1. INTRODUCTION

The analysis contained in this section addresses the potential hazards that may be present at the Project site due to the following: (1) the prior use of the 157-acre portion of the site that is located south of Del Amo Boulevard as a landfill, and (2) prior uses on the 11-acre portion of the Project site that is located north of Del Amo Boulevard. With regard to the 157-acre portion of the Project site, the analysis contained in this section focuses on the existing subsurface contamination in soil and groundwater that exists at the former landfill site.[33] Due to the size and complexity of the former landfill site, DTSC divided the landfill site vertically into two principal operable units.[34] Remedial Action Plans (RAPs) have been approved by the California Department of Toxic Substances Control (DTSC) for the Upper and Lower Operable Units. Copies of the approved RAPs are provided in Appendix E of this EIR. Environmental review was conducted by DTSC as part of the approval process for each of the RAPs. As such, this EIR will not provide an analysis of the RAPs but will provide information regarding the RAPs to place the Project in a context of its existing regulatory approvals. In addition, this section summarizes the proposed design refinements for the remediation activities as described in a report entitled Preliminary Remedial Design Refinements prepared by Tetra Tech, Inc. With regard to the 11-acre portion of the Project site to the north of Del Amo Boulevard, this section is based on a draft Phase I and a preliminary Phase II investigation that was prepared for this portion of the site.

In addition, operation of the Project would involve the limited use and storage of hazardous materials associated with residential and commercial uses, such as cleaning solvents and pesticides. As concluded in the Initial Study that is presented in Appendix A of this Draft EIR, the use and storage of such materials would occur in compliance with applicable standards and regulations. Therefore, the use and storage of these materials would not pose significant hazards to the public or the environment through the transport, use, or disposal of hazardous

[33] *Impacts to surface water quality are addressed in Section IV.F, Surface Water Quality.*

[34] *Federal regulations at 40 CFR 300.5 define an operable unit as "…a discrete action that comprises an incremental step toward comprehensively addressing site problems. This discrete portion of a remedial response manages migration, or eliminates or mitigates a release, threat of release, or pathway of exposure. The cleanup of the site can be divided into a number of operable units, depending on the complexity of the problems associated with the site. Operable units may address geographical portions of a site, specific site problems, or initial phases of an action, or may consist of any set of actions performed over time or any actions that are concurrent but located in different parts of a site."*

materials. Based on this conclusion, no further analysis of this aspect of project construction and operations is needed.

2. ENVIRONMENTAL SETTING

a. Regulatory Environment

(1) State

(a) California Department of Toxic Substances Control

The Department of Toxic Substances Control (DTSC) has authority under the Hazardous Substance Account Act (Health & Safety Code Section 25300 et seq.) and the Hazardous Waste Control Act (Health & Safety Code Section 25100 et seq.) to require responsible parties to remediate releases of hazardous substances and hazardous waste. When exercising such authority, DTSC is required to ensure that a selected remedy complies with all state and federal applicable or relevant and appropriate requirements (ARARs). In other words, DTSC is required to take into account statutory and regulatory requirements of its sister agencies, including water quality requirements applicable under the federal Clean Water Act and the California Water Code. The remedial action plans approved by DTSC for this site therefore address contamination in both soil and groundwater and impose requirements for both media.

Pursuant to Health and Safety Code, Section 25260 et seq. (Assembly Bill 2061), the Site Designation Committee has designated DTSC as the lead administering agency for the 157-acre former landfill located on Development Districts 1 and 2. As the lead administering agency, DTSC's responsibilities include administering all state and local laws that govern the site cleanup, determining the adequacy and extent of cleanup, issuance of necessary authorizations and permits, and following a determination that an approved remedy has been accomplished, issuance of a certificate of completion. A key part of the lead administering agency's role is coordinating input from other agencies that have jurisdiction over cleanup activities at the site, streamlining the permitting and compliance requirements and eliminating regulatory duplication and overlap. DTSC may form a working group to facilitate this process.

(b) California Division of Oil and Gas and Geothermal Resources (DOGGR)

Section 3200, et. seq. of the Public Resources Code regulates the permitting, establishment, completion, and abandonment/reabandonment of gas and oil wells. DOGGR is the state agency with primary responsibility for the enforcement of these regulations and is the state agency responsible for conducting construction site plan review for development proposed in proximity to gas or oil wells. Local jurisdictions require completion of a construction site plan review by DOGGR to confirm the location and condition of wells (i.e., tested for leaks, evaluation as to proper abandonment, etc.) prior to issuance of grading or building permits for such development. In connection with its review, DOGGR may require reabandonment of previously abandoned wells.

(2) Regional

(a) South Coast Air Quality Management District

The South Coast Air Quality Management District (SCAQMD) has jurisdiction over the air quality in the South Coast Air Basin (Basin), an area of approximately 10,743 square miles. The Basin includes all of Los Angeles County except for the Antelope Valley, all of Orange County, the nondesert portion of western San Bernardino County, and the western and Coachella Valley portions of Riverside County. As the Project site is located within the jurisdictional area of the SCAQMD, the Project would need to comply with applicable SCAQMD regulations. Specifically, SCAQMD Rule 1150 provides regulations for the excavation of landfill sites. Excavation is defined as any activity which exposes buried waste to the atmosphere. Further, SCAQMD Rule 1150.1, Control of Gaseous Emissions from Municipal Solid Waste Landfills, applies to active and inactive landfills. Inactive landfills, for which it is determined that a gas collection system is required, must meet the active landfill requirements for such a system. A Permit to Control or Permit to Operate would be required for the gas collection system.

(3) Los Angeles County

The California Integrated Waste Management Board (CIWMB) regulates landfills under Title 27 of the California Code of Regulations (Title 27). The CIWMB has delegated its authority under Title 27 to the Los Angeles County Department of Health Services as the Local Enforcement Agency (LEA) for the subject landfill. Section 21190 of Title 27 applies to development projects within 1,000 feet of a landfill, as well as development on top of landfill waste. The developer must demonstrate that the proposed development will not pose a threat to public health and safety and the environment. Section 21190 of Title 27 also requires that construction maintain the integrity of the landfill's final cover, drainage and erosion control systems, and gas monitoring and control systems. Subsection (e) of Section 21190 requires a number of structural improvements for development on top of landfilled areas during the postclosure period. These requirements include the following: automatic methane gas sensors; prohibition of enclosed basement construction; construction so as to mitigate the effects of gas accumulation and differential settlement; and periodic methane gas monitoring inside all buildings. Utility connections must be designed with flexible connections and utility collars and must not be installed in or below any low permeability layer of final cover. In addition, Title 27 requires that pilings not be installed in or through any bottom liner, unless approved by the Regional Water Quality Control Board (RWQCB).

In addition, the Los Angeles County Uniform Building Code (LAC-UBC), Section 110.3, requires that a permit shall not be issued for a building or structure located within 1,000 feet of landfills containing rubbish or other decomposable material unless the fill is isolated by a natural or artificial protective system or unless designed according to recommendations contained in a report prepared by a licensed engineer. The LAC-UBC also requires that protection be provided to prevent damage to the structure, floors, underground piping and utilities due to uneven settlement of the materials deposited within the landfill. In addition, Section 110.4 of the LAC-UBC addresses methane gas hazards. This section requires that buildings or structures adjacent to or within 25 feet of active or abandoned oil or gas wells must be designed according to recommendations of a licensed civil engineer and approved by the City's Building Official.

(4) City of Carson

(a) General Plan Safety Element

The City of Carson has an adopted the Safety Element as a component of the City's General Plan. The guiding principle of the Safety Element is to promote safety throughout the community in order to enhance the livability, quality of life, business environment, and positive image of the community as well as to reduce the effects of crime and environmental hazards. The Safety Element identifies and evaluates potential hazards, including natural and man-made, that exist within the City and aims to reduce the potential risk that could result from such hazards. The Safety Element contains goals, policies and implementation actions to reduce the impacts of these hazards.

The Safety Element indicates that there are 14 inactive sanitary landfills and no active landfills within the City. The Safety Element states that any future development of these sites should be carefully studied and a landfill gas control plan and monitoring system may be required for safety. The goals of the Safety Element are divided into four issue areas, which include natural disasters; handling and exposure of hazardous materials; urban fires; and crime. The Safety Element does not contain policies relevant to the implementation of the Project's RAPs.

(b) Municipal Code

The City's zoning map, a component of the Carson Municipal Code (CMC), has currently designated the Project site with an Organic Refuse Landfill (ORL) overlay designation, which provides for the public health, safety and general welfare by regulating uses of organic refuse landfill sites and ensuring that proper mitigation measures are taken to eliminate or minimize hazards to persons and property and environmental risks associated with such sites including, but not limited to, toxicity, fire, explosion and subsidence. If the Project is approved, then the zoning designation for the Project site will change to Marketplace Specific Plan and the ORL overlay designation will no longer be applicable as the Marketplace Specific Plan will control.

b. Existing Physical Environment

(1) Development Districts 1 and 2 (Former Landfill Site)

The 157-acre portion of the Project site that is located south of Del Amo Boulevard was used as a Class II landfill under an Industrial Waste Disposal Permit issued to Cal Compact, Inc. by the County of Los Angeles in 1959. Landfilling on the 157-acre site began in 1959, shortly after the banning of incinerators in Los Angeles County in 1957. The Cal Compact Landfill was permitted to receive municipal solid waste (MSW) and liquid waste under permit conditions set forth in the April 1959 Prescribing Requirements issued by the State of California Regional Water Pollution Control Board. The landfill site also operated under Industrial Waste Permit No. 2145 issued by the Industrial Waste Division of the Los Angeles County Engineer’s Office in July 1959.

The permit allowed the landfill to accept ordinary household and commercial waste and/or rubbish, garbage, other decomposable organic waste, and scrap metal. Specifically, MSW that was deposited at the Cal Compact Landfill included the following:

- Metals and metal products except magnesium and its alloys and salts;
- Paper and paper products including roofing and tarpaper;
- Cloth and clothing;
- Wood and wood products;
- Lawn clippings, sod, and shrubbery;
- Small dead animals;
- Unquenched ashes mixed with waste;
- Manufactured rubber products;
- Solid plastic products;
- Dried mud cake from oil fields;

- Paint sludge received from water circulated paint spray booths not transported in vacuum trucks;
- Occasional loads of dry paint in drums;
- Street sweepings;
- Inert solid fill including natural earth, rock, sand and gravel, paving fragments, concrete, brick, plaster and plaster products, steel mill slag, glass and asbestos fiber and products therefrom;
- Hog manure and hog pen waste; and
- Residue and grit from sewer cleaning and sewage treatment processes, provided that (a) this material be covered immediately, (b) such steps as are necessary be taken at all times in order to prevent fly breeding or odor nuisance.

The Industrial Waste Permit allowed the following liquid wastes to be accepted at the landfill:

- Paint sludge recovered from water circulated in paint spray booths;
- Acetylene sludge;
- Sludge from automobile wash racks and steam cleaning plants;
- Sludge derived from the softening of water by the lime soda process;
- Mud and water from laundries;
- Liquid latex wastes;
- Ceramic, pottery, glaze wastes;
- Lime and soda water;
- Water containing not more than 0.5% molasses;
- Water containing lampblack and incidental amounts of mud resulting from floor washing;
- Tank bottoms;
- Liquid waste from petroleum processes; and
- Occasional loads of printers’ ink, containing small amounts of solvent.

The landfill consisted of four waste cells, which were all excavated and filled. The waste cells covered the entire 157-acre landfill site with the exception of the haul roads and the perimeter slopes, which remain on undisturbed native soil. The landfill operated by cut and cover method, in which the waste was deposited and regularly covered with dirt and watered to assure adequate compaction. Disposal of solid waste occurred at the landfill from April 1959 to December 1964 with an approximate closing date of February 1965.

During the life of the landfill, approximately 6 million cubic yards (cy) of solid municipal waste and 2.6 million barrels of industrial liquid waste were received at the landfill. Refuse thickness varies over the site and ranges between 1.75 to 64.75 feet in depth, with an average of 40 feet in depth.[35] The estimated volume of solid waste in the landfill is 6,260,000 cubic yards.[36] Recent estimates indicate that the landfill received 550,936 cubic yards of liquid industrial waste.[37] Current soil cover over the landfill materials across the site ranges from three to 30 feet in thickness.

Investigations conducted on the site beginning in 1978 identified and confirmed the presence of hazardous substances on the site that had entered into the environment. The investigations conducted in 1978 indicated that despite a cap of a minimum of three feet of soil covering the landfill material, landfill gas emissions of methane and carbon dioxide were detected escaping from cracks in the cap. Investigations conducted in 1981 indicated concentrations of metals in the groundwater to be greater than state drinking water standards and concentrations of heavy metals, polynuclear aromatics hydrocarbons (PNAs) and other organics in the soils to be above background levels. In addition, notable concentrations of chlorinated and other volatile aromatic hydrocarbons such as toluene and ethylbenzene were found in vapor wells.

Based on the potential threat to people and the environment from contaminants and substances that are defined as hazardous substances in the Health and Safety Code, the State Department of Health Services issued Remedial Action Order (RAO) No. HSA87/88-040 on March 18, 1988 to 14 potentially responsible parties (PRPs). The RAO required the submittal of a workplan to identify the hazardous substances present and to determine the extent of cleanup required.

In 1995, the DTSC entered into a Consent Order and RAO with the former landfill owner (BKK), successor to Cal Compact Inc., for preparation of a RAP for the Upper Operable Unit (Upper OU). In 1995, the DTSC also entered into a Consent Decree (CD) with the current site owners, L.A. Metro Mall, LLC and Commercial Realty Projects, Inc., for implementation of the

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[35] *Plans and Specifications for Landfill Gas Control/Treatment Systems, Part * - Remedial Design Overview, SCS Engineers, March 1996.*

[36] *The Los Angeles County Engineer had calculated that the landfill had a capacity of 6,298,500 cubic yards.*

[37] *Summary of Environmental Conditions, Remediation Plan, and Geotechnical Assessments, Allwest Remediation, Inc., April 8, 2003.*

Upper OU RAP. In addition and as a result of contamination on and adjacent to the landfill, the 157-acre portion of the Project site is listed by the DTSC on the Hazardous Waste and Substances Site (Cortese) list.

Due to the size and complexity of the former landfill site, DTSC divided the landfill site vertically into two principal operable units. The Upper OU was defined to include the site soils, the waste zone above and within the Bellflower Aquitard, and the Bellflower Aquitard, which was described to extend to a depth of approximately 220 feet below the landfill site. The Lower Operable Unit (Lower OU) was defined as the deeper hydrostratigraphic units beginning with the Gage aquifer and extending down to the Silverado aquifer, and all other areas impacted by the geographic extent of any hazardous substances which may have migrated or may migrate from the aforementioned areas or from the Upper OU. The operable units were also established to prioritize the remedial response to the areas of known impacts (Upper OU) versus potential impacts (Lower OU).

Remedial Investigations (RIs) were undertaken and characterized the hazardous substances on the site. The investigations analyzed samples taken from the following areas: (1) surface and run-off water; (2) soil cover; (3) waste zones; (4) groundwater, and (5) air. The characterization documented the presence of landfill gases (methane and carbon dioxide) as well as volatile organic compounds (VOCs) and metals in the Upper OU. As shown in Table 27, on page 277 the primary contaminants in the soil include metals (antimony and beryllium) and organics (benzo(a)anthracene, benzo(b)fluoranthene, alpha-BHC, and Bis(2-ethylhexyl)phthalate). The primary contaminants in the groundwater are dissolved chlorinated and aromatic VOCs, primarily trichlorethene (TCE), 1,2-dichlorethane (1,2-DCA), vinyl chloride and benzene, toluene, ethylbenzene, and xylenes (BTEX). These VOCs were detected in localized areas within the Bellflower Aquitard at concentrations above their respective drinking water Maximum Concentration Levels (MCLs). The primary contaminants in the air are benzene, tetrachloroethylene (PCE), toluene, trichloroethylene, and xylenes. The primary contaminants may be revised based on additional site data obtained.

As part of the development of the RAP, a Baseline Risk Assessment (BRA) was conducted to identify potential health risks to persons both on and off site as well as construction workers due to exposure to site-related chemicals under hypothetical future uses of the former landfill site. The BRA was prepared under the direction of DTSC and in accordance with DTSC and U.S. EPA guidelines and the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP). In accordance with U.S. EPA guidelines and specific direction from DTSC, three hypothetical exposure scenarios were evaluated. The three scenarios assumed that no remedial actions or controls would be in place. In other words, the BRA assumed that development occurred without implementation of the landfill cap, landfill gas system, building protection or groundwater system.

Table 27

Summary of Primary Contaminants in Upper OU

Chemical	Concentration Range (parts per million [ppm]) Soil (cover and waste zone)	Groundwater	Air
Antimony	1.8 – 4.8		
Beryllium	<0.05 – 0.1		
Benzo(a)anthracene	0.80		
benzo(b)fluoranthene	0.72		
alpha-BHC	0.044		
Bis(2-ethylhexyl)phthalate)	0.33 – 7.5		
trichlorethene (TCE)		<0.001 – 0.038	0.0075
1,2-dichlorethane (1,2-DCA),		<0.001 – 0.072	
vinyl chloride			0.0809
benzene		<0.001 – 7.5	0.0014 – 0.0573
toluene	0.006 - 12	<0.001 – 20.4	0.0044 – 0.0177
ethylbenzene		<0.001 – 12.6	
xylenes		<0.001 – 12.4	0.0033 – 0.957
tetrachloroethylene (PCE)			0.002 – 0.0579

Source: Brown & Root Environmental, 1995.

In addition, the BRA was conducted using conservative assumptions with regard to chemical concentrations, chemical fate/transport, and human exposure. For example, as indicated previously, the soil cover thickness ranges from a minimum of three feet up to 30 feet. The BRA assumes that the soil cover is only three feet thick over the entire landfill, which influences the amount of vapor migrating to the surface. In addition, the analysis assumed unrestricted contact with the soil, waste and groundwater.

The BRA presents age-specific increased cancer risks (carcinogens) and noncancer hazard indices (noncarcinogens) as well as the predominant pathways of exposure for each scenario. The three scenarios analyzed were: (1) Long-Term Residential Use, (2) Long-Term Commercial/Industrial Use, and (3) 2-Year Construction/Excavation Activities.

The Long-Term Residential Use scenario assumed a residential housing community was developed on the landfill with no RAP-required remedial measures and that unrestricted disruption of the current soil cover by residents would occur. The analysis assumed that excavation of swimming pools, gardening, inhalation of vapors, drinking groundwater and other associated exposures would occur. The scenario also analyzed the risks to children and adults living off-site within neighboring residential communities. For hypothetical on-site residents, the specific exposure pathways evaluated included:

- Ingestion of groundwater;
- Dermal and inhalation exposure to groundwater (bathing and showering);
- Inhalation of vapors (indoors and outdoors) and suspended soil particulates (outdoors);
- Dermal absorption from soils;
- Incidental ingestion of soils; and
- Ingestion of garden vegetables (which was accounted for by a 50% increase in soil ingestion rates).

Exposure pathways for hypothetical off-site residents included inhalation of vapors and soil particulates. For both on-site and off-site residents, exposure was assumed to occur 24 hours/day, 365 days/year for 24 years (adult only) or 30 years (child aged 0 to 6 years + adult).

The Long-Term Commercial/Industrial Use scenario assumed commercial or industrial uses were developed on the landfill site. The analysis assessed potential risk to workers in the commercial or industrial uses as well as the potential periodic on-site visitor (adults and juveniles aged 6 to 12 years). The scenario assumed no disruption of the current soil cover. For hypothetical on-site workers and visitors, the specific exposure pathways evaluated included:

- Inhalation of vapors (outdoors) and suspended soil particulates (outdoors);
- Dermal absorption from soils; and
- Incidental ingestion of soils.

Workers were assumed to be on-site 8 hours/day, 250 days/year for 25 years. Juvenile and adult visitors were assumed to be on-site for 1 hour/day, 156 days/year for 30 years (6 years as a juvenile and 24 years as an adult).

The 2-Year Construction/Excavation Activities scenario evaluated the risks to on-site workers and off-site residents during development, construction and excavation activities on the landfill over a period of two years. This scenario assumed that the current soil cover was completely removed for a period of two years. Workers were assumed to be on-site 8 hours/day, 250 days/year for 2 years. The specific exposure pathways evaluated included:

- Inhalation of vapors (outdoors) and suspended soil particulates (outdoors);

- Dermal absorption from soils; and
- Incidental ingestion of soils.

Exposure pathways for hypothetical off-site residents included inhalation of vapors and soil particulates. For off-site residents (child and adult), exposure was assumed to occur 24 hours/day, 365 days/year for 2 years.

For each of the three scenarios evaluated, two exposure point concentrations (EPCs) were calculated for soil and groundwater, one EPC defined as the mean and a second EPC defined as an upper-bound value. For data that fit a normal distribution, the 95 percent upper confidence limit (UCL) on the mean concentration was used as an estimate of the upper-bound EPC. For data that did not fit a normal distribution, the mean of the log transformed data was used as an estimate of the upper-bound EPC. In cases where the calculated EPC exceeded the maximum concentration, the maximum concentration was used to represent the EPC.

The Jury et al. (1983) behavior assessment model was used to estimate the flux of VOCs from soil and groundwater to ambient air. A standard box model was used to estimate ambient air VOC concentrations from these flux data results. Migration of VOCs was also modeled from soil and groundwater to hypothetical residential buildings using a standard box model. The Farmer et al. (1978, 1980) model was used to estimate the flux of methane from soil gas wells; this flux rate was then used to model methane concentrations in crawlspaces of hypothetical residential buildings using a modified box model assuming no loss of gas from the crawl space. All vapor migration modeling assumed a soil cover over waste materials of three feet. Airborne particulate concentrations for both hypothetical on-site and off-site residents were estimated from monitoring data obtained from the nearby Long Beach Air Monitoring Station (California Air Resources Board facility).

Risk assessment results found that for on-site residents, potential 95 percent UCL-based cancer risks ranged from 1.2×10^{-2} (adult) to 1.4×10^{-2} (child). UCL-based noncancer hazard indices (HIs) ranged from 45.3 (adult) to 210 (child). The primary exposure pathways contributing to elevated risks and HIs were groundwater ingestion and inhalation of VOCs in indoor air. Modeling of methane gas intrusion into the crawl space of residential buildings found that explosive levels may be reached after 45 days. For off-site residents, UCL-based cancer risks ranged from 7.9×10^{-5} (child) to 8.6×10^{-5} (adult). UCL-based HIs ranged from 0.4 (adult) to 1.3 (child). Off-site residential risks and HIs were due primarily to the airborne soil particulate exposure pathway.

Under the long-term commercial/industrial use scenario, the estimated UCL-based cancer risk for workers was 6.6×10^{-5}, and the UCL-based HI was 0.3. Vapor inhalation was the predominant exposure pathway. For on-site visitors, UCL-based cancer risks ranged from 5.8 x

10^{-5} (adult) to 7.3 x 10^{-5} (juvenile). UCL-based noncancer HIs ranged from 0.02 (adult) to 0.07 (juvenile). The predominant exposure pathways for visitors were vapor inhalation for cancer risk and dermal contact for noncancer effects.

For the 2-year construction/excavation activities scenario, the estimated UCL-based cancer risk for workers was 9.1 x 10^{-5}, and the UCL-based HI was 1.7. Vapor inhalation was the predominant exposure pathway. For off-site residents, UCL-based cancer risks ranged from 6.3 x 10^{-5} (adult) to 2.9 x 10^{-4} (child). UCL-based noncancer HIs ranged from 1.7 (adult) to 7.8 (child). The predominant exposure pathway was vapor inhalation.

The BRA concluded that excavation activities associated with the 2-year construction/excavation activities and/or the development of the landfill into detached single-family homes built at grade would result in greater risks to human health compared to commercial/industrial development. If the site were developed into permanent housing, without implementation of RAP-required remedial measures the most immediate health hazard would be related to the possible accumulation of methane gas beneath structures and the potential risk from an explosion or fire. In addition, under the BRA no remediation assumption, long-term residents might be subjected to elevated cancer risks and noncarcinogenic health hazards. In contrast, the estimated health risks would be lower in the Long-Term Commercial/Industrial Use scenario. The estimated lifetime cancer risks to off-site residents/visitors, on-site workers, and a resident/worker composite scenario would be well within risks calculated for average background concentrations of selected air pollutants that are common in the Los Angeles area. Thus, on-site activities would not incrementally add to the risks that are already present in the area.

An Ecological Risk Assessment was not included due to the urban nature of the Project area, the lack of natural water bodies in the area and the impervious nature of the stormwater and flood drainage channels.

(a) Final Remedial Action Plan for the Upper Operable Unit

A Final Remedial Action Plan (Final RAP) was prepared for the Upper OU and approved by DTSC in 1995. The Final RAP is based on site-specific data gathered from the RI for the Upper OU. The Final RAP summarizes the findings of the RI, BRA and Feasibility Study (FS). The Final RAP describes the remedial alternative chosen for the Upper OU, how the Remedial Action Objectives are to be met, and an implementation schedule. The primary remedial action objective is to provide protection for human health and the environment. More specifically, objectives include: control surface water infiltration into the waste prism to reduce the generation of leachate; prevent direct contact with contaminated soil or buried waste; capture, control, and treat on-site contaminated groundwater and the plume that is now off site; and control or prevent potential releases of landfill gas to the atmosphere.

Based on the RI and the BRA, the RAP indicates that the remedial action should include a combination of the following actions:

- Construction of a low-permeability clay cover system for the entire landfill site;
- Installation of groundwater extraction and treatment systems along the downgradient side of the landfill site;
- Installation of a perimeter landfill gas extraction, control, and treatment system along the perimeter of the landfill site within the waste zone;
- Implementation of long-term monitoring of the groundwater and landfill gases; and
- Long term maintenance of the cap.

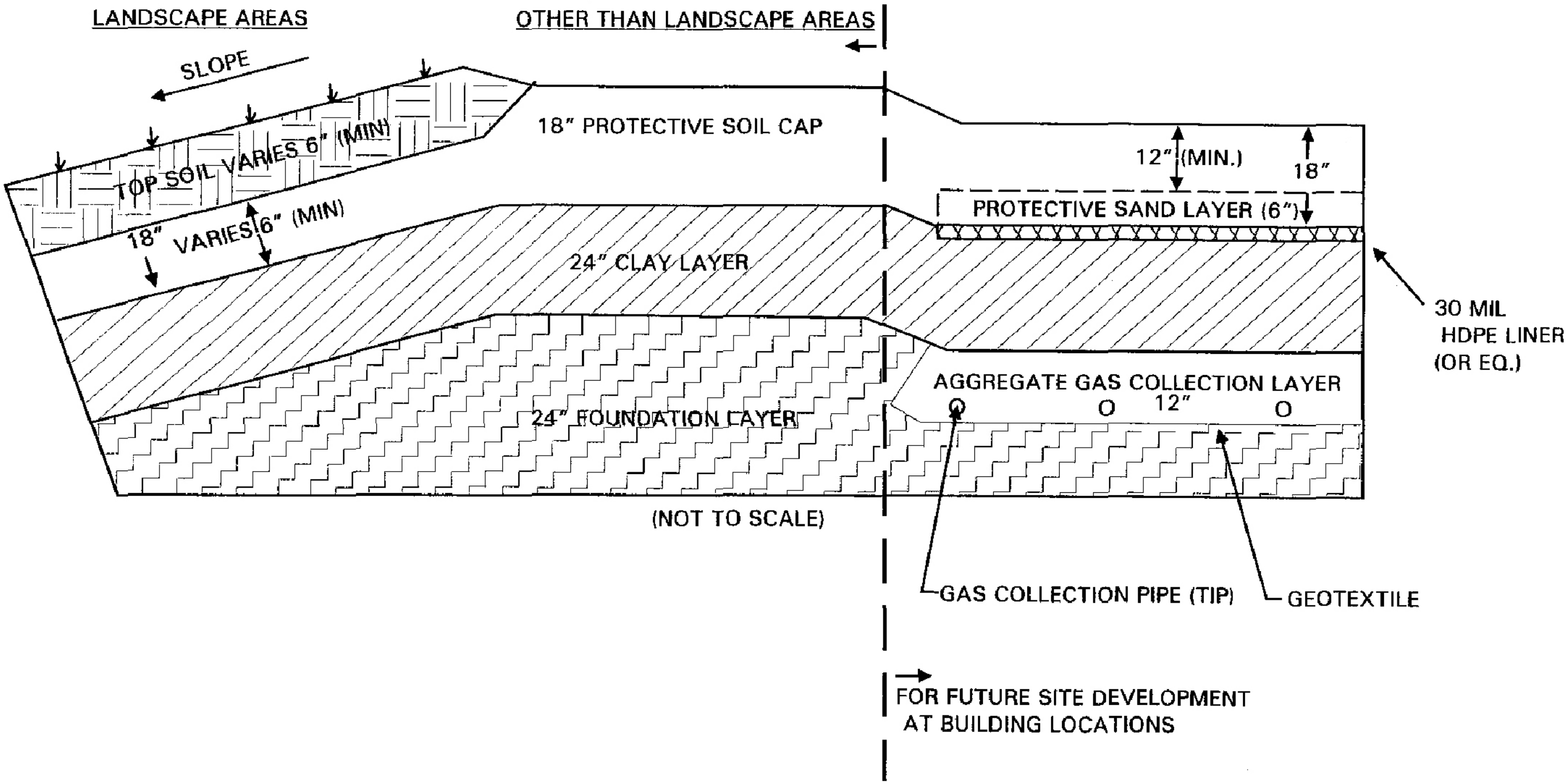
To ensure the proper design, construction, and implementation of the systems indicated above, recommendations were also provided in the RAP for development and performance of detailed confirmatory investigations to obtain additional information for the RD. The planned confirmatory investigations included a landfill gas survey. During the RD phase, the RAP requires that operation and maintenance and monitoring programs be developed for all remedial systems. A description of each of the identified actions as set forth in the RAP is provided below under separate subheadings.

(i) Landfill Cap

The purpose of the low-permeability clay cover system is to contain the buried waste and the impacted soil on the landfill site. As shown in Figure 26 on page 282, the proposed cap consists of layers. The cap would be different for areas under structures, non-building and non-landscape areas (i.e., parking lots), and landscape areas. Prior to the installation of the landfill cap, deep dynamic compaction (DDC) would be used to pre-consolidate the upper layers of the trash so as to reduce future settlement of the material and to provide a more uniform substrate over which to construct the landfill cap.[38] DDC would be conducted so as to not expose trash and would include a provision to immediately apply soil in the event that exposure of trash were to become a concern. The finished surface after DDC would be a clean and smooth soil surface.

The cap would have three primary layers, the foundation layer, clay layer and protective soil cap. The foundation layer consists of existing soil cover material and/or suitable imported

[38] *Deep dynamic compaction (DDC) is the densification of soil deposits or other materials by means of repeatedly dropping a heavy weight onto the ground. Most DDC is undertaken with weights ranging from 6 to 30 tons. The drop heights generally range from 50 to 100 feet and the weight is generally dropped by a conventional crane.*



PCR

Figure 26
Landfill Cap Layer

Source: Allwest Remediation, 2002

materials and serves to support the cover system. The RAP requires a foundation layer thickness of 24 inches. The RAP allows 12 inches of existing soil cover to account for part of the foundation layer.

The purpose of the clay layer is to inhibit infiltration of surface water into the refuse and to inhibit upward migration of landfill gas. The clay layer would consist of a minimum of 24 inches of clay material with a permeability of 1×10^{-6} cm/sec or less. As needed, bentonite amended soil may be added to achieve the required permeability.

An 18 inch protective soil cover layer serves to protect the clay layer. The protective soil cover layer would be constructed from suitable imported material.

The RAP requires the installation of a double liner system under buildings in order to provide additional protection and landfill cap integrity. The double liner consists of a geomembrane liner (30 mil High Density Polyethylene [HDPE] liner) on top of the clay layer. A 6 inch thick sand layer is placed above the geomembrane liner to protect it during construction/installation activities and to serve as a drainage layer. In addition, a 12-inch thick layer of sand/gravel aggregate would be provided in the foundation layer. This aggregate layer will be placed under the clay layer and wrapped with a geotextile filter to prevent the introduction of fine particules. The landfill gas collection system under the buildings would be installed in this aggregate layer.

In landscaped areas a topsoil layer would be provided to support vegetation root systems. The topsoil layer would have an average thickness of 12 inches and may replace the upper 6 inches of the protective soil cover.

The RAP envisioned that much of the soil used to construct the earthen cap, including topsoil would likely be imported. In addition, existing soil cover and soil contained in the sloped areas surrounding the cap would remain and be used as part of the cap or remain adjacent to the cap. During Remedial Design (RD), additional soil cover samples will be collected and analyzed to further evaluate existing soil-cover quality, particularly soil that will reside near land surface such as in landscaped areas. Human-health risk evaluations and a soil management plan will be completed and provided to the DTSC for evaluation and approval to ensure that exposure to soil at the Project site does not pose unacceptable human health risks.

In 1999, the South Coast Air Quality Management District (SCAQMD) issued a Notice to Comply with SCAQMD Rule 1150.1(h)(2) regarding emissions of landfill gas. The Notice to Comply imposed a requirement to mitigate the emissions of landfill gas (methane), which exceeded 500 parts per million by volume (ppmv) in the western portion of the landfill. Approximately 22,000 cubic yards of compacted fill material was placed over surficial fissures that had developed in the existing landfill soil cover on the western portions of the landfill prism.

The placement of the material was completed to reduce emissions of methane to concentrations of less than 500 parts per million by volume (ppmv) from surface fissures to reduce potential risks to the health and safety of the adjacent residential neighborhood. Following placement of the cover soils, SCAQMD inspection confirmed that no significant concentrations of landfill gas were detected in sampled air above the western portion of the landfill. Compliance with all SCAQMD Rules, including 1150.1 will be required as part of RAP implementation.

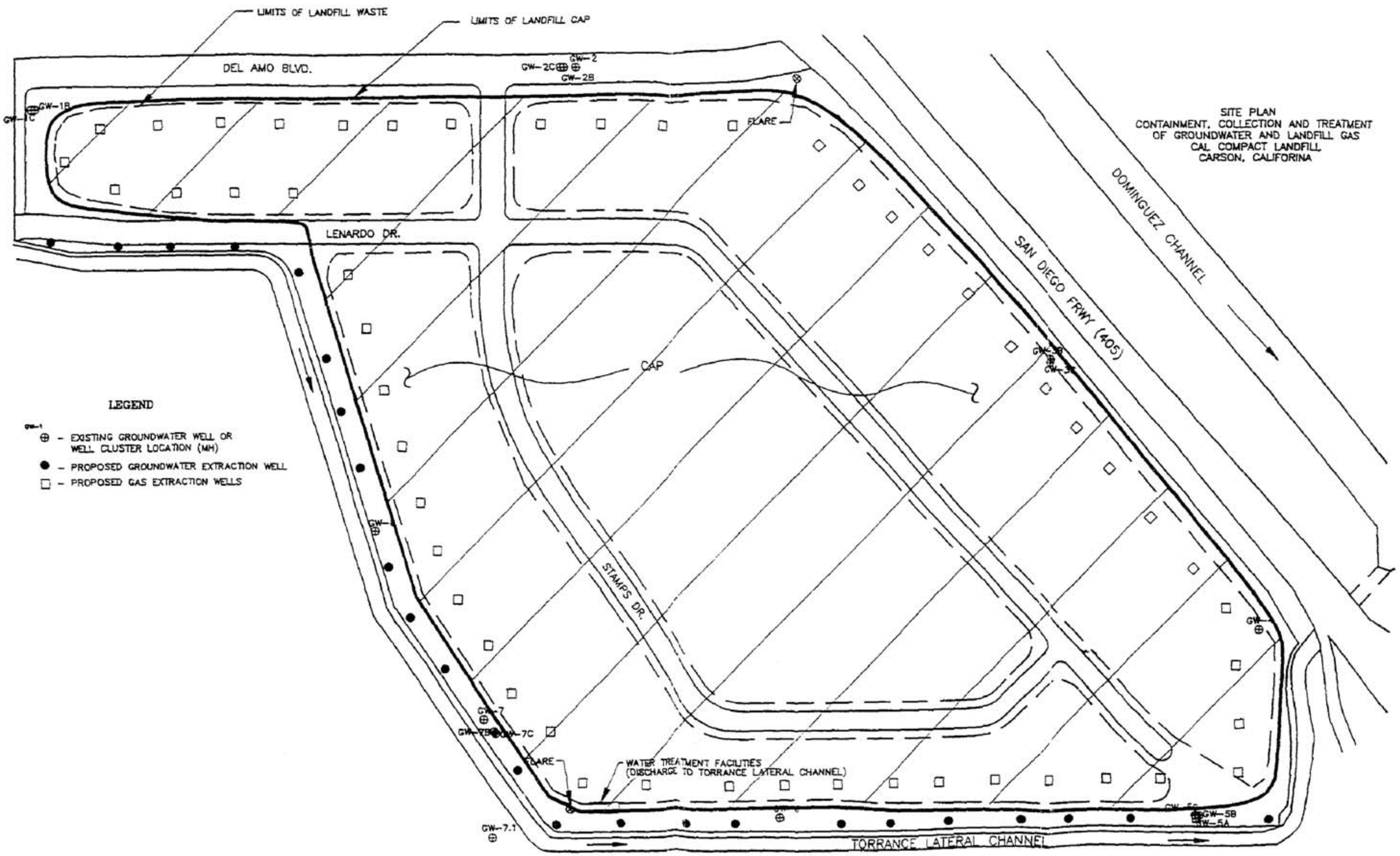
In addition to collecting additional soil data during RD and subsequent RAP implementation phases to evaluate potential health risks, construction and perimeter monitoring will also be completed during earth work, and construction of remediation systems. The approved RAP requires that dust and particulate emissions be controlled and that perimeter monitoring be completed during construction. Therefore, a plan will be developed based on existing and future soil quality data collected during the RD phase, and existing RAP requirements. The plan will be developed to implement engineering controls to minimize off-site migration of dust and particulates to ensure that the surrounding community's health is properly protected. Monitoring and analysis parameters will be based on constituents present at the site and at a minimum, dust and particulate matter (PM_{10}) will be monitored using high-volume air samplers (or equivalent) properly located around the property perimeter. In addition, construction equipment emission will also be periodically monitored at the property boundary in accordance with relevant SCAQMD regulations. This plan will be submitted to the DTSC during RD for review, comment, and approval before any construction activities occur.

(ii) Perimeter Landfill Gas Extraction, Control and Treatment System

The RAP requires the installation of a landfill gas extraction, control, and treatment system. The primary objectives of the landfill gas control system are to prevent the migration and accumulation of combustible gas into enclosed buildings and to prevent off-site landfill gas migration.

The RAP provides that the preferred landfill gas control, collection and treatment system consist of (1) a series of vertical gas extraction wells placed within the outer edges of the waste cells along the perimeter of the landfill; (2) thermal destruction of collected gas using a flare unit, and (3) other gas monitoring and venting systems, if determined necessary and applicable.

The RAP specifies that the gas control wells be installed and screened at appropriate depths intercepting the pervious or semi-pervious zones above the water table. Depending on the presence of the methane and toxic contaminants, these wells must be designed either as a passive or active system to intercept/control the potential for off-site migration. The perimeter gas control system assumes the use of an active extraction system with a typical well spacing of 200 feet and an average depth of about 40 feet. (See Figures 27 and 28 on pages 285 and 286, respectively.) As a result, the RAP requires a total of 55 wells to be constructed along the



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N

0 150 300 Feet

Scale in approximate feet

Source: Brown & Root Environmental

Figure 27
Proposed Groundwater and Gas Extraction Well Locations

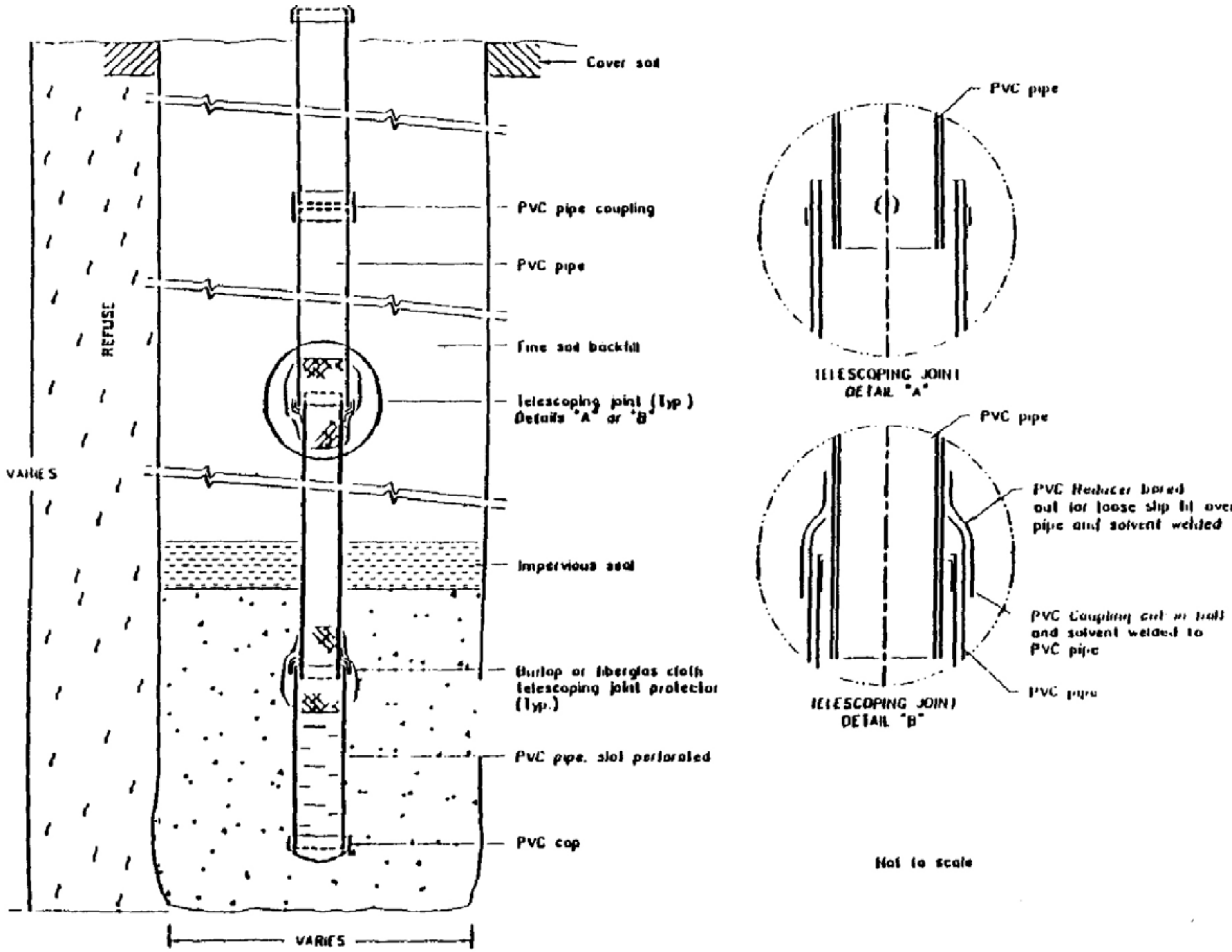

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Figure 28
Proposed Conceptual Gas Extraction Well

Source: Brown & Root Environmental

landfill site boundaries. Detailed design of the gas control system including the actual number of wells and specific spacing is to be determined based on the landfill gas survey.

Under the building areas, an active landfill gas control system would be installed under the clay cover system to protect against the landfill gases. The active landfill gas control system would consist of horizontal, perforated piping that is installed in the permeable aggregate layer below the clay/geomembrane layer. The active gas control would be a low pressure vacuum system to minimize potential drying of the clay layer. Spacing for these pipes would coincide with the spacing for the piling needed to support the building. A spacing of 15 feet is anticipated for the horizontal piping.

Based on the size of the landfill site and the need of the perimeter landfill gas control, the RAP assumes that the landfill gas treatment will require the construction of a flare unit including related collection headers, blowers, and gas sampling and processing components. The RAP provides that collected landfill gas will be delivered from the header system to the flare by a blower. The gas is to pass through an automatic shut-off valve and a flame arrestor to prevent flash back. Landfill gas would be mixed with dilution air for efficient combustion at the flare burner elements. Dilution is to be automatically introduced into the flare by a dilution air valve regulated by the combustion temperature. Supplemental fuel (natural gas or propane) would be automatically introduced into the flare to maintain the required combustion temperature and thermal efficiency. The flare, which is subject to SCQAMD requirements, would be equipped with standard safeguard controls and other required air emission control devices to monitor operating conditions and shut down the system when appropriate. The flare would be constructed or shielded from the traveling motorists to minimize or reduce the potential for visual distraction.

The RAP also requires that for building safety, additional landfill gas venting or monitoring features be considered. These features include:

- Open ventilation provided by open parking structures or passive surface vent pipes to monitor or release methane from accumulating beneath the cap. As applicable, the vent pipe will be constructed with the ability to be connected to an induced draft exhaust system;
- A pile sleeve system to seal the liner to the building piles; and
- A landfill gas monitoring and alarm system for landfill gas in or under the building.

The RAP indicates that these features would be designed in detail during the remediation system and/or building construction/design phase and would be part of the ongoing operation and maintenance activities.

(iii) Groundwater Extraction and Treatment System

The RAP requires a groundwater extraction system to be installed along the downgradient perimeter of the site to recover contaminated groundwater and to prevent off-site migration of contaminated groundwater. Recovered groundwater would be routed from groundwater extraction wells to an on-site groundwater treatment system which is designed to prevent off-site migration of contaminated groundwater. As shown in Figure 29 on page 289, the treatment system would consist of an equalization tank (holding tank), a filter (screening) process to remove suspended solids, a precipitation/sedimentation process to remove metals, an activated carbon treatment process to remove organics, and a final polishing filter process to remove settlable solids prior to discharge. The groundwater treatment equipment would be constructed on a reinforced concrete pad or equivalent structure. The final design of the system would be developed during the remedial design phase and approved by DTSC prior to construction. Any groundwater wells that would be installed as part of this system will be designed constructed and maintained using materials and methodologies that reduce the risk of the wells serving as conduits for contamination to migrate to deeper hydrostratigraphic units below the Upper OU. DTSC will review and approve all plans related to groundwater wells installed and operated as part of this system.

(iv) Long Term Monitoring of the Groundwater and Landfill Gases

Groundwater Monitoring

The RAP requires quarterly groundwater monitoring to provide adequate and representative groundwater quality data to monitor the effectiveness and duration of the groundwater remedial action. The monitoring data would be used to adjust the remedial strategy, if necessary, to ensure that contamination does not migrate off-site. While the groundwater level is rising in the area, where the waste is in contact with the groundwater there is evidence that the contaminants are not downmigrating into the groundwater.

The monitoring program would include monitoring points at downgradient points, both on and off-site, upgradient points, and points in the Gage aquifer beneath the Upper OU. The approved RAP anticipates that the monitoring network would include the following: (1) approximately five new downgradient wells located outside the leading edge of the identified contamination area of concern near the west and southwest corner of the 157-acre landfill site, (2) one new upgradient well near the northeast property boundary, and (3) three new Gage wells, one upgradient and two downgradient. Several existing monitoring wells including the two Gage wells could be redeveloped and used as part of the monitoring program. The specific number and location of the wells would be determined during final development of the groundwater monitoring program and would be approved by DTSC.

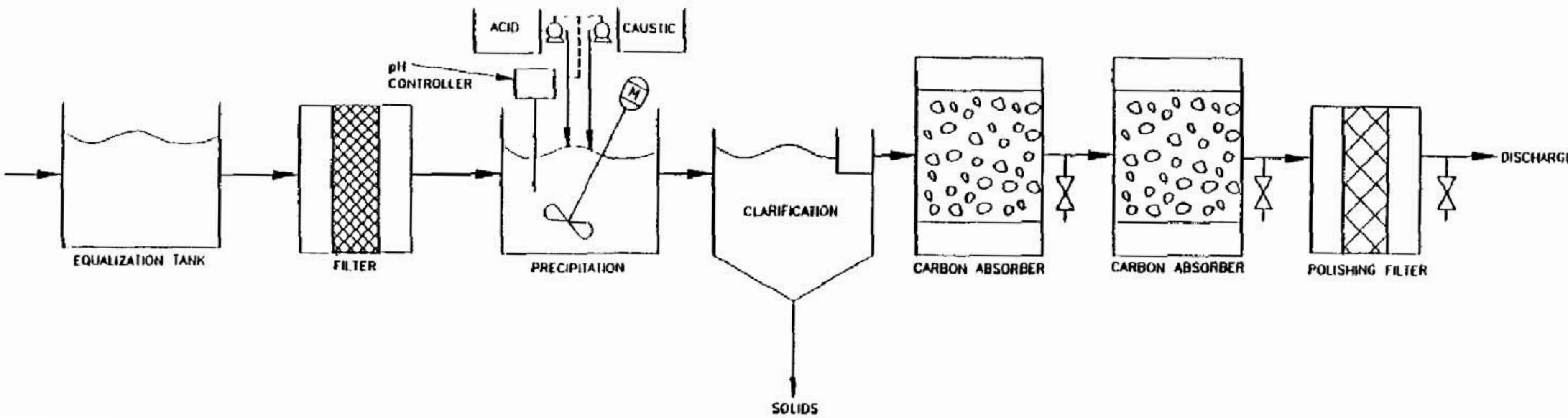

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Figure 29
Conceptual Groundwater Treatment System

Source: Brown & Root Environmental, 1995

Groundwater monitoring and sampling of all wells would initially be conducted on a quarterly bases for one year. The samples would be analyzed for 34 VOCs in the Target Compound List (TCL) using approved methodologies. After one year, the frequency and analyses to be performed would be re-evaluated and modified as appropriate. The monitoring program would be conducted for 30 years or until the groundwater contamination has been in continuous compliance with the remediation goals and upon DTSC and RWQCB written approval.

Landfill Gas Monitoring

The RAP requires quarterly air and soil monitoring of landfill gas. The purpose of the monitoring is to provide early warning of potential off-site migration and to ensure proper control of the landfill gases. With regard to air sampling, requirements for the gas monitoring include the following: (1) the concentration of methane gas must not exceed 1.25 percent by volume in air within on-site structures, (2) the concentration of methane gas must not exceed 5 percent by volume in air at the landfill property boundary, and (3) trace gases must be controlled to prevent adverse acute and chronic exposure to toxic and/or carcinogenic compounds. The monitoring data would be used to adjust the gas collection and treatment measures as necessary so that the gas control and treatment system would be properly implemented.

The landfill monitoring system would also include a perimeter gas monitoring network. The monitoring network would use 18 monitoring wells/probes distributed along the entire landfill property perimeter within the native soil. Spacing of the wells would be approximately 1,000 feet along the north and east boundaries and 500 feet along the south and west boundaries near the neighboring residential area. The perimeter gas monitoring would include the analysis of Calderon air contaminants, in particular, benzene, vinyl chloride and total organic compounds measured as methane. The monitoring program would be conducted on a quarterly basis for 30 years.

(v) Long Term Maintenance of the Landfill Cap

The RAP requires the long term maintenance of the landfill cap. The post-closure maintenance of the cap would include inspections of the cover to check for surface cracking, settlement and/or surficial slumping. Any cover deficiencies identified would be repaired to ensure the integrity of the landfill cap.

(vi) Other Components of the RAP for the Upper Operable Unit

In addition to the components discussed above, the RAP provides specific requirements with regard to the use of pile foundation that is proposed for the site. The RAP also requires deed restrictions for the development of the site. These are both addressed below.

Piling Construction

The RAP anticipated that future development of the landfill site would use a pile foundation to support the buildings located over the landfill refuse. The RAP requires that the pile penetrations in the building areas incorporate a sealable sleeve made out of steel, and a geomembrane or geocomposite (a composite layer of geomembrane and bentonite) material that is fastened or adhered to the geomembrane liner. The sleeve would be attached between the piles and the liner and would provide controlled slack to allow for settlement. The piles would be driven to the bearing soil below the waste. The annular space between the piling and sleeve would be sealed with a polymer material to prevent landfill gas from migrating upward in this space.

During installation of the piles, some landfill gas may discharge to the atmosphere. Furthermore, some liquids contained within the refuse may migrate downward to the bottom of the pile penetration within the bearing soil. During the initial remedial design for the landfill cap and landfill gas collection system, further characterization and evaluation of the landfill gas occurrence and landfill liquid occurrence will be performed. Following further characterization, plans will be prepared that will include methods for minimizing and monitoring the discharge of landfill gas and the downward migration of landfill liquids. The plans, which will include a description of methodologies and installation procedures that are protective of human health and the environment, will be submitted to DTSC for review and approval prior to installation of the piles. DTSC's review will focus on the means by which the installation methods will be protective of human health and the environment. The installation contractor will also follow OSHA-compliant health and safety plans to further protect the workers and the public from unacceptable exposure to landfill gas and other potential hazards during construction.

Potential methods that may be used to mitigate discharge of landfill gas during pile installation include:

- work area and landfill perimeter air monitoring;
- the use of agents that reduce gas emissions, such as water spray or applicable foams;
- pre-installation of permanent vertical gas wells with a temporary extraction and gas treatment system prior to and during pile driving,
- further characterization of landfill gas occurrence across the landfill cells; and
- the implementation of the aforementioned health and safety plans.

Potential methods for mitigating impact to groundwater during pile installation include:

- proceeding with an end-bearing pile design, as compared to a friction pile design, which significantly reduces the depth of penetration into the soils beneath the refuse;
- the use of bentonite fluids to help seal the annual space between the pile and the bearing soils;
- further RAP-required groundwater monitoring in the LOU which will continue for many years after installation; and
- the operation of the RAP-required UOU groundwater containment system.

Deed Restrictions

Deed restrictions are a legal control to prohibit specific activities that could occur at the Project site. Under the RAP, deed restrictions must be recorded on the landfill site with the appropriate county recorders office to limit future land uses to commercial/light industrial activity, and to ban such uses as residential, hospitals, schools, and day care centers. In addition, the deed restrictions must limit activities on the landfill site such as deep excavations into the clay layer or buried waste or use of groundwater wells for domestic supply or for agriculture. Deed restrictions will also be used to grant right of access to specific areas of the site as needed for the implementation and monitoring programs required in the RAP.

The RAP provides that the deed restrictions would be approved by the DTSC prior to recording and would run with the property. The recording of the deed restriction is intended to put all potential buyers of the property on notice of the deed restrictions, which would remain in force regardless of future property transactions. To the extent that the proposed residential use is permitted by DTSC, based upon a final determination that the project design features are protective of residents' health and safety, the required deed restrictions would need to be modified to allow elevated residential development within certain specified areas of the site.

(b) Final Remedial Action Plan for the Lower Operable Unit

The Final RAP for the Lower OU addresses the potential impact of groundwater contamination in the Upper OU on the Lower OU. The Lower OU is defined as the deeper hydrostratigraphic unit beginning at the Gage aquifer and extending down to the Silverado aquifer.

In 1998, site-specific models (Dames & Moore, 1998) were developed to evaluate the hydrostratigraphic units of both the Upper and Lower OUs, specifically the position of the Gage aquifer, to assess the potential for downward migration of VOCs into the Lower OU. The result of the 1998 study supported the conclusion that the contamination previously attributed to the

Gage aquifer actually reflected conditions in portions of the overlying Bellflower Aquitard. In 2000, a hydrostratigraphic investigation was conducted to confirm the findings of the 1998 study. The conditions encountered during the 2000 investigation confirmed, with a high degree of precision, the interpretation that the Gage aquifer is located at a greater depth (by almost 100 feet) than previously interpreted in the Upper OU RAP. The DTSC has concurred with the findings of this study, which places the Upper OU/Lower OU boundary at a depth of approximately 220 feet below ground surface (bgs). This is deeper than the interpretation presented in the Upper OU RAP, which placed the top of the Gage aquifer at approximately 100 feet bgs. Figure 30 on page 294 provides a schematic hydrosratigraphic cross section illustrating the site model with regard to the aquifers. In addition, laboratory results for groundwater samples collected from the Gage aquifer indicated no detectable concentrations of VOCs or metals.[39] Barium and zinc concentrations were reported below MCLs for drinking water.

Based on groundwater monitoring and chemical fate and mobility modeling data, in conjunction with remedial actions for the Upper OU, the risk posed to the Lower OU is considered to be minimal. The Final RAP for the Lower OU concludes that additional remedial investigation of the Lower OU is not currently warranted since no VOCs are present at detectable concentrations in the Gage aquifer (Lower OU).[40] However, because of the potential for contamination of drinking water and to satisfy the applicable regulatory provisions,[41] a response action was selected as the remedy for the Lower OU as it will provide the necessary controls to detect any future chemical impacts to the Lower OU. Under the DTSC-approved remedy, the groundwater monitoring would be conducted on a quarterly basis for a period of two years, followed by semi-annual monitoring for an additional two years, and annual monitoring every third year thereafter for up to 50 years. If any VOC is detected in the Lower OU during that period, the monitoring events would be increased to quarterly for a period of two years.

The monitoring of the Lower OU began in January 2005. Sampling of the three Lower OU groundwater monitoring wells in the Gage Unit aquifer were conducted in April and July 2005. Consistent with sampling conducted prior to approval of the Lower OU RAP, the July 2005 groundwater samples do not show evidence of contamination.[42] These results differ from the April 2005 results in which very low levels of perchlorate in two of the three wells were detected. The April 2005 sampling also showed some phthalate detections. The April 2005 results may be an anomaly. The expanded database that will be created as a result of future

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[39] *URS/Dames & Moore, 2000.*

[40] *URS, Op. Cit, page 7.*

[41] *The regulatory provisions include CERCLA, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] Section 300.415(b)(2)), and the California Health and Safety Code section 25323.*

[42] *Letter dated August 10, 2005 from BKK Corporation to DTSC.*

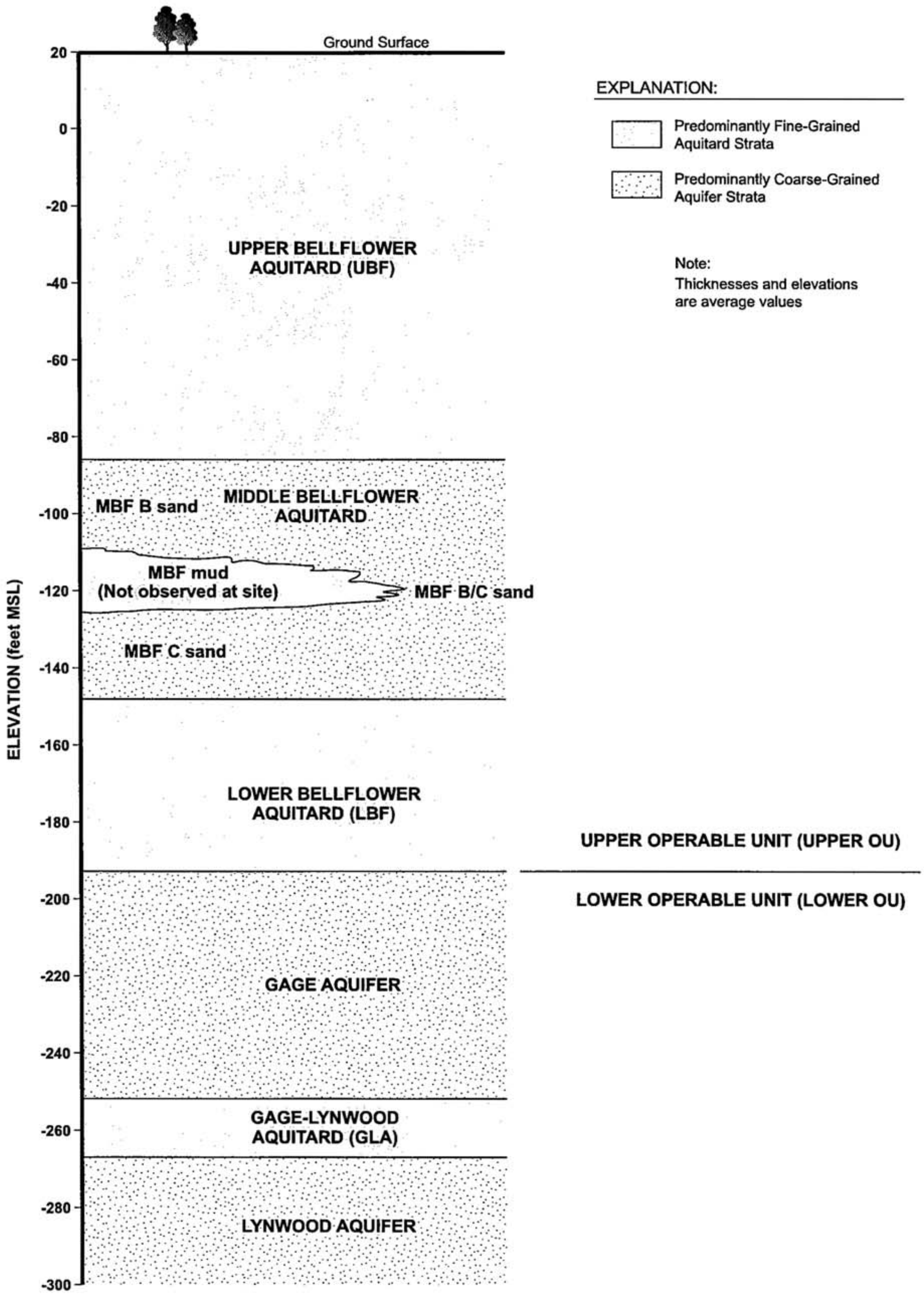

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Figure 30
Schematic Hydrostratigraphic Cross Section

Source: Dames & Moore 2000 and URS

RAP-required monitoring will yield a more thorough assessment of the groundwater quality in the Gage Unit aquifer. DTSC will oversee this monitoring and evaluate the database.

(iv) Risk of Upset Analysis

The Applicant has identified potential upset risks related to the presence of landfill waste at the Project site, during both (1) implementation of the Remedial Action (RA) and construction of the Project; and (2) operation of the developed Project. An analysis of the likelihood of such risks and an evaluation of how to address potential upsets was then completed.

With respect to implementation of the RA and the construction phase, the analysis focused on unanticipated and/or accidental events that if they happen, could adversely impact the environment. Safety-related incidences or physical accidents were not considered since they will be identified, minimized, controlled, and monitored by health and safety planning and implementation.

Potential construction or remedy-related upset scenarios that could impact the environment were identified as follows:

- Unintentional, sudden or significantly increased release of landfill gas (LFG) during RA activities;
- Significant off-site migration of airborne particulates during earth-work activities;
- Underground landfill contents fire; and
- Driving soil or groundwater contamination into deeper hydrostratigraphic units.

Each of the potential upset scenarios above has a low likelihood of occurring for the reasons explained in Table 28 on page 296. Table 28 also explains what would be done to eliminate or minimize impacts even in the unlikely event that any of these potential upset scenarios occurred.

With respect to the operation phase of the Project, multiple layers of protection and fail-safe features have been proposed to be incorporated into the remediation systems to protect future occupants and the surrounding community. A description of these systems is provided in paragraph 3.c. of this Hazards Section. As a consequence, simultaneous failure of the multiple protection systems would have to happen before a true upset scenario would occur. Nevertheless, for purposes of analysis, potential individual operation-related upset scenarios were identified as follows:

Table 28

Upset Scenarios During the RA and Construction Phases

Upset Scenario	Reason for Low – Likelihood	Possible Corrective Actions to Minimize Impacts
Unintentional, sudden or significantly increased release of landfill gas (LFG)	-Landfill is mature (inactive over40 years) with minimal LFG production capabilities. -Site would be characterized to better understand conditions of LFG, therefore extra caution would be employed in areas with high LFG potential -Continuous air monitoring of work area and perimeter would allow rapid corrective action -No planned exposure of waste during RA activities with the soil cover being maintained during construction -Pipeline trenches would be backfilled immediately after pipe installed	-Immediately stop operations -Cover LFG escape route with on-site soils -Re-evaluate construction procedures to eliminate problem -Use foam to control emissions- -Cover LFG escape route with on-site soils. -Use SCAQMD approved emissions control box
Significant off-site migration of airborne particulates during earth-work activities	-Continuous dust monitoring of work area and perimeter would be completed -Application of water for dust control would be frequent -Wind conditions would be monitored and activities adjusted accordingly -Weather forecast would be monitored for adverse wind conditions and activities adjusted accordingly	-Increase water application -Use specialized dust suppressants -Stop work during high wind periods
Underground landfill contents fire	-Likely that the methane to oxygen ratio would not be ideal to spark and/or ignite -No planned activities that would introduce oxygen into the waste prism -No significant exposure of waste to atmosphere during construction	-Continuous monitoring of subterranean temperatures and oxygen concentrations in work area -Heavily water work area -Inject water into waste -Stop work at predetermined action levels -Coordinate with local fire authorities

Table 28 (Continued)

Upset Scenarios During the RA and Construction Phases

Upset Scenario	Reason for Low – Likelihood	Possible Corrective Actions to Minimize Impacts
Driving soil or groundwater contamination into deeper hydrostratigraphic units	-Site characterized with known groundwater conditions at locations where piles would be driven -Use of displacement piles that impact only upper 20 feet of Bellflower Aquitard beneath waste -Engineered controls would be applied to specifically address this risk	-Modify pile driving procedures -Use bentonite slurry as seal material at bottom of piles -For wells, modify well design and construction methods, or properly abandon the well

Source: PCR Services Corporation.

- Failure of landfill gas extraction wells or conveyance piping;
- Failure of landfill gas vacuum system;
- Failure of landfill gas flare, blowers, or make-up gas;
- Failure of electrical power;
- Failure of landfill gas system instrumentation, data logger, or data transmitter;
- Failure of landfill gas alarms;
- Geomembrane liner (cap) puncture, tear, or seam separation;
- Failure of building protection system's impermeable liner attached to slab;
- Failure of methane detection sensors;
- Failure of groundwater injection or extraction wells or conveyance piping; and
- Failure of groundwater treatment and discharge system.

Each of the potential individual upset scenarios above has a low likelihood of occurring for the reasons explained in Table 29 on page 298. Table 29 also explains what would be done to eliminate or minimize impacts even in the unlikely event that any of these potential upset scenarios occurred. Moreover, as explained above, due to the redundancy of the systems,

Table 29

Upset Scenarios During the Operation Phase of The Project

Upset Scenario	Reason for Low Likelihood	Corrective Actions to Minimize Impacts
Failure of landfill gas extraction wells or conveyance piping	-System designed per local seismic standards -Design to use flexible pipe and joints to accommodate movement - Use of inert materials in construction -Extensive Construction Quality Assurance (CQA) Program -Established Institutional Control Program (ICP) to control damage -Routine and frequent monitoring and inspections would be completed	-Have spare parts and repair equipment on hand -Form an emergency response team (ERT) for rapid response with appropriate training -Have a 24/7 monitoring system with automated notification of ERT
Failure of landfill gas vacuum system	-System designed per local seismic standards -Have strict O&M program -Have back-up system -Design to use flexible pipe and joints -Extensive Construction Quality Assurance (CQA) Program -Routine and frequent monitoring and inspections would be completed	-Have spare parts and repair equipment on hand -Upgrade equipment as needed
Failure of landfill gas flare, blowers, or make-up gas	-System designed per local seismic standards -Have strict O&M program -Have back-up system -Design to use flexible pipe and joints -Extensive Construction Quality Assurance (CQA) Program -Fail-safe shut down controls would be included	-Have spare parts and repair equipment on hand -Upgrade equipment as needed -Form an emergency response team (ERT) for rapid response with appropriate training -Have a 24/7 monitoring system with automated notification of ERT
Failure of electrical power	-Have back-up generator -Have back-up batteries for sensors -Have strict O&M program	-Maintain back-up generator -Upgrade equipment as needed
Failure of landfill gas system instrumentation, data logger, or data transmitter	-Perform frequent inspections and diagnostics -Have strict O&M program -On-site operations and maintenance personnel will be present during much of the work week	-Have spare parts and repair equipment on hand -Upgrade equipment as needed

Table 29 (Continued)

Upset Scenarios During the Operation Phase of the Project

Upset Scenario	Reason for Low Likelihood	Corrective Actions to Minimize Impacts
	-Have back-up systems	
Failure of landfill gas alarms	-Perform frequent inspections and diagnostics -Have strict O&M program -Have back-up systems	-Have spare parts and repair equipment on hand -Upgrade equipment as needed
Geomembrane liner (cap) puncture, tear, or seam separation	-Use 40 to 60-mil LLDPE for strength and elongation to accommodate settlement -Bury liner at least 4 ft below surface -Liner under buildings protected by slab -Extensive Construction Quality Assurance (CQA) Program -Established inspection and repair program -Established Institutional Control Program (ICP) to control damage	-Conduct surface screening to identify any leaks -Have repair materials and equipment readily available
Failure of building protection system secondary liner	-Use 80 mil HDPE or equivalent for strength and longevity -Liner protected by slab -Extensive Construction Quality Assurance (CQA) Program -Established Institutional Control Program (ICP) to control damage	-Conduct surface screening to identify any leaks -Have repair materials and equipment readily available -Actively extract air space beneath buildings
Failure of methane sensors	Perform frequent inspections and diagnostics -Have strict O&M program -Have back-up systems -Employ only rugged, durable, and reliable sensors	-Have spare parts and repair equipment on hand -Upgrade equipment as needed
Failure of groundwater injection or extraction wells or conveyance piping	-System designed per local seismic standards -Design to use flexible pipe and joints to accommodate movement - Use of inert materials in construction -Extensive Construction Quality Assurance (CQA) Program -Established Institutional Control Program (ICP) to control damage -Routine and frequent monitoring and	-Have spare parts and repair equipment on hand -Form an emergency response team (ERT) for rapid response with appropriate training -Have a 24/7 monitoring system with automated notification of ERT

Table 29 (Continued)

Upset Scenarios During the Operation Phase of the Project

Upset Scenario	Reason for Low Likelihood	Corrective Actions to Minimize Impacts
	inspections will be completed	
Failure of groundwater treatment and discharge system	-System designed per local seismic standards -Have strict O&M program -Have back-up system -Design to use flexible pipe and joints -Extensive Construction Quality Assurance (CQA) Program	-Have spare parts and repair equipment on hand -Upgrade equipment as needed -Form an emergency response team (ERT) for rapid response with appropriate training -Have a 24/7 monitoring system with automated notification of ERT

Source: PCR Services Corporation

multiple and simultaneous failures would have to occur to create the potential for impacting human health or the environment. The likelihood of such multiple, simultaneous, and complete system failure is very low.

As part of the Remedial Design (RD) process, upset scenarios that could impact human health and the environment, during either the RA/construction phase or the operation phase of the Project, would be further evaluated and refined. Based upon that evaluation and refinement, design elements, engineering controls, and monitoring and contingency plans would be developed and incorporated into the remedial designs and specifications to minimize the potential for upset events and to establish plans for protection of human health and the environment should an upset event occur. DTSC review and approval of such design elements, engineering controls and monitoring and contingency plans would be a component of DTSC's review and approval of the final remedial designs and specifications for the Project.

(c) On-Site Oil and Water Wells

While the Project site is located beyond the boundaries of any oil and gas field, there is information that suggests two abandoned oil wells are located within Development Districts 1 and 2. These wells are identified as the Marigold-Del Amo and Kelly-Del Amo oil wells. The Marigold-Del Amo oil well was drilled in August 1955 and was abandoned in September 1955. The Kelly-Del Amo oil well was drilled in 1933 and was abandoned in December 1934. Both wells were drilled and abandoned with permits from the California Division of Oil and Gas, which is currently the Division of Oil, Gas, & Geothermal Resources (DOGGR). The Marigold-Del Amo and Kelly-Del Amo oil wells are believed to be located under approximately 50 feet of landfill waste and an estimated 20 feet of groundwater.[43]

In addition to the oil wells, State of California Department of Water Resources (DWR) records indicate that water well 4S/13W-7H1 was installed on the site in October 1948. DWR records indicate that the well was monitored in October 1987. The location of the water well is not clear. The well location as plotted based on DWR records, indicates that the well is located on the former haul road to the east of the Kelly-Del Amo oil well. However, based on site investigations conducted in 1992, the well could be located within the landfill waste prism to the southeast of the Kelly-Del Amo oil well. In either location, the water well is located within Development District 2.

The approved RAP for the Upper OU called for an additional investigation to be conducted during the implementation phase of the RAP to locate the three wells and to address issues such as the risk of downward migration of contaminants into lower aquifers. To the extent feasible, the RAP requires that the former water well and two oil wells be located and abandoned to meet current regulatory standards. The RAP indicates that the location of the wells is to be re-surveyed using available historic data. Survey locations are then to be compared to the prior investigations. Based on the results of these investigations, an excavation plan is to be considered, which is limited to those areas with the highest probability of finding the oil and water wells. The limitation is necessary because of the risk associated with excavating buried hazardous substances. The RAP requires that the health risk be evaluated prior to any excavation. Regulatory approval of all plans and permits must be obtained prior to any excavation activities.

A December 1998 Allwest Geoscience, Inc. report concludes that well re-abandonment would be infeasible due to the following factors: (1) oil well casings are estimated at depths in excess of 50 feet below existing ground surface; (2) 20 feet of perched groundwater exists above the estimated top of the well casing; (3) potential health risks and liabilities from vapor emissions, particulates, excavated materials, and leachate; and (4) fire and explosion risks. This report has not been approved by DTSC. DTSC is continuing to evaluate the feasibility of well abandonment.

Current documentation regarding the location and abandonment of these wells are unclear. If the wells are present and can be found, it is possible that they were not abandoned consistent with today's requirements to minimize downward groundwater migration around the well casing. During RAP implementation, additional evaluations regarding well locations and

[43] *Workplan for Oil and Water Well Closure at LA Metromall, LLC, Allwest Geoscience, December 1998.*

conditions will be completed with DTSC input and a determination will be made regarding the need for and feasibility of re-abandoning these wells.

(2) Development District 3

Development District 3 currently contains vacant, undeveloped land covered with vegetation. There were historically three small structures, a baseball field, and small stockpiles of asphaltic material in the western portion of Development District 3. Aside from this, the area does not appear to have been developed in the past. Based on historical records, all or some of the three small structures may have been used as a dairy, likely for the sale of milk products. However, for the past 15 years, the property has been used on a limited basis to store construction equipment and materials. Minor stained areas associated with the construction equipment exist in the area where the equipment is stored. No other evidence of environmental concerns such as stained soils, stressed vegetation or indications of the presence of underground storage tanks were observed or reported in the information reviewed. Based on historical geotechnical investigations, fill soils exist to depths of approximately 8 feet.

A soil-vapor survey completed in 1990 identified the presence of VOCs in soil vapor approximately 9 feet below ground surface (bgs) within Development District 3. The presence of VOCs suggested at that time that some landfill gases may have been migrating into Development District 3 from former landfills north and/or south of the property. More recent soil-vapor sampling in shallow soil did not detect the presence of VOCs.

Based on the site reconnaissance, interviews, and records review performed as part of the environmental assessments, there is no evidence to suggest that Development District 3 is a potential source of groundwater contamination. However, several sites in the immediate vicinity have histories of environmental contamination including the Cal Compact Landfill to the south of Del Amo Boulevard (i.e., Development Districts 1 and 2), the Del Amo Superfund site, the Gardena Valley Landfill and the Southwest Conservation Landfill. These sites have the potential to result in groundwater contamination within Development District 3 due to the migration of contaminated groundwater and/or subsurface vapors.

A file review was completed at the Los Angeles Regional Water Quality Control Board for the Brownfield's Economic Development Initiatives (BEDI) Properties and for the properties adjoining the site to the north and south. The BEDI properties, northwest, west and southwest of Development District 3, all have Phase I reports associated with each property. The Phase I documents indicate all the properties were former landfills. Pipelines adjacent to Del Amo Blvd or on the individual properties could also impact Development District 3 due to their potential for leaking. Phase II activities have been proposed for each of these properties. The Phase II work is for soil and soil-vapor sampling for VOCs, semi-volatile organic compounds, metals, petroleum compounds and methane. The proposed sampling depths are 5 to 20 feet depending on the property. At this time, it is unclear if the proposed Phase II activities have been completed.

The Dominquez Hills Golf Course (formerly a portion of the BKK Landfill) is located north of Development District 3 and the lead regulatory agency is DTSC. Potentially impacted groundwater from the golf course may have migrated into Development District 3 due to the site's proximity and likely southerly groundwater flow direction.

The former Cal Compact Class II Landfill (Development Districts 1 and 2) is located immediately south of Del Amo Boulevard and is likely downgradient of the subject property. The First Semi-Annual 2005 Groundwater Monitoring Report, the most recent report available, was reviewed. Six groundwater monitoring wells are located either in Del Amo Boulevard, between Main Street and the I-405 overpass, or on the northern perimeter of the former Cal Compact Class II Landfill. Wells GW-1B, GW-1C, GW-2B and GW-2C are screened in the middle portion of the Upper Bellflower Aquitard. Wells MWG-1 and GW-2 are screened in the upper portion of the Middle Bellflower Aquitard. With the exception of monitoring well GW-2, VOCs were detected in the wells described above located nearest to Development District 3.

An initial Phase II investigation was completed for Development District 3 because a prior environmental investigation of the site identified the presence of elevated concentrations of VOCs and methane in subsurface soil vapor, anticipated to be due to the proximity to former landfills. As part of the Phase II investigation, soil vapor samples were collected at 5 feet bgs at 12 locations across the area. No VOCs were identified in the samples collected and analyzed on site by USEPA Method 8260B above the method detection limit. Methane was detected in five samples at concentrations only at or slightly above the detection limit. As a confirmatory measure, two samples were collected in Summa canisters and submitted for off-site analysis by USEPA Method TO-15. Thirteen VOCs and methane were identified at very low concentrations in these samples.

In addition, five shallow soil samples were analyzed for the possible presence of metals, pesticides, polychlorinated biphenyls (PCBs) and semi-volatile organic compounds. The detected metals concentrations were within general background levels with the possible exception of barium. Only 4,4' DDE, a pesticide, was detected in one soil sample. A screening-level risk evaluation of these data indicates that there are likely no unacceptable risks associated with either the barium or 4,4'DDE or the low levels of VOCs either individually or on a combined basis.

The soil-vapor survey findings of this initial Phase II investigation are different from the results of the initial soil vapor survey conducted in 1990. However, the consistency of the results coupled with the independent confirmation of soil vapor results by off-site analysis suggest that the newer data are of good quality. Moreover, it is possible that the 5 foot bgs sampling depth resulted in the collection of vapor from loose fill soils that could be subject to barometric pumping which can cause constant turnover of soil vapor. It is also possible that a deeper investigation of soil-vapor quality could yield different results. Therefore, additional Phase II activities have been recommended to further evaluate potential vapor intrusion and worker health and safety concerns by completing deeper soil-vapor sampling.

3. ENVIRONMENTAL IMPACTS

a. Methodology

The analysis of Development Districts 1 and 2 and the information provided regarding remediation activities is based on the approved RAPs for the landfill site.

The analysis of Development District 3 is based on existing studies. A draft Phase I and limited Phase II investigation were completed to evaluate potential environmental concerns related to proposed development within this portion of the Project site. The Phase II investigation was performed as a reconnaissance level survey to evaluate environmental conditions due to the close proximity of several landfills and past evidence of VOCs and methane in subsurface soil vapor.

b. Thresholds of Significance

The Project would result in a significant impact with regard to hazards and hazardous materials if the Project would expose people or structures to substantial risk resulting from the release of a hazardous material, or from exposure to a health hazard, in excess of regulatory standards.

c. Project Design Features

The RAP for the Upper Operable Unit was prepared during the time of the proposed commercial and industrial Metro 2000 development and assumed no residential development. The proposed Project would include elevated residential development on a podium deck with open-air parking below living spaces. In addition, elevated residential development would include multiple layers of physical protection for occupants. The primary layers of protection include:

- the landfill gas collection system which will be operated and monitored 24-hours per day, seven days per week;

- the primary impermeable membrane featured within the landfill cap;
- the passive gas venting system below the grade-level foundation that rests on piles;
- an automated methane gas detection system which would be monitored on a regular basis;
- the secondary membrane which would be attached to the bottom of the grade-level foundation;
- the ground-level open-air parking level; and
- the building ventilation systems.

At a conceptual level, DTSC has indicated that elevated residential use is appropriate as there is no potential for direct contact with surface soil in that there are no backyards or garden areas and the potential for vapor intrusion is mitigated by the presence of open space below living spaces. (See Appendix E for a copy of letter from DTSC) DTSC's indication that residential development within Development District No. 1 is appropriate at a conceptual level was based upon:

- age and character of the landfill;
- analysis of conceptual design and construction quality assurance details for the landfill cap provided by the Applicant;
- the consideration that data indicate that the landfill gas occurrence in this portion of the landfill is less than in other areas of the landfill;
- the conceptual refinements to the landfill gas collection and treatment system;
- the detailed concepts for a building protection system;
- the conceptual podium design which features elevated residential units;
- the redundancies and multiple layers of protection that are anticipated in conceptual integrated design for the landfill cap, landfill gas collection and treatment systems, and the building protection systems;
- the fact that a post-remediation risk assessment (including confirmation sampling) will be performed to ensure that systems that were designed to be protective of human health and the environment indeed are after construction and a period of operation;

- the ability to certify that all remedial/protection/monitoring systems are fully operational and performing as designed prior to providing its approval for building occupancy;
- the conceptual gas monitoring and detection systems;
- the conceptual long-term operation and maintenance program;
- DTSC's continued involvement with review and approval before any alterations of the remedial systems; and
- the institutional controls that will be reviewed and approved by DTSC prior to formal approval.

Finally, DTSC will require detailed plans in order to make a final determination that elevated residential use is protective of human health and safety. As stated above, following construction and a sufficient period of operation of the remedial systems, DTSC will:

- evaluate remedial system performance data collected by the Applicant;
- evaluate confirmation sampling of media (soil and air);
- evaluate a post-remediation risk assessment prepared by the Applicant; and
- when all are sufficient and acceptable to DTSC, will certify that the systems are performing as designed and intended.

DTSC's certification will be one of the necessary requirements for the City to issue any Certificate of Occupancy for buildings within the development. Following certification by the DTSC, 5-year reviews of all remediation systems will also be completed to ensure long-term protection of human health and the environment.

The Applicant is proposing to implement the RAP for the Upper OU, with refinements in certain technologies based on improvements in science and engineering since 1995, but with the same performance goals of controlling exposure pathways and migration. (The proposed refinements are provided in detail in a document that was submitted to DTSC and is provided in Appendix E of this EIR.) With regard to the primary membrane of the landfill cap, the Applicant proposes to use a Linear Low Density Polyethylene (LLDPE) membrane rather than a clay cap for the waste prism. The 1995 RAP included the traditional clay cap that emerged as the standard prescriptive design in the late 1980s and early 1990s. Since that time, alternative cap materials have been found to be effective. The geomembrane would be used instead of the compacted clay to provide the infiltration barrier function of the landfill cap. The proposed cap includes strip drains and will be sloped to provide drainage of infiltrated water off the membrane surface. In addition, the membrane provides a more robust barrier that minimizes landfill gas migration to land surfaces.

In addition, alternative designs may be used to enhance gas control and groundwater treatment. The Landfill Gas Extraction and Treatment System would be similar to the system described in the RAP but would be improved by adding both horizontal and vertical wells within the site and not just around the landfill site boundary. The system would be designed to automatically collect condensate and deliver landfill gas to a treatment facility that would include a flare system.

The Applicant may also propose a modification to the groundwater remedy approved in the RAP. The modification, if proposed, would use in-situ bioremediation to reduce the source of contaminants impacting groundwater in the Upper OU. There are a number of studies that need to be conducted to determine whether in-situ bioremediation would be an effective alternative or a supplement to extraction and treatment of groundwater, as required in the RAP. If the studies indicate in-situ bioremediation is likely to be effective, the Applicant would seek DTSC approval of the modification, as required under applicable regulations.

Changes in the design of the remediation system would only be allowed if DTSC determines that the proposed design accomplishes the same performance objectives as the previously approved design and is protective of human health and the environment. Specific details on the remedial activities that would be implemented on the landfill site would be provided in the RD. The RD would be prepared and submitted to DTSC prior to initiating any remedial actions. In addition, DTSC would formally approve any change in RAP requirements, as required under applicable regulations.

d. Project Impacts

(1) Development Districts 1 and 2 (Former Landfill Site)

The RAP for the Upper OU was approved by DTSC in 1995 and the RAP for the Lower OU was approved by DTSC in 2005. DTSC concurred with the conclusions in the Metro 2000 EIR regarding potential impacts resulting from the construction of the landfill cap. DTSC conducted a separate environmental analysis to analyze other components of the RAP, i.e., the landfill gas collection and treatment system and the groundwater treatment system. DTSC prepared a Negative Declaration for the RAP for the Lower OU. These analyses concluded that implementation of the RAPs would result in less than significant impacts with regard to all environmental issues of concern. Therefore, the implementation of the RAPs does not require further review under CEQA and, as such, is not subject to analysis in this EIR.

With regard to the implementation of the Upper OU RAP, as indicated above, the Applicant proposes certain refinements, including use of a synthetic membrane cap rather than a clay cap to cover the on-site waste prism, enhancement of gas control and in-situ bioremediation to reduce the source of contaminants impacting groundwater in the Upper OU. Any changes in the design of the remediation would only be allowed if DTSC determines that the proposed design accomplishes the same performance objectives as the previously approved design and is protective of human health and the environment. Therefore, no greater impacts would result from the proposed modifications to the approved RAP The potential air quality and noise impacts during construction of both the approved RAPs as well as the proposed modifications are analyzed in Section IV.G, Air Quality and Section IV.H, Noise, of this EIR.

Furthermore, DTSC is responsible for evaluating health and safety issues related to the proposed residential development on Development Sites 1 and 2. DTSC provided a letter dated February 9, 2005 indicating the "DTSC believes the concepts presented for the proposed development are appropriate at a conceptual level and could be protective of human health and safety, however, as is common for all projects under DTSC's authority, more detailed plans are necessary before DTSC can make such a final determination." No residential development would occur until DTSC formally concludes that the development would be implemented in a manner that is protective of human health and the environment.

With regard to existing on-site oil and water wells, the approved RAP for the Upper OU required additional investigation to locate the three wells and to address issues such as the risk of downward migration of contaminants into the lower aquifers. As a result, DTSC would review and approve additional work in compliance with the RAP relative to the wells.

(2) Development District 3

Based on the draft Phase I and preliminary Phase II conducted for the 11-acre portion of the Project site, no specific remediation efforts would be implemented. However, additional Phase II activities are recommended to further evaluate potential vapor intrusion and worker health and safety concerns by completing deeper soil-vapor sampling. In addition, Development Site 3 would be subject to the provisions of California Code of Regulations, Title 27, Section 21190 that govern development activities within 1,000 feet of a closed landfill. These provisions include such measures as the installation of vapor mitigation and monitoring devices. As the construction and operation of the proposed land uses within Development Site 3 would be in compliance with all applicable regulations, potential risks would be reduced to a less than significant level.

4. MITIGATION MEASURES

The certified CEQA documentation for the Upper OU RAP includes mitigation measures to reduce the potential construction impacts associated with the implementation of the clay cap.[44] The mitigation measures set forth in that document are in the environmental areas of earth, air quality, surface and groundwater, natural resources (use of nonrenewable resources), risk of upset, and energy. Section 7.4 of the Final RAP for the Upper OU requires that certain mitigation measures be performed to minimize potential impacts related to remedial activities. (See Appendix E for a copy of the Upper OU RAP.)

The following mitigation measures are required to ensure that any revisions to the RAP are approved by DTSC and that access to the necessary areas for monitoring programs required in the RAPs would be provided.

Mitigation Measure D-1: To the extent the Applicant desires to refine or modify requirements in the RAP, the Applicant shall provide documentation to the City indicating DTSC approval of such refinements or modifications.

Mitigation Measure D-2: The Applicant shall provide documentation to the City indicating DTSC shall permit the proposed residential uses in Development District 1 prior to issuance of any permits for such residential development in Development Districts 1.

Mitigation Measure D-3: The Applicant shall provide documentation to the City indicating both on- and off-site risks associated with RAP construction have been evaluated to the satisfaction of the DTSC, and at a minimum, perimeter air monitoring shall be completed for dust, particulates, and constituents determined to be Constituents of Concern (COCs).

Mitigation Measure D-4: The Applicant shall provide to the City, documentation indicating that (1) a post remediation risk assessment has been prepared by the Applicant and approved by DTSC; and (2) DTSC has certified that the remedial systems are properly functioning prior to issuance of a Certificate of Occupancy.

Mitigation Measure D-5: The Applicant shall provide documentation to the City indicating that applicable remedial systems and monitoring plans, including the location of the flare and treatment facility are in accordance with applicable SCAQMD regulations.

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[44] *The Negative Declaration was prepared for the construction, operation and maintenance of the proposed landfill gas collection and treatment system and the groundwater treatment system.*

5. CUMULATIVE IMPACTS

Section III, Environmental Setting, of this EIR identifies 36 related projects within the Project study area. The analysis contained in this section focuses on the implementation of the approved RAPs for the Upper OU and the Lower OU. The purpose of the RAPs is to provide protection for human health and the environment. Development of the 11-acre portion of the Project site would occur in compliance with applicable regulations regarding hazardous materials. All new development would occur in compliance with applicable regulations relative to hazardous materials. Therefore, the Project would not result in a significant impact with regard to hazards. All of the related projects would be required to comply with applicable regulations with regard to hazardous materials. Therefore, no significant cumulative hazards or hazardous materials impacts are anticipated.

6. LEVEL OF SIGNIFICANCE AFTER MITIGATION

While the Project would not result in a significant impact with regard to hazards and hazardous materials, mitigation measures are provided to ensure that any revisions to the RAP are approved by DTSC.