2.3.3 *Regional Hydrogeology*

Basal groundwater is formed by rainwater percolating down through the residual soils and permeable volcanic rock. All of the island situated below sea level, except within rift zones of the volcanoes, is saturated with ocean salt water and thus forms a basal lens called the "Ghyben-Herzberg" lens. A zone of transition between the fresh groundwater and the ocean salt water occurs due to the constant movement of the interface as a result of tidal fluctuations, seasonal fluctuations in recharge and discharge and aquifer development (Macdonald, et al., 1983).

Downward percolation of rainwater may be stopped by impermeable layers such as dense lava flows, alluvial clay layers and volcanic ash. The groundwater then forms a perched or high level aquifer, which is not in contact with salt water. Recharge of the aquifer occurs in areas of high rainfall, which are the interior mountainous areas. The groundwater flows from the recharge areas to the areas of discharge along the shoreline. Frictional resistance to groundwater flow causes it to pile up within the island until it attains sufficient hydraulic head to overcome friction. Thus, basal groundwater tends to slope toward the shoreline.

2.3.4 *Site Hydrogeology*

The site is underlain by the Leeward Aquifer System, which is part of the Central Aquifer Sector on the island of Lanai. The aquifer is classified by Mink and Lau, 1993, with the system identification number 50102212 (11111). This system includes an unconfined high level aquifer in dike compartments. The groundwater in this aquifer is described as being a currently in use and containing groundwater with a fresh salinity (<250 mg/l Cl^-). The groundwater is an irreplaceable drinking water source with a high level of vulnerability to contamination (Mink and Lau, 1993). The direction of groundwater flow is assumed to follow the topographic gradient, southwest towards the Pacific Ocean.

2.4 Contaminant Background

ETC reviewed the July 13, 1993 "Further Phase II Site Characterization Report, Dole Packaged Foods Company Emulsion Plant Facility, 750 Fraser Avenue" prepared by Brewer Environmental Services (BES). According to the BES report, Unitek Environmental Consultants (UEC) removed two 10,000-gallon USTs from the facility in 1989. The USTs were used to store diesel fuel from 1947 through 1978 or 1979 and Telone II (1,3-dichloropropene) from 1978 or 1979 through the mid-1980s. During removal, UEC observed numerous holes along the base of both USTs. Soil samples collected from beneath the USTs contained total petroleum hydrocarbons as gasoline (TPH-G), total petroleum hydrocarbons as diesel (TPH-D), benzene, and ethylbenzene concentrations that exceeded Hawaii Department of Health (DOH) Cleanup Goals at the time. In addition, 1,2-dichloropropane and 1,3-dichloropropene were detected. These results suggested that a release occurred from the USTs and therefore UEC recommended that additional site characterization be performed.

UEC advanced two borings near the south end of the former USTs to depths of approximately 46.5 feet bgs. Eight soil samples were collected from each boring. Laboratory analysis of the soil samples indicated that TPH-D, benzene, toluene, and ethylbenzene concentrations exceeded DOH Cleanup Goals at the time. In addition, 1,2-dichloropropane was detected at concentrations ranging from 0.0222 mg/kg to 1.6 mg/kg and 1,3-dichloropropene concentrations were below method detection limits. Various organochlorine pesticides and HVOCs were also detected, suggesting either the chemicals were there through application or due to a release. UEC subsequently recommended further investigation.

Between December 1991 and March 1992, BES advanced nine borings surrounding the former USTs, up to depths of 140 feet bgs. Soil encountered from 0 to 55 feet bgs was classified as silty clay and unweathered, unfractured basalt rock was encountered from 55 to 60 feet bgs and deeper. Soil samples collected from these borings had detectable concentrations of TPH-D, benzene, toluene, ethylbenzene, HVOCs, and organochlorine pesticides. At the time, there was no DOH recommended cleanup criteria for TPH-D; and benzene, toluene, and ethylbenzene concentrations were below their respective DOH recommended cleanup criteria. Concentrations of 1,3-dichloropropene were below method detection limits in all samples and 1,2-dichloropropane concentrations, detected in four borings (B9-B12), ranged from 0.005 mg/kg to 0.18 mg/kg.

Based on site characterization activities performed by both UEC and BES, BES recommended that:

- An exposure prevention management and monitoring program be prepared to address residual petroleum and 1,3-dichloropropene impacted soil associated with the UST systems, and

- No further action be required for constituents unrelated to the former contents of the USTs (pesticides and HVOCs), since a reportable quantity release of these constituents had not occurred.

Subsequently, the DOH SHWB sent a letter dated September 17, 2001 to Dole Food Company Hawaii. The letter stated that the DOH SHWB reviewed BES' *Further Site Characterization Report, Dole Packaged Foods Company Emulsion Plant Facility, 750 Fraser Avenue, Lanai City, Lanai, Hawaii* dated July 13, 1994. The DOH indicated that, since petroleum contaminated soil still exists at the property, the DOH could not issue a letter requiring no further action and that additional work should be performed.

ETC's review of the BES report indicated that there are two separate issues: 1) constituents related to contents of the former USTs and 2) constituents detected by BES that are not related to the former USTs.

Based on ETC's review of the BES report, petroleum (specifically diesel) and Telone II were the two contaminants of concern related to the UST release. TPH-D concentrations (5,100 mg/kg) at a depth of 41.5 feet bgs in one boring (B9) exceeds it's current DOH Tier 1 Action Level for soil in areas where a drinking water source is threatened of 5,000 mg/kg. However, Telone II (1,3-dichloropropene) concentrations in all soil samples were below method detection limits and 1,2-dichloropropane concentrations, detected in four borings (B9-B12) ranging from 0.005 mg/kg to 0.18 mg/kg, were below the applicable EPA Region 9 Preliminary Remediation Goal (PRG) for industrial soil.

Organochlorine pesticides and HVOCs other than 1,3-dichloropropene and 1,2-dichloropropane are contaminants of concern at the site that are not related to the former UST release. Specifically, heptachlor concentrations (1.8 mg/kg) at a depth of 41.5 feet bgs in B9 exceeded the applicable EPA Region 9 PRG for industrial soil, 4,4-DDT concentrations (ranging from 0.9 mg/kg to 6.1 mg/kg) at depths of 26.5 feet bgs to 56.5 feet bgs in B9 exceeded its DOH Tier 1 Action Level (but were below its EPA Region 9 PRG for industrial soil), and toxaphene concentrations (2.4 mg/kg) at a depth of 66.5 feet bgs in B10 exceeded its EPA Region 9 PRG for industrial soil.

ETC was therefore contracted by CCR to conduct soil sampling activities at the property to assess current UST related constituent concentrations within the former UST excavation.

In December 2002, ETC observed the excavation of six test pits to depths of 12 to 15 feet bgs in the vicinity of the former USTs. Soil samples were collected from the test pits to determine TPH-D, BTEX, and PAH concentrations, as well as 1,3-dichloropropene and 1,2-dichloropropane concentrations. The constituents were selected based on previous contents of the USTs. Analytical results indicated that constituent concentrations were below applicable DOH Tier 1 Action Levels for soil in areas where a groundwater source is threatened and where rainfall amounts to less than 200 centimeters per year. However, 1,2-dichloropropane concentrations of 230 mg/kg at a depth of 15 feet bgs exceeded its EPA Region 9 PRG for industrial soils.

Since CCR does not anticipate any change in property usage, ETC recommended implementing an exposure prevention management program to address the presence of constituents related to the UST release, as well as other constituents identified during site characterization activities, that are present in the subsurface soil.

In an April 1, 2004 letter to CCR, the DOH SHWB requested that pertinent supporting documents be submitted if preparation of an Exposure Prevention Management Plan (EPMP) is the selected method for addressing subsurface contamination.

2.5 Contaminants of Concern

Based on findings from previous environmental investigations, this EPMP has been prepared to address the presence of TPH-D, 1,2-dichloropropane, 4,4-DDT, heptachlor, and toxaphene in the subsurface soil.

3.0 EXPOSURE MONITORING AND REPORTING PLAN

3.1 Site Assessment

Based on the data collected during previous activities performed at the site, TPH-D and 4,4-DDT concentrations exceeding DOH Tier 1 Action Levels exists in the subsurface soil. Furthermore, 1,2-dichloropropane (which may be associated with the Telone II contents stored in the USTs), heptachlor, and toxaphene also exist in the subsurface soil at concentrations exceeding EPA Region 9 PRGs for industrial soil.

Total petroleum hydrocarbons, or TPH, is an overall term used to describe a large family of chemical compounds that originate from crude oil and consists mainly of hydrogen and carbon. TPH-D is considered an indicator compound used to grossly quantify semi-volatile and non-volatile petroleum constituents.

Dichlorodiphenyltrichloroethane (DDT) is a pesticide that was once used extensively as an agricultural pesticide and was banned from use in the U.S. in 1972. DDT generally exists as a solid, white powder that strongly attaches to soil and is relatively insoluble in water. Routes of exposure to DDT include inhalation of particles, ingestion, and absorption through the skin and eyes. Target organs include the eyes, skin, central nervous system, kidneys, liver, and peripheral nervous system. The EPA has determined that DDT is a probable human carcinogen.

1,2-dichloropropane, sometimes referred to as propylene dichloride, is a colorless, flammable liquid. It was used in the past as a soil fumigant, chemical intermediate, and industrial solvent that was found in paint strippers, varnishes, and furniture finish removers. Currently, 1,2-dichloropropane is almost exclusively used as a chemical intermediate to produce chlorinated chemicals. When released to soil, 1,2-dichloropropane is not easily broken down by bacteria, but readily volatilizes to the air. Routes of exposure to 1,2-dichloropropane include inhalation of vapors, ingestion, and absorption through the skin and eyes. Target organs include the eyes, skin, respiratory system, liver, kidneys, and central nervous system. It is not known whether 1,2-dichloropropane is a human carcinogen.

Heptachlor is a crystalline solid used extensively in the past as an insecticide in homes, buildings, and on food crops. Use of heptachlor was slowed in the 1970s and stopped in 1988. Heptachlor is relatively persistent in the environment - it strongly attaches to soil, is relatively insoluble in water, and does not readily volatilize to air. Routes of exposure to heptachlor include inhalation of particles, ingestion, and absorption through the skin and eyes. Target organs include the central nervous system and liver. It is not known whether heptachlor is a human carcinogen.

Toxaphene, sometimes referred to as chlorinated camphene, is an insecticide mixture consisting of at least 670 chemicals (polychlorinated bicyclic terpenes) and is typically found as a waxy solid or a gas. Toxaphene was used extensively in the past to control insects found in crops and livestock up until it was banned from use in 1990. Toxaphene breaks down slowly in the environment and is typically found in soil and sediment since it is relatively insoluble in water. Routes of exposure to toxaphene include inhalation of particles, ingestion, and absorption through the skin and eyes. The US Department of Health and Human Services has determined that toxaphene may reasonably be anticipated as a human carcinogen.

The DOH Tier 1 Action Levels established for TPH-D and 4,4-DDT are 5,000 mg/kg and 0.82 mg/kg, respectively. The Tier 1 Action Levels were generated by the DOH as conservative, default soil action levels that can be used at any impacted site. The Action Levels address 1) potential adverse impact on groundwater due to leaching of residual contamination from impacted soil; 2) potential adverse impact on groundwater due to remobilization of free product in impacted soil; and 3) potential threats to human health due to direct exposure to impacted soil. Since groundwater is anticipated at depths of nearly 800 to 900 feet bgs, and silty clay/basalt lithology with a relatively low hydraulic conductivity was encountered during subsurface investigations, adverse impact to groundwater is not foreseen as a significant issue.

The EPA Region 9 PRGs for industrial soil established for 1,2-dichloropropane, heptachlor, and toxaphene are 0.74 mg/kg, 0.38 mg/kg, and 1.6 mg/kg, respectively. The Region 9 PRGs are risk-based screening criteria that combine current EPA risk factors with standard exposure factors to estimate contaminant concentrations in environmental media that are considered protective of humans, including sensitive groups, over a lifetime. Region 9 PRGs are chemical concentrations that correspond to fixed levels of risk (i.e., one-in-one million cancer risk or a hazard quotient of one for noncarcinogenic compounds) in soil, air, and water, and are based on direct exposure pathways and do not consider impact to groundwater or ecological receptors. Chemical concentrations that exceed these levels would not automatically designate a site as "dirty" or trigger a response action. However, exceedance of Region 9 PRGs suggest that further evaluation of potential risks associated with exposure to site contaminants is warranted.

3.2 Natural Barriers and Engineered Controls

Based upon the depth at which contaminants of concern (COC) exist at the facility, ETC believes that direct exposure risks are minimal since there are no significant migration pathways. As described in Attachment 1, the shallowest depth at which COC concentrations exceeding either DOH Tier 1 Action Levels or EPA Region 9 industrial PRGs was 15 feet bgs in TP6, where 1,2-dichloropropane was encountered at a concentration of 230 mg/kg. Therefore, the minimum thickness of the natural soil barrier covering COCs is approximately 15 feet.

In order for personnel at the facility to be exposed to the COC, subsurface soil must be disturbed to depths of at least 15 feet bgs. CCR's current plans for the facility do not require such disturbance and CCR does not anticipate construction activities requiring excavation in the future. However, in the event that construction activities are performed, Section 4.3 describes controls to protect construction personnel.

Based on the approximate depth to groundwater at the facility and the relatively low hydraulic conductivity of the silty clay soil native to the area, ETC believes that risks associated with migration of contaminants to the groundwater are minimal. As described in Appendix I, the estimated depth to groundwater at the facility is approximately 800 to 900 feet bgs, and the maximum depth at which COC were detected is 113 feet bgs. Therefore, residual COC must leach an additional 687 to 787 feet bgs through a natural barrier of silty clay soil with a relatively low (10^{-6} centimeters per second) hydraulic conductivity and weathered basalt before reaching groundwater.

Due to the depths at which the COC exist, the native silty clay existing above the contaminated area, and the current and future projected use of the site as a parking area for employee and commercial vehicles, ETC believes that engineered controls are not warranted at this time. If future use of the site changes, the effect of subsurface contamination will be evaluated at that time.

3.3 Contaminant Detection and Monitoring

A contaminant detection and monitoring system is not feasible since there are no significant routes of migration. If future use of the site changes, the effect of subsurface contamination will be evaluated at that time.

3.4 Preventive Maintenance

There will be no routine preventative maintenance measures as long as ground surface remains intact as an unimproved parking area. If future use of the site changes, the effect of subsurface contamination will be evaluated at that time.

4.0 EXPOSURE CONTINGENCY PLAN

This Exposure Contingency Plan addresses various scenarios where the working population at the facility may be exposed to the contaminants of concern.

4.1 Breach of Natural Barriers/Failure of Engineered Controls

The native soil above the contaminated area and the anticipated depth to groundwater are the only natural barriers at the site. A breach of the natural barriers would require the installation of a conduit through the subsurface contamination. Such a breach would create a direct exposure pathway to users of the site. If such a conduit were deep enough (i.e., monitoring well installed to access groundwater), there would be a breach of the natural barrier protecting groundwater below the site.

A conduit to the contaminated soil would only occur during construction activities, or if a well were installed within the contaminated area. If such activities are planned, the measures described in Section 4.3 would be used to minimize exposure risks.

4.2 Exacerbation of Residual Contamination

Exacerbation of residual contamination is not anticipated at the facility since the suspected source of contamination has been removed.

4.3 Construction Management

Although construction activities are not anticipated, the controls described in this subsection should be implemented in the event that subsurface soils are disturbed. Specifically, if construction activities impact soil at depths of 15 feet bgs, controls will need to be implemented to protect site workers from direct exposure to COC.

The management of potential risks to construction workers consists of two primary elements: 1) education/communication, and 2) implementation of exposure management measures. Workers should be aware of the potential risks present at the site. Workers should also have an understanding of activities that could increase their potential risks and alternatives that could minimize potential exposure to contaminants.

4.3.1 Education and Communication

All construction workers who have contact with subsurface soil should be educated on the site conditions and potential risks associated with contaminants found at the Site. In particular, workers should be aware that TPH-D, 1,2-dichloropropane, 4,4-DDT, heptachlor, and toxaphene exist in the subsurface soil. In addition, workers should be aware that routes of exposure to the COC are typically via inhalation of vapors, inhalation of airborne particulates, ingestion of soil, and absorption through the skin and eyes.

The most common method of informing construction personnel of potential exposure risks is to prepare a Site Safety and Health Plan (SSHP). The SSHP should describe the contaminants of concern, routes of exposure, and potential symptoms of exposure. The plan should also describe personal protection measures, controls, and work practices to minimize the risk of exposure. Construction personnel should be required to review the SSHP and certify that they have reviewed the plan and understand the risks involved with the project.

4.3.2 Exposure Prevention

Although CCR has no current plans to further develop the facility, measures provided herein should be utilized in the event that construction activities disturb contaminated soil.

Workers who handle contaminated soil or are required to be near contaminated soil during excavation activities should wear personal protective equipment, specifically a full or half-face respirator with combination organic vapor/HEPA filter cartridges, eye protection, gloves, and protective clothing (i.e., Tyvek suit). Immediately after leaving the work area, workers should remove personal protective equipment and wash hands and face with soap and water. At no time should workers be allowed to smoke, drink, or eat within the work zone and/or near contaminated soil.

Soil removed from the subsurface in the vicinity of the contaminated area should be segregated, with the suspect contaminated soil placed on and covered with polyethylene sheeting. Placing contaminated soil on and covering contaminated soil with polyethylene sheeting should be performed to prevent the generation of fugitive dust and prevent run-on/run-off of storm water.

If feasible, contaminated soil should be treated on-site via aeration/natural attenuation and soil samples should be collected from the excavation to determine residual contaminant concentrations. If 4,4-DDT, heptachlor, or toxaphene concentrations in the excavated soil exceed their respective DOH Tier 1 Action Levels or EPA Region 9 PRGs for industrial soil, an evaluation of soil management will need to be made since these COC do not rapidly break down (i.e., non-volatile, not easily degraded by naturally-occurring microorganisms, etc.).

4.3.3 Dust Control

All standard procedures to minimize dusty conditions, such as dust barriers and spraying water on the soil, should be utilized at the site by the contractor. Dust barriers should be constructed along the perimeter of the site. Controlled spraying of the area with water to suppress dust migration should also be conducted.

4.4 Future Use of Property

The property is currently used by CCR employees as an undeveloped parking area for employee vehicles and CCR-owned heavy equipment. A change in land use is not anticipated.

4.5 High Water Tables and Flooding Events

Due to the depth of contamination and the depth of groundwater at the site, exposure to contaminants due to high water tables and/or flooding is not anticipated.

5.0 OPERATION AND MAINTENANCE

CCR has no impending plans to change operations at the facility. Therefore, management of contaminated soil will be minimal due to the depth at which affected soil exists and since ETC does not anticipate impacts to groundwater based on the depth to groundwater and subsurface lithology.

If disturbance of subsurface soil is required, exposure prevention measures described in Section 4.3 above will be implemented to protect construction workers and future users of the property. Upon completion of construction activities, the ground surface should be completed as asphalt pavement or concrete to act as a cap.