITE ASSESSMENT REPORT CHECKLIST

Site assessment results must be documented in a comprehensive site conceptual model, also known as a site assessment report. This report is not simply a written description of the field and analytical work performed at the site; it must provide complete documentation of the environmental investigation work and a comprehensive evaluation of the findings relevant to the aforementioned site assessment objectives. In addition to a narrative form, the investigation findings should also be presented in maps and cross sections that show the geologic and hydrogeologic conditions and the distribution of contaminants (examples are provided in Appendix F.I). All reports should summarize

and interpret the findings as conclusions, and also provide recommendations as to what steps should be taken for future assessment and/or mitigation of the contamination at the site.

> Note: All reports that include geologic, hydrogeologic, contaminant flow, or contaminant migration interpretation must be prepared by, or under the direct supervision of, a California Professional Geologist, Certified Hydrogeologist, Certified Engineering Geologist, or Registered Civil Engineer. This professional must take full responsibility for the content of the report by signing and/or stamping it with his/her professional seal. Registered Environmental Assessors are not qualified to prepare site assessment reports, because proper interpretation of geological and/or hydrological data is required.

Each of the topics outlined below must be addressed in a site assessment report. If a topic is not applicable, provide an explanation. The report does not have to follow the order of the checklist. Reports must be "stand-alone" documents written in a narrative form; do not use the checklist as a "fill-in-the-blanks" form.

A. Site Identification

1. Site address (street name and number, city, state, zip code)
2. Name of business at site
3. Assessor's parcel number (APN)
4. DEH Case Number (e.g., H21042-001)
5. Responsible parties (property owner UST owner, and UST operator) (name and mailing address)
6. Contact persons for responsible parties and consultant (name, mailing address and phone number)
7. Location maps

B. Site History/Development/Usage

1. Historical site use (including potential sources of contamination and dates)
2. Current site use (including potential sources of contamination and dates)
3. Future site use and development plans (type of use, new construction, below-grade structures, proposed excavation work, elevator shafts, vaults, utility trenches)
4. Adjacent site uses
5. Description of release
    a. Substance(s) released
    b. Contaminant characterization
    c. Quantity of substance(s) released (estimate)
    d. How and when release occurred
    e. Location of release on site

C. Site Plot Plan

1. Drawn to scale (indicate scale used)
2. North direction arrow
3. Streets, structures, and utilities
4. Excavation and stockpile locations
5. UST and piping locations (past, existing, proposed)

6. Well, boring, and sample locations
7. Legend for symbols and abbreviations

D. Geology

1. Local geology description
2. Site geology description
3. Topography

E. Hydrology

1. Surface drainage and surface-water bodies in vicinity
2. RWQCB basin plan hydrographic unit and subunit identification

F. Hydrogeology

1. Groundwater elevation measurements and depth to groundwater
2. Groundwater gradient and direction of groundwater flow
3. Description of all groundwater aquifers
4. Known or probable contaminant migration patterns (consider hydrogeology, groundwater gradient, utility trenches location and depth, etc.)
5. Source of information

G. Delineation of Contamination

1. Summary table(s) of analytical data with sample identification, depth, location, analysis method(s), and results
2. Map(s) showing horizontal extent of soil contamination, probable contamination sources, contaminant migration pathways, well and boring locations, sample locations, and sample results
3. Cross sections showing vertical and horizontal extent of soil contamination, contamination source(s), lithology, water table, sample locations, sample results, and underground structures
4. Map(s) showing horizontal extent of groundwater contamination, well locations, sample results, product thickness in wells, groundwater elevation in wells, groundwater elevation contours, and groundwater flow directions
5. Environmental parameters or man-made features which may affect the spread of contamination
6. Estimated volume of contaminated soil and/or water
5. Estimated mass of contaminant in soil and/or water

H. Exposure Concerns

1. Contaminant migration pathways description
2. Man-made pathways (conduits, utilities, vaults, piping, storm drains, etc.)
3. Natural pathways (air, soil, surface water, bedrock fractures, groundwater, etc.)
4. Impact on biological receptors (people, plants, animals)
5. Potential nuisance complaints (odors, eyesore)
6. Risk assessment concepts and calculations

7. Identify all production and potable water supply wells within 2250 feet of the site by means of area site reconnaissance, California Department of Water Resources (DWR) records, Land and Water Quality Division permit review, GeoTracker website and other pertinent sources.

I. Sampling

1. Protocol description (basis for sampling)
2. Methods
3. Preservation and transport
4. Analyses performed
5. Chain-of-custody forms
6. Sample matrix description (clay, sand, water)
7. Laboratory analytical reports
6. Quality assurance/quality control data
7. Interpretation of analytical results with respect to previous and current understanding of site

J. Stockpiled Soil Management

1. Volume
2. Location
3. Methods used to prevent aeration, run-off, and public access
4. Disposal methods
5. Copies of manifests

K. Site Safety

1. Site safety/security description
2. Community health and safety issues addressed
3. Monitoring equipment
4. Protective equipment
5. Public agency notifications
6. Utility notifications

L. Stormwater Pollution Prevention Plan (SWPPP)

Describe what controls will be implemented at the site to prevent or minimize the transport of pollutants to receiving waters. Also describe how the controls will be maintained during active or inactive phases of the proposed work.

M. Summary/Conclusions/Recommendations

1. Horizontal and vertical extent of soil and groundwater contamination defined
2. Recommendations for additional assessment
3. Recommendations for mitigation alternatives

N. Signature/Registration

1. Signature(s) of report preparer(s)

2. Signature(s) and registration number(s) of the registered professional(s) who supervised and is responsible for designated portions of the report
3. Authorized signature for the company preparing the report (original signatures required; no draft or unsigned reports)

O. Appendices

1. Well/boring logs
2. Hazardous waste manifests and disposal receipts
3. Permits (Air Pollution Control District, fire department, wells, etc.)
4. Laboratory data sheets
5. Chain-of-custody forms
6. Backup supporting documentation, including calculations, notes, photographs, etc., as appropriate