

Prepared for

The Presidio Trust
67 Martinez Street
San Francisco, California

CONSTRUCTION COMPLETION REPORT LANDFILL E REMEDIATION PRESIDIO OF SAN FRANCISCO, CALIFORNIA

Volume I of II
(Main Report and Appendices A & C-F)

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Project Number: WR1280

February 2012

CONSTRUCTION COMPLETION REPORT LANDFILL E REMEDIATION

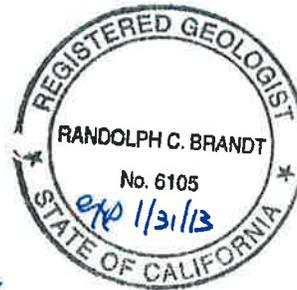
PRESIDIO OF SAN FRANCISCO, CALIFORNIA

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LIST OF ACRONYMS AND ABBREVIATIONS

AC	Asphalt Concrete
ADMP	Air and Dust Monitoring Plan
BAPR	Barnard Avenue Protected Range
BMPs	Best Management Practices
C&T	Curtis and Tompkins
CCR	Construction Completion Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	Chemicals of Concern
CQA	Construction Quality Assurance
DTSC	California Environmental Protection Agency, Department of Toxic Substances Control
EBMUD	East Bay Municipal Utilities District
ECB	Erosion Control Blanket
FS/RAP	Feasibility Study/Remedial Action Plan
bgs	Below Ground Surface
GPS	Global Positioning System
HASP	Health And Safety Plan
HDPE	High Density Polyethylene
LFE	Landfill E
LFG	Landfill Gas
LUCMRR	Land Use Controls Master Reference Report
LUCs	Land Use Controls
O&M	Operations and Maintenance
OCPs	Organochlorine Pesticides
OER	Ordnance and Explosives Remediation, Inc.
PAHs	Polycyclic Aromatic Hydrocarbons
PE	Professional Engineer
PM	Particulate Matter
PTMP	Presidio Trust Management Plan
RDIP	Remedial Design and Implementation Plan
RWQCB	Regional Water Quality Control Board
SVOCs	Semi-volatile Organic Compounds
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
THEA	Tennessee Hollow Upper Watershed Revitalization Project

	Environmental Assessment
TPH-d	Total Petroleum Hydrocarbons as diesel
UXO	Unexploded Ordnance
VMP	Vegetation Management Plan and Environmental Assessment for the Presidio of San Francisco

1. INTRODUCTION

This document presents the Construction Completion Report (CCR) for construction of an engineered soil cover at Landfill E (LFE, or Site) at the Presidio of San Francisco, California (the Presidio). The CCR describes the processes and procedures that were implemented as part of remediation of LFE, as well as design modifications that were made during construction. This CCR includes required elements specified in the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) Guidance Document *Environmental Oversight Agreement (DTSC, 2004)*.

1.1 Project Overview

Construction of the engineered soil cover at LFE was performed consistent with the requirements of the approved Final Remedial Design and Implementation Plan (RDIP) prepared by Geosyntec Consultants, Inc. (Geosyntec, 2011c) on behalf of the Presidio Trust (the Trust). The RDIP, which was approved by the DTSC on June 21, 2011 (Appendix A), presented the implementation plan for the preferred remedy selected in the Final Feasibility Study and Remedial Action Plan (FS/RAP) for LFE, prepared by Geosyntec on behalf of the Trust (Geosyntec, 2011b). The FS/RAP summarized the studies undertaken to evaluate the nature and extent of fill materials and associated impacts, identified the constituents of concern (COCs), presented and evaluated potential remedial alternatives for the site, and described the preferred alternative.

1.2 Description of LFE

LFE was created by filling a portion of the western drainage of the Tennessee Hollow area, previously used as a small-arms firing range designated the Barnard Avenue Protected Range (BAPR). LFE is approximately 4.8 acres in area and is bounded by Barnard Avenue on the northwest and Quarry Road on the southwest (CH2M Hill, 2005). Fernandez Road is approximately 500 feet to the north (Figure 1-1).

LFE is believed to contain soil mixed with building debris, municipal-type solid waste, and chemical waste (Montgomery Watson, 1999). The total landfill volume at LFE is estimated to be 107,500 cubic yards (EKI, 2003). LFE has a maximum depth of fill of approximately 39 feet below ground surface (ft bgs) in the north-central portion, and pinches out at the canyon walls. Figure 1-2 presents a site plan of LFE with post-construction topography and landfill limits.

COCs present in the soil and debris fill that could pose potential risks to human health and the environment are listed below (Geosyntec, 2011b):

Metals	Pesticides	Polycyclic Aromatic Hydrocarbons (PAHs)
Antimony Arsenic Barium Cadmium Copper Lead Selenium Silver Vanadium Zinc	4,4-DDE 4,4-DDT Tetraethyl lead	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Chrysene Fluoranthene Indeno(1,2,3-cd)pyrene Naphthalene Phenanthrene Pyrene

The FS/RAP concludes that COCs have not been detected at concentrations or frequencies in groundwater that pose a risk to human health or the environment (Geosyntec, 2011b).

1.3 Remedial Action

The FS/RAP was prepared by Geosyntec on behalf of the Presidio to provide an analysis of remedial alternatives for LFE (Geosyntec, 2011b). The following remedial alternatives were evaluated in the Final FS/RAP:

- Alternative 1: No Action to remediate soil or groundwater.
- Alternative 2: Complete Removal and Monitoring. Excavation, transportation, and disposal of contaminated soil and landfill material. Post-closure monitoring of groundwater and surface water.
- Alternative 3: Containment and Monitoring. Construction of an engineered cover system over contaminated soil and landfill material, including implementation of land use controls (LUCs) and installation of a landfill gas (LFG) venting system and surface water drainage system. Post-closure long-term monitoring of groundwater, surface water, LFG, and the cover. Three types of cover systems were evaluated: Alternative 3a) Engineered Soil Cover; Alternative 3b) Engineered Clay Cover; and Alternative 3c) Engineered Geosynthetic Cover.

The FS/RAP identified Alternative 3a as the preferred remedy for remediation of LFE. Alternative 3a provides a high level of protection to human health, is implementable, readily maintained and monitored, and is cost-effective to implement. Containment of the landfill also allows future site restoration and development in accordance with the Tennessee Hollow Upper Watershed Revitalization Project Environmental Assessment (THEA) (Trust, 2007), Presidio Trust Management Plan (PTMP) (Trust, 2002), and Vegetation Management Plan and Environmental Assessment (VMP) (Trust and NPS, 2001).

1.4 Remedial Design

The RDIP was prepared by Geosyntec on behalf of the Presidio to present the design and provide details of the implementation approach for the preferred remedy for LFE (Geosyntec, 2011b). The primary elements required to design closure of LFE are excavation and final grading plans, supported by slope stability analyses, long term landfill settlement evaluations, landfill gas control, and drainage and erosion control systems. A brief summary of these closure design elements are described below:

- **Grading Approach and Plans** – The final grading contours for LFE are designed to promote lateral run-off of surface water and maintain positive slopes after settlement for surface water runoff. The top deck area is designed with minimum grades of 2%. The north slope is designed to have approximately 3H:1V grades throughout.
- **Seismic Hazard Evaluation** – LFE is located in an area of high seismicity. As a result, the site can expect strong shaking during a seismic event. A seismic hazard evaluation was performed to assess the degree of shaking that the landfill can expect. The design earthquake for LFE remediation is a magnitude 7.9 earthquake on the San Andreas Fault approximately 5.6 miles from the site with a peak ground acceleration of 0.36g.
- **Global Slope Stability** – Geosyntec performed slope stability analyses along two cross-sections through LFE. Analyses included static slope stability and an evaluation of seismically induced deformation. A static factor of safety greater than or equal to 1.5 was achieved for all landfill cross-sections analyzed. Seismically induced deformations of between 4 and 11 inches under the design earthquake were computed, which fall within the acceptable range for the standard of practice for unlined landfills.

- **Cover Slope Stability** – The stability of the cover system on the steep 3H:1V north slope was evaluated using infinite slope stability techniques for a range of strength parameters. The required minimum strength envelopes needed to achieve adequate stability of the cover soils was evaluated. Strength testing performed for the East Bay Municipal Utility District (EBMUD) Miller Road soil source that was ultimately used for north slope cover was found to exceed the minimum design strength requirements.
- **Landfill Settlement** – A key component of landfill cover design is establishment of sufficient slope such that positive drainage off of the cover is maintained and infiltration is minimized. The cover for LFE incorporates 2% minimum slopes on the top deck, and primary drainage swales sloping at approximately 1.5% towards the north slope. Settlement analyses performed to evaluate the potential long term slope configuration after settlement indicated that final closure areas are anticipated to have positive drainage throughout the 30-yr post-closure maintenance period. The concrete lined v-ditch on the eastern side of the landfill conforms to cover grades and has limited areas with less than 1% slope, but is anticipated to have minimal settlement as it at the margins of the landfill.
- **Landfill Gas System** – Based on the presence of localized pockets of methane within LFE, Geosyntec performed a conservative evaluation of the LFG generation potential at LFE, and designed an LFG collection and passive venting system. The LFG collection system design is not intended to prevent landfill gas from migrating upwards through the cover soils, but rather to provide an easy path to the atmosphere such that if cover soils in some areas are of low permeability, the LFG will have an escape path rather than being forced to migrate laterally beyond the limits of the landfill. Based on the evaluation of LFG generation potential in conjunction with air dispersion modeling from LFG vents, Geosyntec developed two scenarios for passive venting. Short 4 ft tall, 4-inch diameter LFG vents can be used while enclosed within a fence providing an offset of 1 m (3.3 ft) around each vent. Taller 13 ft tall, 4-in diameter LFG vents are adequate without the use of the fence enclosure. The shorter 4 ft tall vents were constructed as part of the final closure.
- **Surface Water Management** – The LFE surface water management system was designed to manage the 100-yr, 24-hour storm event. The surface water management system is separated into a west and east side.

Offsite runoff enters the western system from the existing access road near the southeast corner of the landfill, as well as from a natural drainage channel entering near the southwest corner. This water is conveyed within the primary western channel to the northwest corner of the landfill top deck, where it enters a buried pipe that discharges on a riprap energy dissipation pad at the northwestern toe of the landfill.

A smaller amount of runoff enters the eastern conveyance, starting near the southeast corner of the landfill and continuing to the approximate midpoint of the eastern side of the landfill. At this point, the conveyance transitions to a buried pipe, collecting additional runoff from an additional drop inlet near the northeastern corner of the top deck, as well as from two offsite pipes draining surface water from Quarry Rd east of the landfill.

A separate slotted trench drain, drop inlet, and associated buried pipe collect runoff from the planned paved area at the northern end of the LFE top deck. This water discharges to a third riprap energy dissipation pad at the northeastern toe of the landfill. While originally designed to discharge to a water quality basin at the toe of the landfill, due to schedule implications during construction, pavement of the top deck was postponed to a future date, such that the water quality basin was no longer needed.

Details of the above elements can be seen on the as-built drawings and construction photographs in the Construction Quality Assurance (CQA) report included as Appendix B.

1.5 Implementation Approach

Implementation of the preferred remedy at LFE included the following general steps:

- **Landfill Consolidation and Grading** – This step involved regrading the existing landfill material within the established limits of Landfill E. Landfill material was excavated in areas of high elevation and recompactd in areas of low elevation relative to the excavation grading plan. Channel alignments were excavated to design grades and confirmation sampling was performed in areas at the landfill perimeter where no visible landfill material or associated fill soils were observed, indicating possible native ground. Excavation and backfill of a clean soil corridor for future buried utilities and planting areas were performed as part of this effort. Once landfill materials were consolidated and trenches were backfilled, the

subgrade surface was compacted and graded as the foundation layer for the clean soil cover.

- **Landfill Gas System Construction** – This step involved excavation and backfilling of LFG collection trenches on the north face and top deck, excavation and backfilling of LFG vents, followed by installation of the LFG geocomposite layer over the landfill top deck,. Geomembrane was then installed above the LFG geocomposite along the western channel alignment.
- **Engineered Soil Cover Construction** – This step involved placement and compaction of a minimum 2-foot thick clean soil cover over the landfill to generally meet the elevations shown on the final grading plan.
- **Final Construction Elements** – In this step, LFG vents were completed and remaining surface water elements (channels, culverts, drop inlets, energy dissipation, etc.) were finalized. Erosion control Best Management Practices (BMPs) were installed at this stage as well.

Further details of these activities are included in Section 3. Please note that due to space limitations, schedule, and associated construction sequencing, not all of the construction elements were performed in the order presented above.

1.6 Project Organization

Figure 1-3 shows the project organization chart for the remedial construction project. Key members included the Trust (Owner, Project Manager, Construction Manager), California Environmental Protection Agency, Department of Toxic Substances Control (DTSC; regulator), Geosyntec (Designer and CQA Engineer), and Guinn Construction (Guinn; General Contractor). Several other entities within the Trust participated in the design process and provided input or support during construction.

1.7 Report Organization

The remainder of this CCR is organized as follows:

- **Section 2: Site Preparation Activities** – Describes work activities performed prior to start of landfill grading, including measures implemented to protect natural resources; planning documents, permits, and construction submittals submitted for

agency review; public outreach programs; and temporary facilities installed in support of remedial construction work.

- **Section 3: Construction Activities** – Describes work performed during grading and cover construction activities, from site clearing and debris removal through establishment of post-construction erosion control BMPs;
- **Section 4: Design Modifications and Field Variances** – Lists design modifications made during the course of construction either in response to construction conditions or to better accommodate long term site use. Further discussion of design modifications is provided in the CQA report included as Appendix B.
- **Section 5: Landfill Material Characterization and Disposal** – Describes the activities performed to classify or characterize mulch and landfill material that were removed from the site. Includes documentation of final disposal of these materials.
- **Section 6: Summary and Conclusions** – Summarizes results of remedial action with respect to project remedial action objectives.
- **Section 7: References** – Provides a list of documents referenced in this CCR.

Tables, Figures and Appendices are included at the end of this CCR.

2. SITE PREPARATION ACTIVITIES

2.1 Public Outreach

The Trust held several meetings and presentations with the public and Restoration Advisory Board (RAB) during the design phase. In Fall 2010, the Trust notified the East Housing District neighbors of the tree removals and installed temporary signs notifying the public of upcoming remedial construction activities. In addition, the Trust positioned Public Information Coordinators (PICs) around the construction area prior to and during construction. The Trust Public Affairs Department continually e-mailed public notifications and regular updates to nearby residents and interested parties before and during construction. The DTSC were notified of the construction start date two weeks prior to construction. Information about the project, schedule, and a copy of the RAP were made available on the Trust website.

2.2 Tree Removal

In November/December 2010, prior to the start of the 2011 bird nesting season, the Trust hired Fallen Leaf Tree Service (Fallen Leaf) to cut and remove or shred trees within the planned work limits. In addition to tree removal, Fallen Leaf cut and shredded vegetation on the top deck, north slope, and around the landfill perimeter. Mulch from the tree shredding operation was either hauled offsite, or spread as mulch for erosion control during the 2010/2011 rainy season.

2.3 Sewer Relocation

During design, it was observed that approximately 150 ft of 6-inch diameter sewer pipe lay within the LFE limit of landfill material. The sewer line serviced Buildings 812, 814 and 816 along Quarry Road east of LFE (see Figure 1-2). In June and July 2011, prior to start of remedial construction at LFE, Guinn installed three new manholes along with a new sewer main and related laterals, and abandoned the old sewer line. The work was performed prior to the start of LFE remediation in order to minimize interruption of service to the residents during the landfill remediation project. All sewer relocation work was performed outside of LFE limits. The abandoned sewer line crossing LFE was subsequently removed, crushed, and incorporated within the LFE landfill material during site clearing activities for the LFE remediation project.

2.4 Fencing

Security fencing and construction signage was installed around the site boundary by Guinn prior to the start of grading activities. In addition, Guinn hired a security guard to be present on nights and weekends to enhance site security and to control access to the site.

2.5 Temporary Facilities

During mobilization, Guinn installed the following temporary facilities in the staging area at the southern end of Barnard Ave.:

- one construction trailer for equipment storage and field office; and
- sanitation facilities consisting of two portable toilets and one wash station.

Geosyntec installed one temporary 10-ft steel container in the staging area for storage of testing equipment.

2.6 Trail Closures and Traffic Controls

Road closure signs, traffic cones, and barricades were placed at the intersection of Barnard Ave. and Fernandez St. Trail closure signs were affixed to perimeter site fencing at all access points to the project site. Access to the parking area at the end of Barnard Ave. was gated and therefore closed or otherwise controlled for the duration of construction. On days when material was either being offhauled or imported, Guinn closed Fernandez St. at the intersection with Barnard Ave. using signage and barricades, and provided a flagperson at the intersection of Barnard Ave. and Presidio Blvd to control ingress and egress to the site.

2.7 Import Soils and Materials Evaluation

Several different soils were used for construction of the LFE cover system. Depending on the target use of the soil, specifications unique to the use were established to achieve geotechnical, chemical, and/or horticultural suitability requirements. Soils to be used in future planting areas were labeled “horticultural soils,” while those to be used in non-planting area were referred to as “engineered soils.” Note that the 5 December 2011 memorandum from H.T. Harvey titled “Presidio Landfill E Remediation Project Soils Amendment and Weed Control Construction Completion Report,” which is included in

Attachment C-1 of the CQA Report (Appendix B), includes a figure showing approximate locations of the different horticultural soils placed at LFE.

The sections that follow describe the source of each of these materials and testing performed to verify suitability for use at LFE. Test results and other relevant documentation for cover soil materials are included in Appendix C. Geotechnical test results for foundation layer (landfill material) soils, and imported drainage rock and aggregate base materials are included in the CQA report (Appendix B).

2.7.1 EBMUD Miller Road Stockpile

The primary source for soil used for LFE cover construction was the EBMUD Miller Road Stockpile in Hayward, California. The Miller Road facility receives trench spoils from EBMUD's water line repair and installation activities in their service area, and specifically excludes any concrete or other debris resulting from their construction activities. Most soils come from excavations below existing streets and sidewalks. According to EBMUD, soils stockpiled at EBMUD's Miller Road site are from areas where no known environmental impacts are present.

Appendix C-1 contains supporting documentation on the suitability of the EBMUD soils, based on analysis of representative samples collected from the stockpile. The soils were found to meet all criteria for acceptance for use at the Presidio as engineered or horticultural soil cover material. Appendix C-1.1 includes documentation of geotechnical test results. Appendix C-1.2 includes documentation of horticultural test results and associated recommendations for soil amendments to meet the horticultural suitability criteria for plant growth. Appendix C-1.3 includes documentation of chemical test results and comparison with Presidio background and cleanup levels to demonstrate chemical suitability. Additionally, Appendix C-1.3 includes DTSC's approval of the use of EBMUD soils for the LFE project.

2.7.2 Presidio Soils

The balance of soils used to construct the soil cover at LFE were imported from six other sources at the Presidio. The chemical suitability for soil derived from Presidio sources had been established for other Presidio projects. Of these six sources, three were used as engineered soils (Doyle Rocky, Doyle Clayey, and Kobbe soils) for which only geotechnical and chemical suitability were required. The other three (Doyle "A", El Polin, and Nike soils) were used as horticultural soils and were required to meet horticultural suitability criteria in addition to geotechnical and chemical suitability.

2.7.2.1 Colma Soils from Doyle Drive Tunnel Excavation (Doyle “A”)

This primarily sandy soil was placed as horticultural soil at the northern end of the western channel. It is estimated that 800 to 850 yd³ of Doyle “A” material was placed at LFE. Documentation on geotechnical, horticultural, and chemical suitability are included in Appendix C-2.

2.7.2.2 Shale/Colma Soils from Doyle Drive Tunnel Excavation (Doyle Rocky)

This soil was obtained from the same general formation and location as the Doyle “A” and Doyle Clayey soils. This engineered soil had a large gradation range, including a significant fraction of rocky material. The Doyle Rocky material was in largest supply at the Presidio, with an estimated quantity of about 2,000 yd³ used. Because the rocky soils were not desirable for planting, and would make poor subgrade for other possible future land use, these materials were spread on the top deck of LFE, in an approximately 1-foot thick layer that was sandwiched between two 6-inch layers of EBMUD soil. In this way, the rocky materials would not come in contact with LFG geocomposite, or be exposed at the ground surface. A significant quantity of Doyle Rocky material was placed near the southeast corner of the top deck, north of the historic forest zone. It was used to a lesser extent in other top deck areas and in the clean soil corridor. Documentation of geotechnical and chemical suitability of the Doyle Rocky material is included in Appendix C-3.

2.7.2.3 Clayey Soils from Doyle Drive Tunnel Excavation (Doyle Clayey)

This soil was obtained from the same general formation and location as the Doyle “A” and Doyle Rocky soils. This primarily clayey soil was used as engineered soil backfill for the clean soil corridor. Only a small quantity (<250 yd³) of Doyle Clayey material was used for the project. Documentation on geotechnical and chemical suitability are included in Appendix C-4.

2.7.2.4 El Polin Soils

This primarily sandy soil, originating from native Presidio soils excavated from the El Polin Loop wetlands construction project, was placed as horticultural soil in the western channel. It is estimated that approximately 450 yd³ of El Polin material was used. Documentation on geotechnical, horticultural, and chemical suitability are included in Appendix C-5.

2.7.2.5 Public Health Services Hospital District Soils (“Nike”)

This primarily sandy soil, originating from the Public Health Services Hospital (PHSH) District, was placed as horticultural soil in the western channel. It is estimated that approximately 350 yd³ of Nike material was used. Documentation on geotechnical, horticultural, and chemical suitability are included in Appendix C-6.

2.7.2.6 Kobbe Soils

This primarily sandy soil, originating from the vicinity of Kobbe Ave. was excavated from the Lincoln/Washington bike trail improvement project, was placed as engineered soil on the LFE top deck to achieve final grades in limited areas. Only a small quantity (<250 yd³) of Kobbe soil was used. Documentation on geotechnical, horticultural, and chemical suitability are included in Appendix C-7.

2.7.3 Other Soils

2.7.3.1 Foundation Layer

Foundation layer soil consisted of recompacted LFE material graded to achieve the excavation grades prior to LFG geocomposite deployment and cover soil placement. Geotechnical testing of representative samples was performed to develop criteria for compaction control. Use of foundation layer material is further described in Section 4.2 of the CQA Report (Appendix B). Test results are included in Attachment E of the CQA Report.

2.7.3.2 Drainage Gravel

Approximately 620 yd³ of drainage gravel was used around the infiltration and LFG vent system pipes at LFE. The drainage gravel was imported from the Hanson Aggregates, Sunol, California plant. Use of drainage gravel is further described in Section 4.5 of the CQA Report (Appendix B). Test results are included in Attachment E of the CQA Report.

2.7.3.3 Aggregate Base

Approximately 1,184 yd³ of aggregate base was used around the parking and access ramp area at LFE, and along the southern access road southeast of the site. The aggregate base material was imported from the Vulcan Materials, Pleasanton,

California plant. Use of aggregate base is further described in Section 4.6 of the CQA Report (Appendix B). Test results are included in Attachment E of the CQA Report.

2.7.3.4 Riprap Rock

The riprap was imported from stockpiles of excavated sandstone at Vasco Road Sanitary Landfill. Upon arrival, the material was stockpiled and visually checked by Geosyntec for compliance with the specified gradation. In addition, a Geosyntec geologist visited the site, to verify that the material that had been delivered met the specifications provided in Construction Memo #2 (see Attachment B and Section 3.3.2 of the CQA Report in Appendix B), and was similar to the rock samples that had been tested during the source evaluation program. As described in Section 3.3.2 of the CQA Report, riprap was generally oversized, but field variances were allowed within tolerances that still met the design intent.

Approximately 60 yd³ of riprap rock was used for energy dissipation spill pads at pipe outlets and in buried grade control structures in the southern and western channel. Use of riprap is further described in Section 4.7 of the CQA Report (Appendix B). Test results are included in Construction Memorandum #2 in Attachment B of the CQA Report.

2.8 Natural Resources Monitoring

Nesting birds were found to be the primary natural resource requiring monitoring at LFE. Tree removal activities described in Section 2.2 were performed in the winter of 2010 prior to the 2011 bird nesting season. During the spring of 2011, much of the vegetation grew back, which required a bird survey be performed prior to clearing and grubbing. Areas of concern were surveyed by the Trust's biologist in June 2011, who identified an area of tall grasses on the eastern portion of the north slope of the landfill containing nesting birds. The area was left untouched until a resurvey of the area indicated that the young birds had fledged. The area was approved by the Trust for clearing and grubbing in July 2011.

2.9 Contractor Plan Preparation

The Contractor submitted the following plans to the Trust for review and approval in accordance with the requirements of the RDIP (Geosyntec, 2011c) and the project specifications:

- Health and Safety Plan (HASP);
- Presidio Dig Permit;
- Stormwater Pollution Prevention Plan (SWPPP): submitted to the Regional Water Quality Control Board (RWQCB) for review. A Notice of Intent was not filed as it is not required by a federal agency on federal lands at Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites;
- Decontamination Plan;
- Dust Control Plan; and
- Traffic Control Plan

3. CONSTRUCTION ACTIVITIES

A summary of major components of the LFE remediation project are presented here. Additional details are included in the CQA Report (Appendix B). Construction photographs are included in Attachment A of the CQA Report.

3.1 Air Monitoring

Air monitoring was performed by Geosyntec to assess whether dust generated during earthwork posed a threat to human health based on action levels developed in the Air and Dust Monitoring Plan (ADMP). The ADMP is included in Appendix G of the RDIP (Geosyntec, 2011c). Background air and dust monitoring was conducted from 5 July through 7 July 2011. Construction-phase air monitoring was performed from 20 July through 2 November 2011. Stationary monitoring was conducted at the project perimeter at one upwind and two downwind locations. One walk-around dust monitor was used to assess the need for increased dust control measures near the active work zone and at the project perimeter away from the stationary monitors.

Air sampling and analytical testing were performed on background air samples and on air samples collected during early phase landfill excavation work to confirm that COC concentrations did not exceed their adjusted risk-based concentrations in air (RBCair) as defined in the ADMP. No LFE COCs (metals, semi-volatile organic compounds [SVOCs] and pesticides) were detected in air and dust samples collected during the background and ongoing construction-phase monitoring. The Trust requested to

discontinue air and dust monitoring for COCs at the Site on 8 August 2011 (Geosyntec, 2011d). This request was approved by DTSC via e-mail on 12 August 2011. Further details on air sampling are included in Section 7 of the CQA Report (Appendix B) and the letters are included in Attachment M of the CQA report.

Perimeter dust monitoring for particulate matter (PM₁₀) concentrations continued throughout the remaining earthmoving activities as described in the ADMP (Appendix G of the RDIP; Geosyntec, 2011c). Dust monitoring is discussed in greater detail in the CQA report (Appendix B).

3.2 Site Clearing and Debris Collection

After site preparation activities were completed, Guinn began site clearing and debris removal. As described in Section 2.8, grubbing was completed in stages due to bird nesting constraints at the north face of LFE. Organic mulch and tree stumps were stockpiled for subsequent offhaul and processing, respectively (see Section 5.1). Inorganic debris (concrete, pipes, etc.) was stockpiled and then crushed and buried within the landfill material beneath the soil cover.

3.3 Landfill Material Excavation and Re-grading Activities

Landfill material excavation began along the western channel footprint and proceeded to the historic forest zone to the south. Areas targeted for potential clean closure were excavated first to allow time for confirmation sampling (see Section 3.5). Excavated landfill material was temporarily stockpiled on the landfill top deck until areas on the top deck or at the north face within the landfill limits were prepared for landfill material placement. Excavated landfill material was then compacted in place as foundation layer material within the landfill limits. Prior to compaction of the landfill material, a test pad was constructed of stockpiled landfill material that had been tested in the laboratory to develop a correlation between level of compaction effort (typically three passes of the sheepsfoot roller) and target compaction density per the specifications. This allowed Geosyntec personnel to observe that adequate compactive effort was applied even when landfill material properties changed. The CQA Report (Appendix B) provides further detail on test pad construction.

As described in Section 3.3.1 of the CQA Report (Appendix B) and in Section 5.2 of this report, top deck elevations were raised by 0.5 ft in order to achieve a closer soil balance and limit offhaul of landfill material. The elevated design grades were bounded on the north by the slope south of the future parking area, on the west by the western

channel, on the south by the southern channel, and on the east by the landfill limit. Both excavation grades (top of waste) and final grades (top of cover) were raised within this area by about 0.5 ft.

3.4 UXO Monitoring

Based on the history of LFE, the Trust did not anticipate encountering unexploded ordnance (UXO) within the landfill material. As such, UXO monitoring was not performed during much of the early excavation activities. However, on 19 August a cannonball was encountered at the toe of the northern slope which appeared to have originated from landfill material being excavated and stockpiled. Landfill material excavation was halted while UXO personnel from Travis Air Force Base were mobilized to the site to evaluate and remove the cannonball.

After removal of the cannonball, and at the request of the Army Corps of Engineers, excavation activities were put on standby until the arrival of UXO monitors from Ordnance and Explosives Remediation, Inc. (OER). OER personnel arrived on site and monitored excavation work from 23 August to 1 September and then again for final excavation activities from 19 September to 1 October. During this time period, no further UXO were observed.

3.5 Confirmation Sampling for Clean Closure Areas

Soil confirmation sampling was conducted at the Site on 4, 12, and 24 August 2011. The field investigation was performed in accordance with the *Soil Confirmation Sampling Plan* (Appendix H of the RDIP; Geosyntec, 2011c). Soil confirmation sampling results were originally provided in two letter reports to the Trust dated 1 September (Geosyntec, 2011e) and 9 November (Geosyntec, 2011f).

The objective of the confirmation sampling was to classify areas along the LFE boundary for construction in accordance with two landfill cover scenarios presented in the RDIP. Areas constructed in accordance with Scenario 1 (clean closure; see as-built drawings in the CQA Report in Appendix B) contained native soils with no observed landfill material and concentrations of COCs below cleanup levels. Areas constructed in accordance with Scenario 2 (see as-built drawings in the CQA Report in Appendix B) contained either landfill material or soils with detectable concentrations of COCs above cleanup levels that were then overexcavated and backfilled in accordance with Scenario 2 soil cover details.

Confirmation samples were collected along the southern and western perimeter of LFE where grading resulted in apparent removal of all landfill material based upon visual inspections conducted in the field (Figure 3-1). Soil samples were collected from the shallow surface interval (0-6 inch below ground surface, bgs) at the designed excavation grades to evaluate the possible landfill material impacts within the Western Channel, along the southern boundary within the Historic Forest, and along the southeastern cut-slope north of the Historic Forest.

Soil samples were collected using a stainless steel trowel and glass jars. Sealed sample jars were labeled, packaged, and shipped under chain of custody protocol to Curtis and Tompkins (C&T) in Berkeley, California for analysis of the following COCs as specified in the RDIP:

- Title 22 metals and mercury;
- Organochlorine pesticides (OCPs);
- Polynuclear aromatic hydrocarbons (PAHs); and
- Total Petroleum Hydrocarbons as diesel (TPH-d).

Analytical results for soil samples collected on 4, 12, and 24 August 2011 are summarized in Table 3-1, with full laboratory reports provided in Appendix D.

Results of confirmation soil samples indicated that no COC exceedances were observed at fifteen out of nineteen locations (DAEEX101 through DAEEX104; DAEEX106; DAEEX109 through DAEEX114; and DAEEX118 through DAEEX119). In accordance with Appendix C to the RDIP, the following areas were clean closed and constructed per Scenario 1 (Figure 3-1):

- Between DAEEX101 and DAEEX114;
- Between DAEEX115 and DAEEX116; and
- Between DAEEX110 and DAEEX119.

The remaining four locations (DAEEX105, DAEEX107, DAEEX117, and DAEEX108) contained COC concentrations above soil cleanup levels for metals and/or PAHs. Although no COC exceedances were detected at location DAEEX109, this area is located between impacted areas and for constructability purposes was included within a Scenario 2 construction area. Therefore, the following areas were constructed in accordance with Scenario 2 (Figure 3-1):

- Between DAEEX114 and DAEEX115; and
- Between DAEEX107 and DAEEX110.

Areas constructed per Scenario 2 along the southern boundary within the Historic Forest do not contain geosynthetic components (geomembrane, or geocomposite) in accordance with Section 4.2.10 of the approved RDIP (Geosyntec, 2011c), with the exception of areas overlapping with the geosynthetic lined southern drainage channel. Areas constructed via Scenario 2 within the Historic Forest were excavated an additional three feet below the excavation grade along the slope followed by replacement with three feet of clean horticultural soil. Areas constructed via Scenario 2 within the western channel were excavated an additional three feet below the excavation grade, and the soil cover was constructed with geosynthetic components per the construction drawings and in accordance with the approved RDIP.

The construction plan was approved by DTSC via letters dated 7 September 2011 and 18 November 2011. Approvals are included in Appendix D.

3.6 Geosynthetics Deployment

Geosyntec monitored installation of geosynthetics at LFE, including reviewing manufacturer's certifications, overseeing conformance laboratory testing, and inventorying materials as they arrived on-site. Geosynthetic components of the LFE remediation project included:

- Double-sided geocomposite (270-mil geonet) for the LFG collection system on the top deck and below the western channel;
- 60-mil High Density Polyethylene (HDPE) geomembrane as an infiltration barrier below the southern and western channels;
- Double-sided geocomposite (270-mil geonet) for the drainage collection layer above the southern and western channel geomembranes; and
- 8 oz per yd² geotextile as filter fabric around gravel filled trenches and as a separation layer below aggregate base in the future parking area.

Installation of geosynthetic components was performed consistent with the construction drawings and project specifications. Further details on installation of geosynthetics can be found in Section 5 of the CQA Report (Appendix B), and as-builts showing limits of LFG geocomposite and channel geomembranes are included in Attachment L of the CQA Report.

3.7 Landfill Gas Collection System Installation

The LFG collection and venting system was constructed according to the construction drawings, and included excavation and backfilling of geotextile-wrapped, gravel-filled LFG trenches on the north face and top deck, excavation and backfilling for construction of twelve LFG vents on the top deck, and LFG geocomposite installation over the entire landfill top deck. Section 3.2.4 of the CQA Report (Appendix B) describes the relocation of several vents for consistency with planned future development of the site, and Attachment L of the CQA Report includes as-built locations of all LFG piping and vents.

3.8 Infiltration Piping Installation

Perforated HDPE infiltration piping was installed in geotextile-wrapped, gravel-filled trenches as shown on the construction drawings to collect water that may infiltrate through the cover soils and reach either the top deck LFG geocomposite, or the western channel drainage geocomposite. Additionally, the perforated LFG collection piping on the north slope serves the dual purpose of collecting LFG as well as performing as infiltration piping to collect and discharge water that infiltrates through the north slope cover. Modifications to the discharge points of several of these infiltration pipes were made based on changes in field conditions as described in Section 3.2.5 of the CQA Report (Appendix B). Attachment L of the CQA Report includes as-built locations of all infiltration piping.

3.9 Cover Soil Placement

Soils used as cover materials are described in Section 2.7. Cover soil varied in material type and/or compaction requirements depending on their use as either horticultural soil in future planting areas or engineered soil elsewhere. Cover soil placement followed preparation of the foundation layer (see Section 3.3) and placement of overlying geosynthetics. The first area to receive cover soil was the western half of the landfill top deck, followed by the southern and western channels, the north slope, the eastern half of the top deck, and finally the future parking area. As described in Section 3.3, top deck elevations south of the parking lot area were raised by 0.5 ft relative to design grades in order to achieve a closer soil balance and to minimize offhaul of landfill material. Geosyntec monitored the level of compaction applied to the soils and verified that specified densities were achieved, as described in Section 4.3 and 4.4 of the CQA Report (Appendix B).

3.10 Surface Water Control System Installation

The surface water control system consists of swales, channels, drop inlets, buried pipes, outlets, and energy dissipation structures. A significant redesign of the system was performed early in the project to better match Trust long term needs, as described in Section 3.2 of the CQA Report (Appendix B). That redesign, including realignment of the southern channel, removal of one buried pipe, and a reassessment of the approach to energy dissipation at the toe of the landfill, is documented in Revision 2 of the Construction Drawings (see Attachment K-2 of the CQA Report). Several additional field variances, documented in Section 3.3 of the CQA Report, were incorporated based on changes in field conditions or efficiencies proposed by Guinn (e.g. flared end sections at pipe outlets).

One significant change, described in Section 3.2.6 of the CQA Report, was postponing construction of the water quality basin. In order to complete the project prior to the rainy season, the Trust elected not to pave the future parking area on the top deck and replaced the thickness of the asphalt concrete (AC) with aggregate base in order to maintain a minimum 2-foot cover thickness. Additionally, a concrete traffic barrier was placed across the ramp entrance to the site from Quarry Road to keep the public from using the parking area prior to completion. Without a parking area, the water quality basin was deemed unnecessary. As a result, all three buried pipes that exit at the north toe of slope of LFE discharge onto riprap spill pads to provide energy dissipation prior to continuing downstream. The Trust plans to construct the water quality basin when the future parking area is paved.

Attachment L of the CQA Report includes as-built locations of surface water control elements.

3.11 Soil Amendments

During identification of borrow sources, and as a design modification (see Section 3.2.8 of the CQA Report in Appendix B) H.T. Harvey & Associates developed soil amendment recommendations for the different soil types that would be used as horticultural soil in the planting areas. Sheet 21 (Soil Type and Amendment Areas) of the Construction Drawings shows the types of amendments that would need to be applied based on the soils to be used.

However, due to the tight construction schedule, the long duration needed to incorporate amendments into the channel areas, and the approaching rainy season, the Trust decided

that the application of horticultural amendments to the soils within and adjacent to the southern and western channels was not practical at this time. There was an additional concern that amendments would result in enhanced weed growth in the channels where mulch was not placed. Amendment application was therefore limited to the north slope where relatively quick and simple incorporation techniques could be utilized. The Trust elected to delay application of amendments in the other horticultural areas until the formal planting plan for those areas is developed.

3.12 Erosion Control Measures

Erosion control measures included installation of silt fences, fiber rolls, erosion control blankets (ECBs), and wood mulch as shown on Construction Drawings 19 and 22 (see Attachment K-2 of CQA Report in Appendix B). All natural, biodegradable and weed free fiber rolls and ECBs were used along with wood stakes and biodegradable ECB staples. Wood chip mulch was provided by the Presidio Trust from sources originating from within the Presidio Trust and was placed to an approximate thickness of 4-inches in the areas shown on Drawing No. 22. At the end of the project in 2011, sufficient mulch was not available to complete the top deck cover. A limited area of the top deck around the future parking area was instead covered with straw mulch and jute netting. The Trust subsequently covered this area with wood chip mulch in January 2012.

These erosion control measure BMPs will be maintained by the Trust until permanent vegetation is established on the site, or until a future permanent use of the site (conceptually, a sports field) is constructed. The Trust intends to implement a vegetation plan along the north face, surface water channels and historic forest zone within the next 2 years.

Geosyntec performed a post-construction sediment transport risk analysis to evaluate the long-term risk associated with maintaining BMPs while future development plans for LFE are developed. The updated analysis is included in Appendix E. The Site Sediment Risk was calculated to be 12.8 tons/acre, which falls within the Low Sediment Risk category (< 15 tons/acre) per the State Water Resources Control Board (SWRCB). The analysis was performed assuming a 2-year exposure duration of the post-construction condition (11/1/11 to 11/1/2013) resulting in a Rainfall Erosivity Factor (R) of 82.1, and assuming a conservative estimate of the Practice Factor (P) of 1. Maintenance of the BMPs in good condition would result in reductions in both of those numbers.

Based on the above, Geosyntec considers that proper maintenance of the BMPs can be used while vegetation and future site development decisions are made. Elements of the BMP maintenance program should include:

- Replacing fiber rolls and silt fence as they degrade or become damaged;
- Placing additional wood chip mulch as the current mulch degrades and thins;
and
- Patching and/or replacing ECBs as they degrade or become damaged.

Further details are provided in the LFE Operations and Maintenance (O&M) Plan (Geosyntec, 2012).

3.13 Surveying Activities

Guinn construction controlled site elevations using Global Positioning System (GPS) based survey equipment. Guinn's survey equipment consisted of units mounted on earthmoving equipment (dozers) to control elevations of cuts and fills, as well as a handheld unit operated by the grade checker to verify consistency with the plans. Licensed surveying was performed by F3 and Associates (F3) under subcontract to Guinn. F3 performed as-needed visits to the site to collect as-built survey data and to check for consistency between Guinn's system and their own. Geosyntec reviewed survey data produced by F3, as well as supplementary data provided by Guinn's grade checker, to verify consistency with the design intent.

As-built drawings showing surveyed subgrade elevations, final cover elevations, geosynthetic limits, and piping and surface water control features, are included in Attachment L of the CQA Report (Appendix B). As discussed in Sections 4.3 and 4.4 of the CQA report, a review of the as-built drawings indicates that minimum soil cover thickness requirements were achieved within construction tolerance.

4. DESIGN MODIFICATIONS AND FIELD VARIANCES

At various times during construction, aspects of the original design were re-evaluated due to: (1) discrepancies between actual field conditions and those conditions assumed as part of the design, (2) additional modifications requested by the Trust, (3) long lead times to obtain certain specified products; and (4) schedule concerns relative to the need to complete landfill remediation prior to the start of the rainy season.

The modifications performed as part of this project were grouped in two categories: (1) design modifications and (2) field variances. Design modifications corresponded to changes performed at the request of the Trust and generally involved revisions to the construction drawings. Field variances generally corresponded to modifications made as a result of changes in field conditions or efficiencies proposed by the Contractor in order to meet the project schedule or reduce cost. All proposed design modifications or field variances were reviewed by the Design Engineer and only those that were found to be consistent with the design intent as presented in the FS/RAP (Geosyntec, 2011a) and RDIP (Geosyntec, 2011b) were allowed.

A description of the design modifications and field variances is included in Section 3 of the CQA Report (Appendix B).

5. LANDFILL MATERIAL CHARACTERIZATION AND DISPOSAL

Two separate stockpiles, mulch and LFE landfill material, were removed as part of construction.

5.1 Mulch

Wood chip mulch that had been spread over the top of LFE for erosion control as part of at least two distinct tree removal projects in the vicinity of the landfill was removed during clearing and grubbing activities. The excess mulch was stockpiled onsite prior to loading, hauling and disposal. Approximately 6,660 yd³ (based on recorded 4,440 tons converted to cubic yardage based on 1.5 yd³/ton) of mulch were disposed of at Potrero Hills Landfill in Fairfield, California. Disposal documentation is included in Appendix F-1.

5.2 Landfill Material

The design of the LFE cover system was intended to result in a balanced site with no off-haul of materials. However, several factors resulted in uncertainty regarding this soil balance, including: (a) presence of significant quantities of mulch over the landfill surface (see Section 5.1) obscuring the actual landfill surface topography; (b) uncertainty in the ability to achieve clean closure across the southern and western perimeter of the landfill and need to overexcavate in areas where clean closure could not be achieved (see Section 3.5); (c) contractor overexcavation of landfill materials in limited areas that were backfilled with clean imported soil; and (d) actual shrinkage and swell factors for the excavated landfill material.

Once it became apparent that surplus landfill material was being generated that could not be compacted within the original excavation grading plan elevations, a decision was made to raise the top deck elevation by 0.5 ft to provide additional room for landfill material placement. However, at the end of the project, a stockpile of LFE landfill material that could not fit within the target cover grades was transported to the “Dust Bowl” storage area adjacent to the Trust Remediation Department’s offices on Martinez Street. The stockpiled landfill material placed over a heavy plastic sheeting, was covered with the same heavy plastic sheeting, and was anchored while awaiting profiling and offhaul.

Approximately 2015 tons of surplus LFE landfill material was profiled as Class II non-hazardous waste soil. The landfill material was transported on December 19-21, 2011



to Potrero Hills Landfill in Suisun City, California, a Presidio Trust approved landfill. Disposal documentation is included in Appendix F-2.

6. SUMMARY AND CONCLUSIONS

Remedial construction work at LFE was conducted in general accordance with the RDIP (Geosyntec, 2011c). Design modifications described in this report were consistent with the intent of the landfill closure remedy. As part of the remedy, the landfill was regraded, a passive LFG venting system was installed, a clean soil cover was constructed, surface water conveyances were installed, and the site was protected with robust erosion control BMPs while future vegetation and site development plans are finalized by the Trust.

The Trust is implementing groundwater, surface water, and landfill gas monitoring programs. Additionally, the site will be monitored and maintained in accordance with an approved Operations and Maintenance (O&M) Plan. Geosyntec concludes that LFE has been closed in accordance with the requirements of the RDIP and, if managed in accordance with the O&M Plan, will be protective of human health and the environment.

7. REFERENCES

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TABLES

Table 3-1
Confirmation Soil Sampling Data
Construction Completion Report, Landfill E
Presidio of San Francisco, California

	Soil Cleanup Level ¹	DAEEX101	DAEEX102	DAEEX103	DAEEX104	DAEEX105	DAEEX106	DAEEX107	DAEEX108	DAEEX109	DAEEX110	DAEEX111	DAEEX112	DAEEX113	DAEEX114	DAEEX115	DAEEX116	DAEEX117	DAEEX118	DAEEX119
Sample Interval (feet bgs)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Date Sampled		8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/12/2011	8/12/2011	8/12/2011	8/12/2011	8/12/2011	8/12/2011	8/12/2011	8/24/2011
Total Petroleum Hydrocarbons (TPH) by GC EPA 8015B [mg/Kg]																				
Diesel C12-C24	700	3.4 Y	ND<1.2	1.2 Y	1.9 Y	340	2 Y	2.3 Y	210	ND<1.1	2.3 Y	ND<1	ND<1.1	14 Y	1.8 Y	ND<1.1	8.1 Y	ND<1.2	ND<1	14 Y
Metals by EPA 6010B and EPA 7471A [mg/Kg]:																				
Antimony	5	ND<3.5	ND<3.4	ND<3.4	ND<3.5	ND<3.7	ND<3.3	ND<3.5	ND<3.9	ND<3.4	ND<3.1	ND<3.2	ND<3.3	ND<3.4	ND<3.3	ND<3.3	ND<3.3	ND<3.7	ND<3.2	ND<3.1
Arsenic	6.2	3.3	2.8	2.5	2.6	3.6	3.5	2.9	3.1	3.4	2.6	2.2	2.9	2.5	2.8	3.3	2.6	4.4	2.5	3.3
Barium	500	150	32	37	67	95	34	61	140	44	76	70	40	72	54	29	99	120	71	93
Beryllium	10	0.43	0.2	0.17	0.27	0.3	0.2	0.32	0.3	0.28	0.28	0.23	0.19	0.27	0.24	0.18	0.29	0.38	0.28	0.26
Cadmium	0.8	ND<0.29	ND<0.29	ND<0.28	ND<0.29	ND<0.31	ND<0.27	ND<0.29	0.4	ND<0.28	ND<0.26	ND<0.26	ND<0.27	ND<0.28	ND<0.27	ND<0.27	ND<0.27	ND<0.3	ND<0.26	ND<0.26
Chromium	140	56	63	74	100	120	74	140	170	84	54	63	81	99	83	53	83	200	72	77
Cobalt	48	13	7.5	8.3	7.3	21	16	18	25	13	11	11	8	11	11	8.3	13	23	12	14
Copper	120	20	6	15	12	25	5.2	13	16	7.9	8.8	8.6	6.1	16	9.4	5.6	11	14	8.6	13
Lead	300	18	2.1	3.2	3.3	100	4.1	9.7	28	2.9	12	5.8	2.3	38	6.6	2.3	20	10	3.5	17
Mercury	1.6	0.16	ND<0.023	ND<0.022	ND<0.024	0.14	0.027	0.043	0.07	ND<0.023	ND<0.021	0.065	0.064	0.035	0.023	ND<0.022	0.045	0.028	ND<0.021	0.027
Molybdenum	300	ND<1.2	ND<1.1	ND<1.1	ND<1.2	ND<1.2	ND<1.1	ND<1.2	ND<1.3	ND<1.1	ND<1	ND<1.1	ND<1.1	ND<1.1	ND<1.1	ND<1.1	ND<1.1	ND<1.2	ND<1.1	ND<1.0
Nickel	110	38	94	76	110	170	64	99	170	81	44	37	82	110	65	62	61	240	45	55
Selenium	1.1	ND<0.58	ND<0.57	ND<0.56	ND<0.59	ND<0.62	ND<0.55	ND<0.58	ND<0.66	ND<0.57	ND<0.52	ND<0.53	ND<0.55	ND<0.57	ND<0.55	ND<0.55	ND<0.55	ND<0.61	ND<0.53	ND<0.51
Silver	2	ND<0.29	ND<0.29	ND<0.28	ND<0.29	ND<0.31	ND<0.27	ND<0.29	ND<0.33	ND<0.28	ND<0.26	ND<0.26	ND<0.27	ND<0.28	ND<0.27	ND<0.27	ND<0.27	ND<0.3	ND<0.26	ND<0.26
Thallium	1	ND<0.56	ND<0.55	ND<0.55	ND<0.58	ND<0.6	ND<0.52	ND<0.53	ND<0.63	ND<0.52	ND<0.49	ND<0.5	ND<0.53	ND<0.56	ND<0.5	ND<0.49	ND<0.52	ND<0.57	ND<0.49	ND<0.48
Vanadium	90	50	36	41	45	48	44	49	52	55	46	42	45	49	47	38	50	63	52	54
Zinc	60	46	22	26	27	100	20	65	140	23	26	23	23	49	34	23	42	42	26	34
Polynuclear Aromatic Hydrocarbons (PAHs) by GC/MS SIM EPA 8270C-SIM [ug/Kg]:																				
2-Methylnaphthalene	40,000	ND<5.7	ND<5.8	ND<5.6	ND<5.9	ND<61	ND<5.6	ND<5.9	180	ND<5.7	ND<5.3	ND<5.2	ND<5.5	ND<5.7	ND<5.6	ND<5.6	11	ND<6.2	ND<5.2	ND<5.1
Acenaphthene	40,000	ND<5.7	ND<5.8	ND<5.6	ND<5.9	ND<61	ND<5.6	ND<5.9	34	ND<5.7	ND<5.3	ND<5.2	ND<5.5	ND<5.7	ND<5.6	ND<5.6	ND<5.6	ND<6.2	ND<5.2	ND<5.1
Acenaphthylene	40,000	ND<5.7	ND<5.8	ND<5.6	ND<5.9	ND<61	ND<5.6	ND<5.9	28	ND<5.7	ND<5.3	ND<5.2	ND<5.5	2.3 J	ND<5.6	ND<5.6	ND<5.6	ND<6.2	ND<5.2	ND<5.1
Anthracene	40,000	ND<5.7	ND<5.8	ND<5.6	ND<5.9	ND<61	ND<5.6	ND<5.9	17 J	ND<5.7	ND<5.3	ND<5.2	ND<5.5	ND<5.7	ND<5.6	ND<5.6	ND<5.6	ND<6.2	ND<5.2	ND<5.1
Benzo(a)anthracene	270	ND<5.7	ND<5.8	ND<5.6	ND<5.9	18 J	ND<5.6	ND<5.9	130	ND<5.7	ND<5.3	ND<5.2	ND<5.5	ND<5.7	ND<5.6	ND<5.6	2.8 J	ND<6.2	ND<5.2	1.1 J
Benzo(a)pyrene	27	ND<5.7	ND<5.8	ND<5.6	ND<5.9	26 J	ND<5.6	ND<5.9	180	ND<5.7	ND<5.3	ND<5.2	ND<5.5	ND<5.7	ND<5.6	ND<5.6	3.8 J	ND<6.2	ND<5.2	1.1 J
Benzo(b)fluoranthene	270	1.4 J	ND<5.8	ND<5.6	ND<5.9	40 J	ND<5.6	ND<5.9	350	ND<5.7	ND<5.3	ND<5.2	ND<5.5	ND<5.7	ND<5.6	ND<5.6	7	ND<6.2	ND<5.2	1.4 J
Benzo(g,h,i)perylene	40,000	ND<5.7	ND<5.8	ND<5.6	ND<5.9	ND<61	ND<5.6	ND<5.9	73	ND<5.7	ND<5.3	ND<5.2	ND<5.5	ND<5.7	ND<5.6	ND<5.6	ND<5.6	ND<6.2	ND<5.2	1.3 J
Benzo(k)fluoranthene	270	ND<5.7	ND<5.8	ND<5.6	ND<5.9	13 J	ND<5.6	ND<5.9	110	ND<5.7	ND<5.3	ND<5.2	ND<5.5	ND<5.7	ND<5.6	ND<5.6	2.0 J	ND<6.2	ND<5.2	ND<5.1
Chrysene	2,700	1.4 J	ND<5.8	ND<5.6	ND<5.9	28 J	ND<5.6	ND<5.9	330	ND<5.7	ND<5.3	ND<5.2	ND<5.5	ND<5.7	ND<5.6	ND<5.6	8.3	ND<6.2	ND<5.2	2.0 J
Dibenz(a,h)anthracene	78	ND<5.7	ND<5.8	ND<5.6	ND<5.9	ND<61	ND<5.6	ND<5.9	30	ND<5.7	ND<5.3	ND<5.2	ND<5.5	ND<5.7	ND<5.6	ND<5.6	ND<5.6	ND<6.2	ND<5.2	ND<5.1
Fluoranthene	40,000	1.2 J	ND<5.8	ND<5.6	ND<5.9	29 J	ND<5.6	ND<5.9	630	ND<5.7	ND<5.3	ND<5.2	ND<5.5	ND<5.7	ND<5.6	ND<5.6	4.9 J	ND<6.2	ND<5.2	1.9 J
Fluorene	40,000	ND<5.7	ND<5.8	ND<5.6	ND<5.9	ND<61	ND<5.6	ND<5.9	68	ND<5.7	ND<5.3	ND<5.2	ND<5.5	3.7 J	ND<5.6	ND<5.6	ND<5.6	ND<6.2	ND<5.2	ND<5.1
Indeno(1,2,3-cd)pyrene	270	ND<5.7	ND<5.8	ND<5.6	ND<5.9	ND<61	ND<5.6	ND<5.9	88	ND<5.7	ND<5.3	ND<5.2	ND<5.5	ND<5.7	ND<5.6	ND<5.6	ND<5.6	ND<6.2	ND<5.2	ND<5.1
Naphthalene	40,000	ND<5.7	ND<5.8	ND<5.6	ND<5.9	ND<61	ND<5.6	ND<5.9	160	ND<5.7	ND<5.3	ND<5.2	ND<5.5	ND<5.7	ND<5.6	ND<5.6	6.2	ND<6.2	ND<5.2	ND<5.1
Phenanthrene	40,000	ND<5.7	ND<5.8	ND<5.6	ND<5.9	14 J	ND<5.6	ND<5.9	790	ND<5.7	ND<5.3	ND<5.2	ND<5.5	ND<5.7	ND<5.6	ND<5.6	6.1	ND<6.2	ND<5.2	1.3 J
Pyrene	40,000	1.7 J	ND<5.8	ND<5.6	ND<5.9	27 J	ND<5.6	ND<5.9	400	ND<5.7	ND<5.3	ND<5.2	ND<5.5	ND<5.7	ND<5.6	ND<5.6	4.4 J	ND<6.2	ND<5.2	2.0 J

Table 3-1
Confirmation Soil Sampling Data
Construction Completion Report, Landfill E
Presidio of San Francisco, California

	Soil Cleanup Level ¹	DAEEX101	DAEEX102	DAEEX103	DAEEX104	DAEEX105	DAEEX106	DAEEX107	DAEEX108	DAEEX109	DAEEX110	DAEEX111	DAEEX112	DAEEX113	DAEEX114	DAEEX115	DAEEX116	DAEEX117	DAEEX118	DAEEX119	
Sample Interval (feet bgs)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Date Sampled		8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/4/2011	8/12/2011	8/12/2011	8/12/2011	8/12/2011	8/12/2011	8/12/2011	8/12/2011	8/24/2011	
Organochlorine Pesticides by EPA 8081A [ug/Kg]:																					
4,4'-DDD	530	ND<3.8	ND<3.8	ND<3.7	ND<3.8	47 C	ND<3.6	ND<3.8	ND<4.3	ND<3.7	ND<3.5	ND<3.5	ND<3.7	ND<3.8	ND<3.7	ND<3.7	ND<3.7	ND<3.7	ND<4.1	ND<3.4	ND<3.4
4,4'-DDE	610	ND<3.8	ND<3.8	ND<3.7	ND<3.8	4.2	ND<3.6	ND<3.8	ND<4.3	ND<3.7	ND<3.5	ND<3.5	ND<3.7	ND<3.8	ND<3.7	ND<3.7	ND<3.7	ND<3.7	ND<4.1	ND<3.4	ND<3.4
4,4'-DDT	530	ND<3.8	ND<3.8	ND<3.7	ND<3.8	11 C	ND<3.6	ND<3.8	ND<4.3	ND<3.7	ND<3.5	ND<3.5	ND<3.7	ND<3.8	ND<3.7	ND<3.7	ND<3.7	ND<3.7	ND<4.1	ND<3.4	ND<3.4
Aldrin	29	ND<2	ND<2	ND<1.9	ND<2	ND<2.1	ND<1.9	ND<2	ND<2.2	ND<1.9	ND<1.8	ND<1.8	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<2.1	ND<1.8	ND<1.7
alpha-BHC	180	ND<2	ND<2	ND<1.9	ND<2	0.83 J	ND<1.9	ND<2	ND<2.2	ND<1.9	ND<1.8	ND<1.8	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<2.1	ND<1.8	ND<1.7
alpha-Chlordane	--	0.83 C, J	ND<2	ND<1.9	ND<2	140	0.46 C, J	ND<2	1.2 J	ND<1.9	0.39 J	ND<1.8	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<2.1	ND<1.8	ND<1.7
beta-BHC	320	ND<2	ND<2	ND<1.9	ND<2	0.54 C, J	ND<1.9	ND<2	ND<2.2	ND<1.9	ND<1.8	ND<1.8	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<2.1	ND<1.8	ND<1.7
delta-BHC	180	ND<2	ND<2	ND<1.9	ND<2	ND<2.1	ND<1.9	ND<2	ND<2.2	ND<1.9	ND<1.8	ND<1.8	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<2.1	ND<1.8	ND<1.7
Dieldrin	30	ND<3.8	ND<3.8	ND<3.7	ND<3.8	1.4 J	ND<3.6	ND<3.8	ND<4.3	ND<3.7	ND<3.5	ND<3.5	ND<3.7	ND<3.8	ND<3.7	ND<3.7	ND<3.7	ND<3.7	ND<4.1	ND<3.4	ND<3.4
Endosulfan I	3,300	ND<2	ND<2	ND<1.9	ND<2	ND<2.1	ND<1.9	ND<2	ND<2.2	ND<1.9	ND<1.8	ND<1.8	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<2.1	ND<1.8	ND<1.7
Endosulfan II	--	ND<3.8	ND<3.8	ND<3.7	ND<3.8	ND<4.1	ND<3.6	ND<3.8	ND<4.3	ND<3.7	ND<3.5	ND<3.5	ND<3.7	ND<3.8	ND<3.7	ND<3.7	ND<3.7	ND<3.7	ND<4.1	ND<3.4	ND<3.4
Endosulfan sulfate	3,300	ND<3.8	ND<3.8	ND<3.7	ND<3.8	ND<4.1	ND<3.6	ND<3.8	ND<4.3	ND<3.7	ND<3.5	ND<3.5	ND<3.7	ND<3.8	ND<3.7	ND<3.7	ND<3.7	ND<3.7	ND<4.1	ND<3.4	ND<3.4
Endrin	110	ND<3.8	ND<3.8	ND<3.7	ND<3.8	ND<4.1	ND<3.6	ND<3.8	ND<4.3	ND<3.7	ND<3.5	ND<3.5	ND<3.7	ND<3.8	ND<3.7	ND<3.7	ND<3.7	ND<3.7	ND<4.1	ND<3.4	ND<3.4
Endrin aldehyde	110	ND<3.8	ND<3.8	ND<3.7	ND<3.8	ND<4.1	ND<3.6	ND<3.8	ND<4.3	ND<3.7	ND<3.5	ND<3.5	ND<3.7	ND<3.8	ND<3.7	ND<3.7	ND<3.7	ND<3.7	ND<4.1	ND<3.4	ND<3.4
Endrin ketone	110	ND<3.8	ND<3.8	ND<3.7	ND<3.8	ND<4.1	ND<3.6	ND<3.8	ND<4.3	ND<3.7	ND<3.5	ND<3.5	ND<3.7	ND<3.8	ND<3.7	ND<3.7	ND<3.7	ND<3.7	ND<4.1	ND<3.4	ND<3.4
gamma-BHC	370	ND<2	ND<2	ND<1.9	ND<2	ND<2.1	ND<1.9	ND<2	1.1 C, J	ND<1.9	ND<1.8	ND<1.8	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<2.1	ND<1.8	ND<1.7
gamma-Chlordane	--	ND<2	ND<2	ND<1.9	ND<2	70 C	ND<1.9	ND<2	0.84 C, J	ND<1.9	ND<1.8	ND<1.8	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<2.1	ND<1.8	ND<1.7
Heptachlor	120	ND<2	ND<2	ND<1.9	ND<2	1.9 J	ND<1.9	ND<2	ND<2.2	ND<1.9	ND<1.8	ND<1.8	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<2.1	ND<1.8	ND<1.7
Heptachlor epoxide	88	0.86 J	ND<2	ND<1.9	ND<2	3.9 C	ND<1.9	ND<2	ND<2.2	ND<1.9	ND<1.8	ND<1.8	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<2.1	ND<1.8	ND<1.7
Isodrin	29	ND<2	ND<2	ND<1.9	ND<2	ND<2.1	ND<1.9	ND<2	ND<2.2	ND<1.9	ND<1.8	ND<1.8	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<1.9	ND<2.1	ND<1.8	ND<1.7
Methoxychlor	18,000	ND<20	ND<20	ND<19	ND<20	ND<21	ND<19	ND<20	ND<22	ND<19	ND<18	ND<18	ND<19	ND<19	ND<19	ND<19	ND<19	ND<19	ND<21	ND<18	ND<17
Toxaphene	--	ND<69	ND<69	ND<67	ND<69	ND<75	ND<66	ND<69	ND<78	ND<68	ND<63	ND<63	ND<67	ND<69	ND<66	ND<66	ND<66	ND<66	ND<74	ND<62	ND<61

Notes:
¹ Soil Cleanup levels are taken from the Final FS/RAP for Landfill E (Geosyntec, 2011) , Table 4-1, "Cleanup Levels for Soil and Sediment - Final Feasibility Study/Remedial Action Plan, Landfill E"
 mg/Kg = milligrams per kilogram
 -- = No Cleanup Level available
 C = Presence confirmed, but Relative Percent Difference between columns exceeds 40%
 J = Estimated value. The compound was detected below the Reporting Limit but greater than zero. Totals qualified with J indicate that an estimated value is part of the total
 Y = Sample exhibits chromatographic pattern which does not resemble standard.

Bolded and Shaded Cells Indicate exceedances of LFE Cleanup Levels

FIGURES



LEGEND

--- Area A and B boundary

Notes:
 Area A Stewardship by the National Park Service.
 Area B Stewardship by the Presidio Trust.



Geosyntec

SITE LOCATION MAP

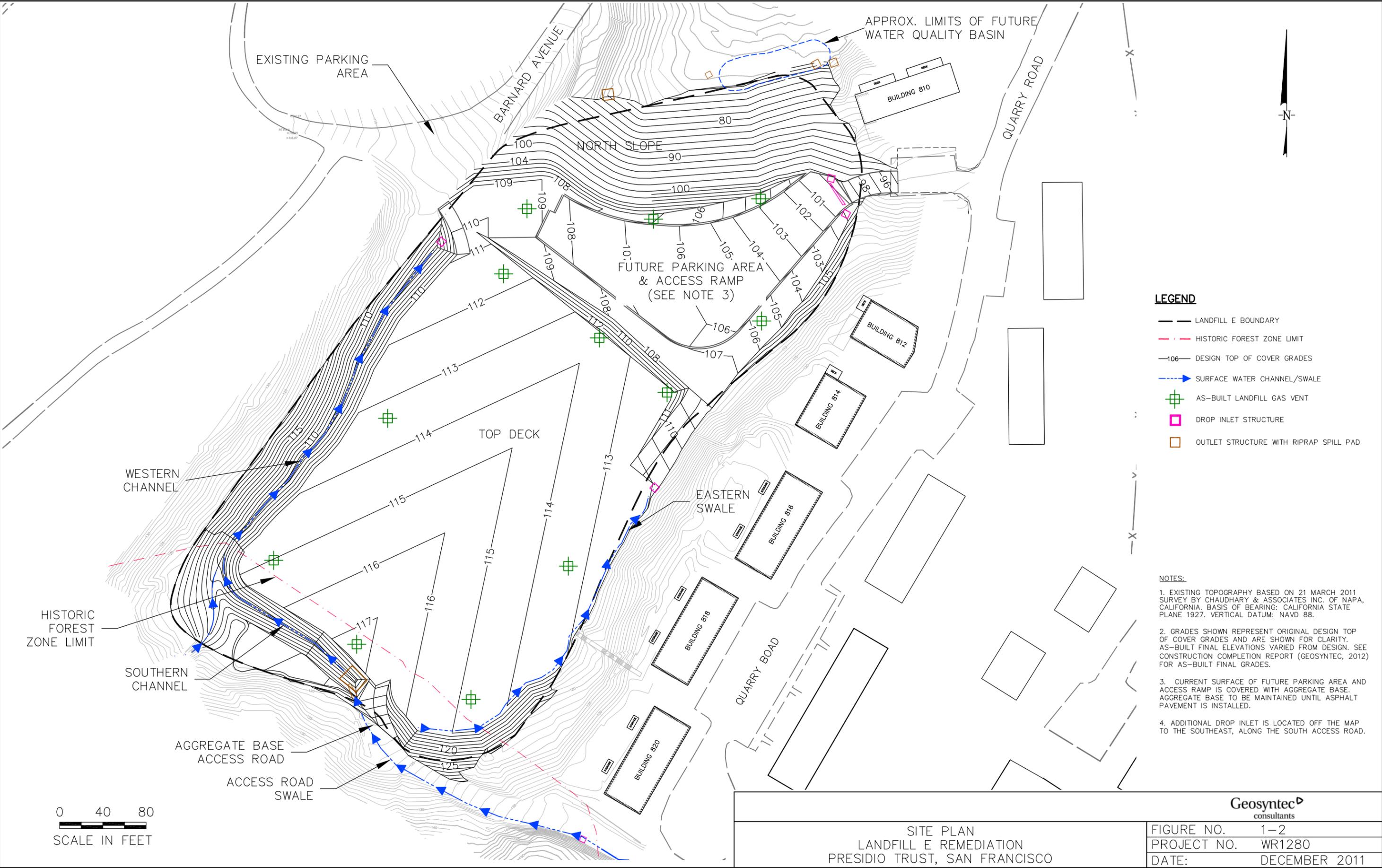
LANDFILL E CCR
 PRESIDIO TRUST
 SAN FRANCISCO, CA



DECEMBER 2011
 FIGURE 1-1

SOURCE: Base map provided by Treadwell & Rollo, November 2004. Draft Small Arms Firing Range Feasibility Study Report, Figure 6.

P:\CADD\Land Projects 3\Presidio.dwg\Design\Figures for Reports\Figure-Site Plan for CCR and COA.dwg



- LEGEND**
- LANDFILL E BOUNDARY
 - - - HISTORIC FOREST ZONE LIMIT
 - 106- DESIGN TOP OF COVER GRADES
 - ▶ SURFACE WATER CHANNEL/SWALE
 - ⊠ AS-BUILT LANDFILL GAS VENT
 - ◻ DROP INLET STRUCTURE
 - ◻ OUTLET STRUCTURE WITH RIPRAP SPILL PAD

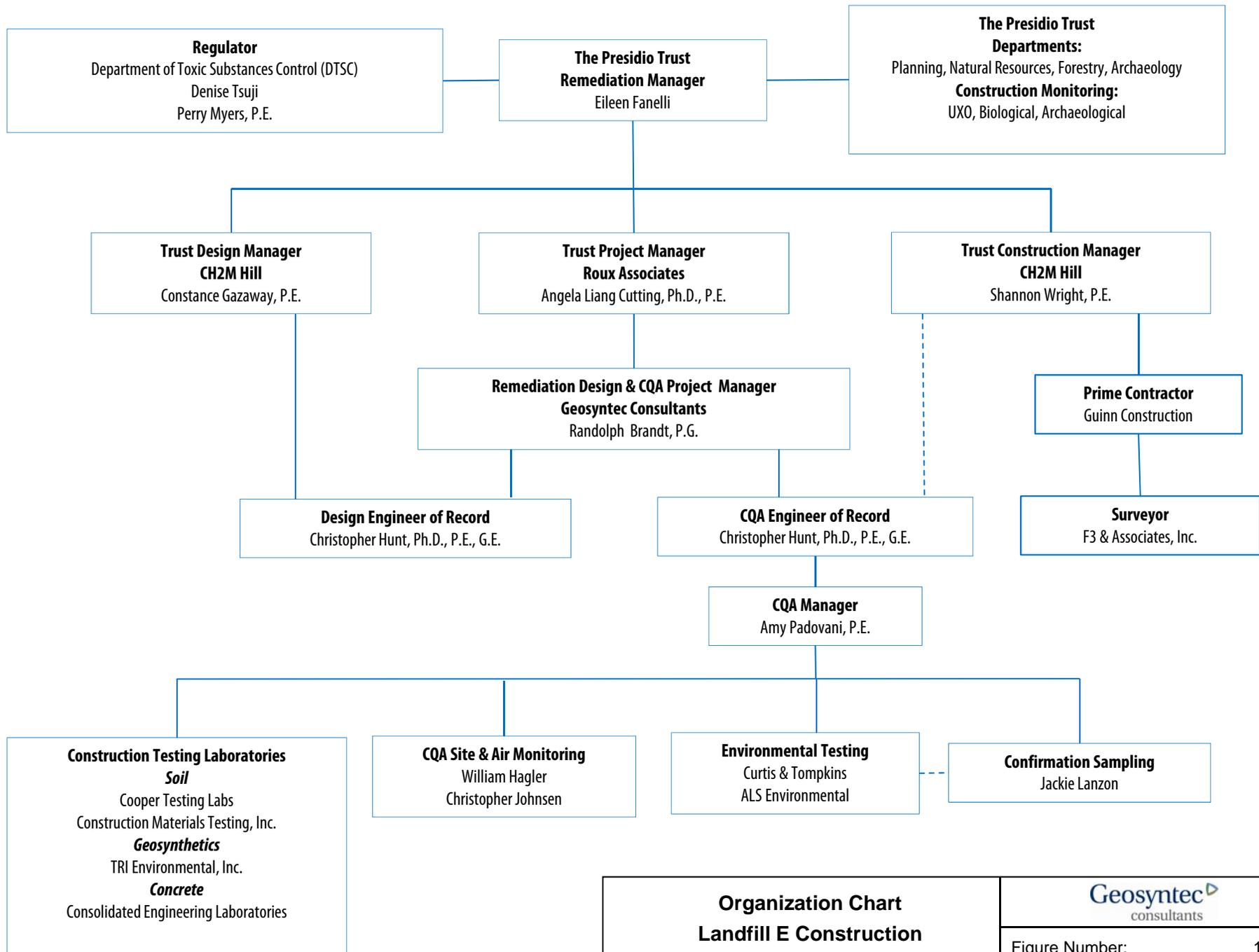
- NOTES:**
1. EXISTING TOPOGRAPHY BASED ON 21 MARCH 2011 SURVEY BY CHAUDHARY & ASSOCIATES INC. OF NAPA, CALIFORNIA. BASIS OF BEARING: CALIFORNIA STATE PLANE 1927. VERTICAL DATUM: NAVD 88.
 2. GRADES SHOWN REPRESENT ORIGINAL DESIGN TOP OF COVER GRADES AND ARE SHOWN FOR CLARITY. AS-BUILT FINAL ELEVATIONS VARIED FROM DESIGN. SEE CONSTRUCTION COMPLETION REPORT (GEOSYNTEC, 2012) FOR AS-BUILT FINAL GRADES.
 3. CURRENT SURFACE OF FUTURE PARKING AREA AND ACCESS RAMP IS COVERED WITH AGGREGATE BASE. AGGREGATE BASE TO BE MAINTAINED UNTIL ASPHALT PAVEMENT IS INSTALLED.
 4. ADDITIONAL DROP INLET IS LOCATED OFF THE MAP TO THE SOUTHEAST, ALONG THE SOUTH ACCESS ROAD.



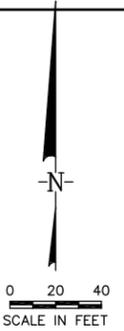
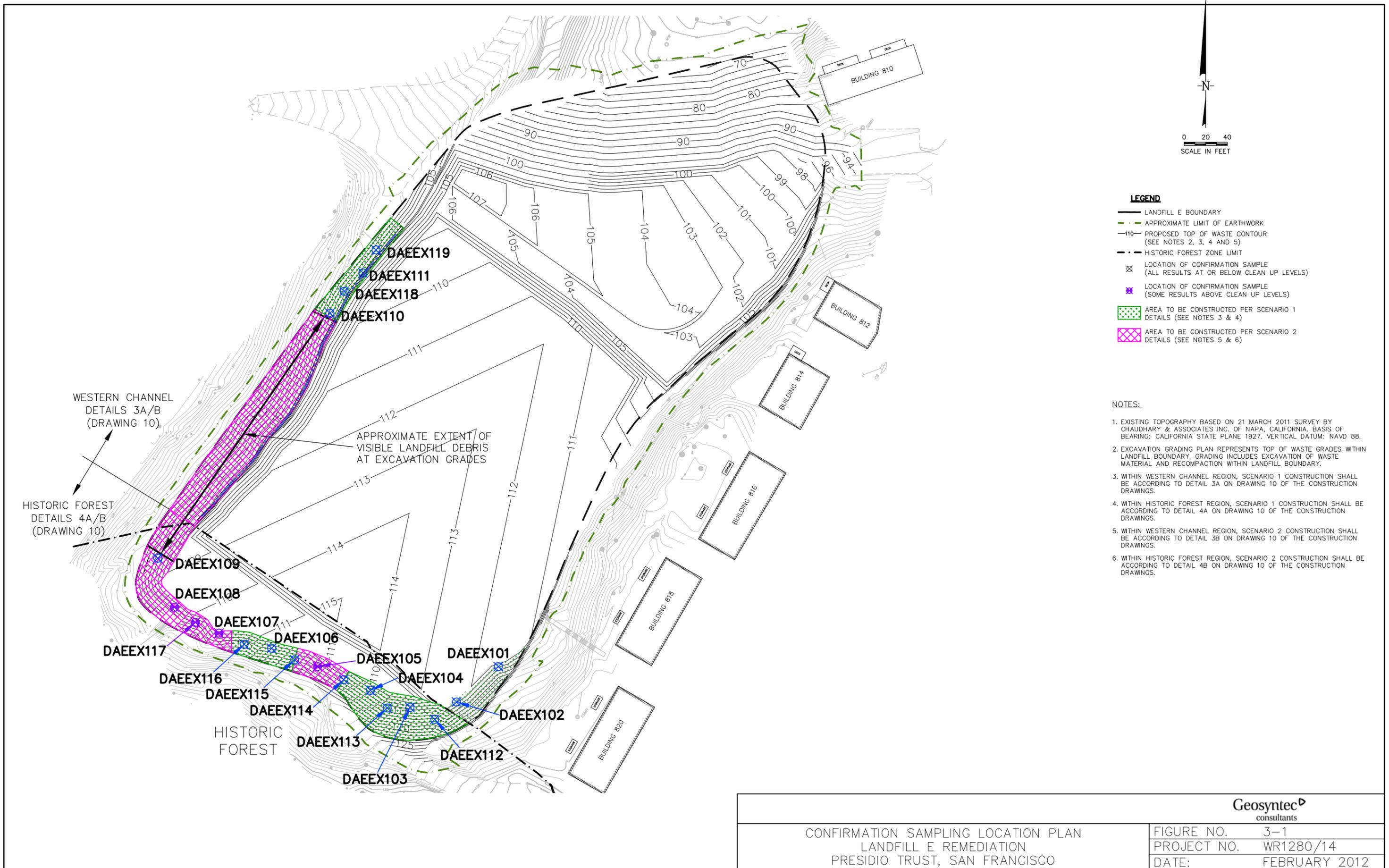
Geosyntec
consultants

SITE PLAN
LANDFILL E REMEDIATION
PRESIDIO TRUST, SAN FRANCISCO

FIGURE NO.	1-2
PROJECT NO.	WR1280
DATE:	DECEMBER 2011



Organization Chart Landfill E Construction Presidio Trust San Francisco, California		
	Figure Number:	1-3
	Date:	December 2011
	Project Number:	WR1280



- LEGEND**
- LANDFILL E BOUNDARY
 - - - APPROXIMATE LIMIT OF EARTHWORK
 - 110- PROPOSED TOP OF WASTE CONTOUR (SEE NOTES 2, 3, 4 AND 5)
 - · - HISTORIC FOREST ZONE LIMIT
 - ⊗ LOCATION OF CONFIRMATION SAMPLE (ALL RESULTS AT OR BELOW CLEAN UP LEVELS)
 - ⊗ LOCATION OF CONFIRMATION SAMPLE (SOME RESULTS ABOVE CLEAN UP LEVELS)
 - ▨ AREA TO BE CONSTRUCTED PER SCENARIO 1 DETAILS (SEE NOTES 3 & 4)
 - ▨ AREA TO BE CONSTRUCTED PER SCENARIO 2 DETAILS (SEE NOTES 5 & 6)

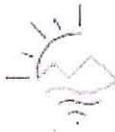
- NOTES:**
1. EXISTING TOPOGRAPHY BASED ON 21 MARCH 2011 SURVEY BY CHAUDHARY & ASSOCIATES INC. OF NAPA, CALIFORNIA. BASIS OF BEARING: CALIFORNIA STATE PLANE 1927. VERTICAL DATUM: NAVD 88.
 2. EXCAVATION GRADING PLAN REPRESENTS TOP OF WASTE GRADES WITHIN LANDFILL BOUNDARY. GRADING INCLUDES EXCAVATION OF WASTE MATERIAL AND RECOMPACTION WITHIN LANDFILL BOUNDARY.
 3. WITHIN WESTERN CHANNEL REGION, SCENARIO 1 CONSTRUCTION SHALL BE ACCORDING TO DETAIL 3A ON DRAWING 10 OF THE CONSTRUCTION DRAWINGS.
 4. WITHIN HISTORIC FOREST REGION, SCENARIO 1 CONSTRUCTION SHALL BE ACCORDING TO DETAIL 4A ON DRAWING 10 OF THE CONSTRUCTION DRAWINGS.
 5. WITHIN WESTERN CHANNEL REGION, SCENARIO 2 CONSTRUCTION SHALL BE ACCORDING TO DETAIL 3B ON DRAWING 10 OF THE CONSTRUCTION DRAWINGS.
 6. WITHIN HISTORIC FOREST REGION, SCENARIO 2 CONSTRUCTION SHALL BE ACCORDING TO DETAIL 4B ON DRAWING 10 OF THE CONSTRUCTION DRAWINGS.

Geosyntec consultants	
CONFIRMATION SAMPLING LOCATION PLAN LANDFILL E REMEDIATION PRESIDIO TRUST, SAN FRANCISCO	FIGURE NO. 3-1 PROJECT NO. WR1280/14 DATE: FEBRUARY 2012

APPENDIX A
DTSC Approval of RDIP



Linda S. Adams
Acting Secretary for
Environmental Protection



Department of Toxic Substances Control

Deborah O. Raphael, Director
700 Heinz Avenue
Berkeley, California 94710-2721



Edmund G. Brown Jr.
Governor

June 21, 2011

Ms. Eileen Fanelli
Remediation Manager
The Presidio Trust
34 Graham Street
P.O. Box 29052
San Francisco, California 94129-0052

Dear Ms. Fanelli:

The Department of Toxic Substances Control (DTSC) has completed its review of the *Remedial Design and Implementation Plan Landfill E (RDIP)* for the Presidio of San Francisco, California. The RDIP, dated June 2011 was prepared by Geosyntec Consultants on behalf of the Presidio Trust and describes how the remedial activities approved in the June 2011 Final Feasibility Study/Remedial Action Plan for Landfill E will be implemented. Based on our review, the RDIP is approved and implementation of the selected remedy may begin provided that all necessary notifications have been made and permits have been obtained.

If you have any questions or comments, please contact Denise Tsuji at (510) 540-3824 or email at dtsuji@dtsc.ca.gov.

Sincerely,

Denise Tsuji
Unit Chief
Brownfields and Environmental
Restoration Program - Berkeley Office

Perry Myers
Senior Hazardous Substances Engineer
Engineering and Special Projects Office



APPENDIX B

Construction Quality Assurance (CQA) Report – Landfill E Closure

(Bound Separately)

Prepared for

The Presidio Trust
67 Martinez Street
San Francisco, California

**CONSTRUCTION QUALITY ASSURANCE
(CQA) REPORT
LANDFILL E REMEDIATION
PRESIDIO OF SAN FRANCISCO, CALIFORNIA**

Volume II of II
(Appendix B of the Construction Completion Report)

Prepared by

Geosyntec 
consultants

engineers | scientists | innovators

1111 Broadway, 6th Floor
Oakland, California 94607

Project Number: WR1280

February 2012

CONSTRUCTION QUALITY ASSURANCE (CQA) REPORT LANDFILL E REMEDIATION

PRESIDIO OF SAN FRANSISCO, CALIFORNIA

Prepared by

Geosyntec Consultants, Inc.
1111 Broadway, 6th Floor
Oakland, California 94607



A handwritten signature in blue ink, appearing to read "C. Hunt", written over a horizontal line.

Christopher Hunt, Ph.D., P.E., G.E.
Associate



A handwritten signature in blue ink, appearing to read "A. Padovani", written over a horizontal line.

Amy Padovani, P.E.
Project Engineer

Project Number: WR1280
February 2012

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LIST OF ACRONYMS AND ABBREVIATIONS

ADMP	Air and Dust Monitoring Plan
ADS	Advanced Drainage System
ALS	ALS Environmental
ASTM	American Society for Testing and Materials
BS/BSD	Method Blanks, Blank Spike/Blank Spike Duplicates
C&T	Curtis and Tompkins Laboratories
CCR	Construction Completion Report
CM	Construction Manager
COCs	Chemicals of Concern
CQA	Construction Quality Assurance
DTSC	California Environmental Protection Agency, Department of Toxic Substances Control
EBMUD	East Bay Municipal Utilities District
FS/RAP	Feasibility Study and Remedial Action Plan
Geosyntec	Geosyntec Consultants, Inc.
HDPE	High Density Polyethylene
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicates
LFE	Landfill E
LFG	Landfill Gas
OSHA	Occupational Safety and Health Administration
PE	Professional Engineer
PM ₁₀	Particulate Matter (10 Microns or Smaller in Diameter)
QAPP/SAP	Quality Assurance Project Plan/Sampling and Analysis Plan
QA/QC	Quality Assurance/Quality Control
RBC _{air}	Risk-based Concentrations in Air
RDIP	Remedial Design and Implementation Plan
RFIs	Requests for Information
RLs	Reporting Limits
SVOCs	Semi-Volatile Organic Compounds
the Presidio	The Presidio of San Francisco, California
Trust	The Presidio Trust

1. INTRODUCTION

This document presents the Construction Quality Assurance (CQA) Report for construction of the engineered soil cover at Landfill E (LFE, or Site) at the Presidio of San Francisco, California (the Presidio). The CQA Report, which is included as an appendix to the project Construction Completion Report (CCR), describes the processes and procedures that were implemented as part of remediation of LFE, design modifications that were made during construction, and CQA observations and testing that were performed to verify compliance with the design intent of the project.

1.1 Project Overview

Construction of the engineered soil cover at LFE was performed consistent with the requirements of the approved Final Remedial Design and Implementation Plan (RDIP) prepared by Geosyntec Consultants, Inc. (Geosyntec, 2011b) on behalf of the Presidio Trust (the Trust). The RDIP, which was approved by the DTSC on June 21, 2011 (see Appendix A of the CCR), presented the implementation plan for the preferred remedy selected in the Final Feasibility Study and Remedial Action Plan (FS/RAP) for LFE, prepared by Geosyntec on behalf of the Trust (Geosyntec, 2011a). The FS/RAP summarized the studies undertaken to evaluate the nature and extent of fill materials and associated impacts, identified the chemicals of concern (COCs), presented and evaluated potential remedial alternatives for the site, and described the preferred alternative.

1.2 Report Organization

The remainder of this report is organized as follows:

- **Section 2: Construction Quality Assurance Program** - Presents a summary of the CQA program;
- **Section 3: Design Modifications and Field Variances** – Describes elements of the original design that were modified either to better meet the Trust’s needs or based on variances observed in the field;
- **Section 4: Earthwork Quality Assurance** – Presents details of the CQA program related to earthwork activities;

- **Section 5: Geosynthetics Quality Assurance** – Presents details of the CQA program related to geosynthetics testing and deployment activities;
- **Section 6: Other Quality Assurance** – Presents details of the CQA program related to High Density Polyethylene (HDPE) piping, concrete, and erosion control features;
- **Section 7: Air Monitoring** – Presents details of the air monitoring program ongoing during earthwork activities;
- **Section 8: Certification** – Presents the certification of the project by the CQA Engineer of Record;
- **Section 9: References** – Provides a list of documents referenced in this CQA Report; and
- **Section 10 – Limitations** – Presents limitations on the application of information presented in this report.

Photographic documentation related to the CQA activities is presented in Attachment A. Construction Memoranda are included in Attachment B. Project correspondence, including contractor submittals and requests for information (RFIs), are included in Attachment C. CQA documentation, including field logs, laboratory test results and field test results, is included in Attachments D through J. Copies of the Construction Drawings are included in Attachment K. The as-built data and record drawings, including the drawing showing the as-built limits of the geomembrane, are presented in Attachment L. Correspondence, summary memoranda, and daily records related to air monitoring are presented in Attachment M.

1.3 Reference Documents

The following list of references includes the applicable design and construction documents related to the construction of the overall project:

- Final Remedial Design and Implementation Plan – Landfill E, Presidio of San Francisco, California, prepared by Geosyntec Consultants, June 2011.
- Construction Drawings, Landfill E Remediation, Presidio of San Francisco, California, prepared by Geosyntec Consultants, June 2011.

- Construction Drawings (Revision 2), Landfill E Remediation, Presidio of San Francisco, California, prepared by Geosyntec Consultants, August 2011 (superseded June 2011 drawings).
- Division 1 – General Requirements, Landfill E Remediation Construction - Landfill Closure at Presidio of San Francisco, California, prepared by Geosyntec Consultants, June 2011 (released June 16).
- Division 2 & 3 – 100% Submittal - Technical Specifications, Landfill E Remediation Construction - Landfill Closure at Presidio of San Francisco, California, prepared by Geosyntec Consultants, June 2011 (released June 16).
- Division 1 – General Requirements (Revision 1), Landfill E Remediation Construction - Landfill Closure at Presidio of San Francisco, California, prepared by Geosyntec Consultants, 30 June 2011
- Construction memoranda included in Attachment B.
- Responses to RFIs included in Attachment C.

2. CONSTRUCTION QUALITY ASSURANCE PROGRAM

2.1 Scope

2.1.1 Introduction

The scope of the CQA program for the remediation of Landfill E included the following:

- construction quality assurance;
- design support; and
- preparation of this report.

These CQA activities are described in Sections 2.1.2 through 2.1.4.

2.1.2 Description of Work

Remediation of LFE included construction of an engineered cover system over contaminated soil and waste, installation of a landfill gas (LFG) venting system, and construction of a surface water drainage system. Further description of the design and construction elements of LFE is included in the RDIP (Geosyntec, 2011b) and Section 1 of the CCR.

2.1.3 Construction Quality Assurance

In addition to design support, Geosyntec's primary role during the remediation of Landfill E was as the CQA Consultant. The services performed included:

- testing and visually classifying borrow soils to assure geotechnical suitability for construction;
- monitoring excavation and grading for subgrade preparation;
- coordinating with the geosynthetics laboratory to collect all necessary geosynthetic conformance samples (either at the manufacturing plant or in the field);
- inspecting delivered geomembrane, geotextile, and geocomposite prior to deployment;

- reviewing conformance test results of geomembrane, geotextile, and geocomposite prior to deployment;
- testing engineered and horticultural soils, drainage rock and aggregate base for conformance with earthwork specifications;
- monitoring placement of solid and perforated HDPE and Advanced Drainage System (ADS) pipes;
- monitoring placement, moisture conditioning, lift thickness and consistency of compactive effort of foundation soil to establish subgrade for the overlying geosynthetics;
- monitoring and documenting deployment of landfill gas collection geocomposite panels;
- monitoring geomembrane trial welding prior to deployment;
- monitoring and documenting deployment and welding of geomembrane panels;
- monitoring and documenting deployment and sewing of drainage geocomposite panels;
- monitoring and documenting deployment of geotextile;
- monitoring installation of landfill gas vents and associated features including protective fencing;
- monitoring placement of engineered and horticultural soils and drainage rock over geosynthetics;
- testing field density and moisture content of placed engineered and horticultural soils to verify compliance with earthwork specifications;
- monitoring placement of aggregate base material over future parking area;
- monitoring excavation activities for construction of surface water channels, associated drop inlets, riprap aprons and buried grade control structures;
- monitoring and documenting deployment of erosion control blankets;
- monitoring and documenting installation of straw wattles;
- monitoring placement of wood mulch; and
- documenting construction activities.

2.1.4 Design Support

During the remediation of Landfill E, Geosyntec performed design support and limited construction management services, which included:

- coordinating with contractors and owner;
- collecting and reviewing submittals and requests for variance from the contractor;
- preparing construction memoranda detailing design changes that occurred during construction;
- reviewing survey as-built data; and
- attending weekly construction meetings.

These tasks were ongoing throughout the duration of the construction.

2.1.5 Report Preparation

Included in this report is a discussion of the findings and observations of Geosyntec's on-site CQA personnel and off-site laboratories for the tasks summarized in Section 2.1.3. Daily documentation of construction activities, including laboratory and field testing associated with the construction is presented as attachments to this report.

As-built drawings showing surveyed elevations of the various soil layers and limits of geosynthetics were provided by F3 & Associates. All record drawings are included in Attachment L.

2.2 Personnel

2.2.1 Project Technical Personnel

The key technical personnel involved in remediation construction of Landfill E are listed below:

The Presidio Trust (Owner)

- Eileen Fanelli – Remediation Manager
- Angela Liang Cutting – Project Manager (Roux Associates)

- Constance Gazaway – Design Manager (CH2M HILL)
- Shannon Wright – Construction Manager (CH2M HILL)

Guinn Construction (General Contractor)

- Jeff Affonso – President
- Alan Shirkey – Project Manager
- Jay Weller – Project Superintendent

F3 & Associates (Surveyor)

- Todd Tillotson, P.L.S. – Surveyor-of-Record

D&E Construction Inc. (Geomembrane Installer)

- Gordon Hosick – Project Manager
- Ernesto Alvarado – Project Superintendent

SKAPS Industries (Geocomposite and Geotextile Manufacturer)

- Nilay Patel – Project Manager

Geosyntec Consultants, Inc. (Design Engineer and CQA Consultant)

- Randy Brandt – Project Manager
- Christopher Hunt, Ph.D., P.E., G.E. – Design and CQA Engineer of Record
- Amy C Padovani, P.E. – CQA Manager
- William Hagler – CQA Field Manager
- Christopher Johnsen – Air Monitoring Field Manager
- Jackie Lanzon – Environmental Engineer

H.T. Harvey & Associates

- Max Busnardo – Ecologist
- Matt Parsons- Biologist

Precision Geosynthetics Laboratories (Geosynthetics Testing)

- Cora Queja – Laboratory Manager
- Christian Sebastian – Project Manager

TRI Environmental, Inc. (Geotechnical Testing)

- John Allen – Division Director
- Richard Lacey – Project Manager

Construction Material Testing, Inc. (Geotechnical Laboratory)

- Jim Musser – Laboratory Manager

Cooper Testing Laboratories (Geotechnical Laboratory)

- Peter Jacke - Laboratory Manager

2.2.2 On-Site CQA Monitoring Personnel Schedules

The remediation of Landfill E occurred during the period of 18 July through 15 November 2011. Geosyntec provided qualified CQA personnel on-site to monitor construction activities on a full-time basis during waste excavation and re-grading, geosynthetics delivery and off-loading, geosynthetics installation, installation of landfill gas venting system, installation of surface water control elements, and installation of erosion control measures during the period of 18 July through 4 November 2011. Part-time monitoring was established for the remainder of the project duration from 7 November 2011 until the final walkthrough on 15 November 2011. Monitoring was coordinated, as necessary, with the Trust and with Guinn staff. Geosyntec personnel were on site during construction according to the following schedule:

Will Hagler	18 July thru 9 November 2011
Christopher Johnsen	20 July thru 20 September 2011
Amy Padovani	19 and 26 July 2011
	2, 8, 16, 23 and 30 August 2011
	6, 13, 20 and 27 September 2011
	6, 11, 18 and 25 October 2011

Christopher Hunt

2 and 15 November 2011

26 July 2011

2 and 16 August 2011

13 and 27 September 2011

6 and 18 October 2011

2 and 15 November 2011

3. DESIGN MODIFICATIONS AND FIELD VARIANCES

3.1 Introduction

At various times during construction, aspects of the original design were re-evaluated due to: (1) discrepancies between actual field conditions and those conditions assumed as part of the design, (2) additional modifications requested by the Trust, (3) long lead times to obtain some of the originally specified products; and (4) schedule concerns relative to the need to complete landfill remediation prior to the start of the rainy season.

The modifications performed as part of this project were grouped in two categories: (1) design modifications and (2) field variances. Design modifications corresponded to changes performed at the request of the Trust, and generally involved revisions to the construction drawings. Field variances generally corresponded to modifications made as a result of changed field conditions (i.e., different than assumed for design) or efficiencies proposed by Guinn in order to meet the project schedule or reduce cost. All proposed design modifications or field variances were reviewed by the Design Engineer and only those that were found to be consistent with the design intent as presented in the FS/RAP (Geosyntec, 2011a) and RDIP (Geosyntec, 2011b) were allowed.

3.2 Design Modifications

3.2.1 Southern Channel Re-grade and Additional Geosynthetics

As part of Revision 2 to the Construction Drawings, submitted by Geosyntec to the Trust in August 2011, the alignment of the southern channel was moved northwards for consistency with the Trust's planned future land use for LFE. This re-alignment (see Drawing 6 of the Construction Drawings in Attachment K-2) moved the channel flowline away from the landfill perimeter where there was little or no waste and into areas of thicker landfill material. A geomembrane was incorporated between the cover soils and the underlying landfill material to minimize the potential for infiltration of surface water into the landfill.

For consistency with the proposed Scenario 2 configuration for the western channel (see Detail 3B on Drawing 10 of the Construction Drawings in Attachment K-2), the Trust elected to install the new geosynthetics in the southern channel at a depth of 3 feet below the proposed final grades. A review of the excavation grading plan (Drawing 5 of

the Construction Drawings in Attachment K-2) indicated that several areas within the southern channel alignment, primarily along the centerline of the channel, would require additional excavation to achieve the planned 3 feet cover over the new geomembrane and drainage geocomposite. The new grading plan, which accounted for the necessary deeper excavation in some areas, was presented to the Trust as part of Construction Memo #3 (CM #3). Details for the geosynthetic liner system for the southern channel were also included as part of CM#3. A copy of this memo is included in Attachment B.

3.2.2 Eastern Surface Water Conveyance

Revision 2 of the construction drawings reduced the number of buried surface water pipes that carry flow down the northeast side of LFE from 3 to 2. One pipe, unchanged from the original design, carries water from the future parking area on top of LFE to the toe of the landfill. Of the other two pipes, one pipe was designed to carry surface water originating from Quarry Road only, and a separate pipe would carry flows from the eastern side of LFE. Originally, Quarry Road flows were kept separate to allow for possible water quality treatment of these flows at some point in the future. However, the Trust decided that any such future treatment would occur at the source on Quarry Road rather than at the toe of LFE. As such, the two pipes were combined into one buried pipe along the eastern side of LFE, with two connections from existing Quarry Road discharge pipes.

3.2.3 Surface Water Energy Dissipation Spill Pads

As part of Revision 2 of the Construction Drawings (see Attachment K-2), the concrete energy dissipation structures and the 40 feet wide stilling basin were replaced by riprap spill pads in order to reduce the footprint of these features. Originally, surface water from the buried pipes on the east and west sides of LFE was intended to reduce velocity with concrete energy dissipaters, flow into a stilling basin, and discharge downstream over an approximately 40 feet wide earthen weir. While the concrete energy dissipaters allowed for control of flows over a narrow footprint at the toe of the landfill, they would likely be difficult to bury and hide from view. The Trust decided that the reduced overall footprint and more natural look of riprap energy dissipaters at each pipe outlet was preferable, and decided to forego the original desire for the 40 feet weir.

3.2.4 Landfill Gas Vent Relocation

A review of landfill gas vents along the top deck at LFE indicated that some of the proposed vent locations would likely interfere with construction of a planned future fence line (see Drawing 8 of the Construction Drawings in Attachment K). The proposed locations for the vents located at the northwest, southwest and southeast corners of the proposed future fence line were moved approximately 10 feet away from the corners towards the southwest, northeast and northeast, respectively. The as-built locations for these vents are presented in as-built drawings shown in Attachment L-2. In all cases, the new locations remained on the alignment of the proposed future fence line.

In addition, the coordinates for the gas vent located near the northeast corner of the proposed future fence line were moved towards the northwest to allow for the fence enclosure around the vent (see Detail 14 on Drawing 12 in Attachment K-2) to be installed without construction fence posts on the adjacent slope. The LFG as-built drawing included in Attachment L-2 also shows the as-built location for this vent.

The gas vents relocation design modification was documented in CM #4, a copy of which is included in Attachment B.

3.2.5 Infiltration Pipe Modifications

The Landfill Gas Control Plan (see Drawing 8 in Attachment K-2) included a note that read “Discharge trench infiltration water to stilling basin with 6” ϕ solid HDPE pipe (See Note 3)”. Based on Revision 2 of the drawings (August 2011), the stilling basin was no longer going to be constructed and therefore the infiltration pipe would no longer be able to discharge at that point.

To allow for the proper discharge of any infiltration water collected in the north slope piping, the solid pipe was instead discharged to a small rock spill pad at the toe of the landfill. Water in this pipe would be limited to infiltration water, and therefore flow rates are expected to be small. The end of the pipe includes a stainless steel mesh to prevent small animals from entering the pipe while allowing water to exit the pipe. The modification to the infiltration pipe was originally documented in CM #3, a copy of which is included in Attachment B.

Additional modifications to the infiltration piping were required at the termination of infiltration pipes on the landfill top deck to allow for discharge of collected water to the

surface water drop inlets. The original design assumed that the infiltration piping would be field fitted to drain to the drop inlets, but construction sequencing resulted in installation of all piping before drop inlets were constructed. As such, the inverts of three of the infiltration pipes were deeper than the inverts of the drop inlets they were intended to discharge to. An e-mail dated 12 October 2011 is included in Attachment C-3 (RFIs) which describes the methods that were recommended to raise the outlets of each of the affected infiltration pipes to allow for proper discharge with minimal potential for ponded water and infiltration.

3.2.6 Parking Area and Water Quality Basin Removal

In order to complete the project prior to the rainy season, the Trust decided to postpone the placement of the asphalt concrete surfacing on the parking area until a future project. In order to achieve the minimum required 2 feet of soil cover in the parking area, it was decided that the thickness of the aggregate base for this area would be increased by 4 inches everywhere to account for the missing 4 inch thickness of the asphalt concrete included in the original design.

Once the decision was made to postpone the construction of the parking area surfacing, it was deemed that it would not be necessary to construct the water quality basin at this time, since the basin was only intended to receive surface water flows from the paved parking area. Note that concrete traffic barriers have been installed at the toe of the access ramp from Quarry Road to prevent any parking on the unpaved future parking area.

3.2.7 Erosion Control Treatment Areas

The original set of Construction Drawings from June 2011 assumed that erosion control would be achieved through hydroseeding and other vegetation. However, with selection of import soils from an offsite borrow source, the East Bay Municipal Utilities District (EBMUD) Miller Road stockpile, and with a Trust decision that formal vegetation of the site would be delayed at least one season, the erosion control methods were modified to include weed control as an additional goal. The primary erosion control measure thus become application of mulch over the majority of the project surface area, with the exception of the future parking area and the southern and western channels. Revision 2 of the Construction Drawings, issued in August 2011, included Sheet 22 (Erosion Control Treatment Areas), developed in conjunction with H.T. Harvey, to

establish different methods of erosion control on the top deck, LFE perimeter, channels, and north slope.

3.2.8 Soil Amendment Plan

At the same time as the erosion control plan was developed by Geosyntec, H.T. Harvey & Associates developed soil amendment recommendations for the different soil types that would be used as horticultural soil in the planting areas. Soil amendments were developed to be general in nature to accommodate the typical Presidio planting palette. Revision 2 of the Construction Drawings issued in August 2011 included Sheet 21 (Soil Type and Amendment Areas), showed the types of amendments that would need to be applied to each area, based on the soils to be used. The drawing references a memo developed by H.T. Harvey & Associates on 8 August 2011, included in Attachment C-1, which described the materials and the methodology to be used when applying the amendments.

3.3 Field Variances

3.3.1 Top Deck Elevation

The design excavation grading plan (Drawing 5 of Attachment K-1) attempted to achieve a balance between cut and fill in order to minimize potential offhaul of landfill materials. However, several factors resulted in uncertainty regarding this soil balance, including: (a) presence of significant quantities of mulch over the landfill surface (see Section 6.1 of the CCR), obscuring the actual landfill surface topography; (b) uncertainty in the ability to achieve clean closure across the southern and western perimeter of the landfill and need to overexcavate in areas where clean closure could not be achieved (see Section 3.4 of the CCR); (c) contractor overexcavation of landfill materials in limited areas that were backfilled with clean imported soil; and (d) actual shrinkage and swell characteristics of the excavated waste.

Once it became apparent that additional landfill material was being generated that could not be compacted within the original excavation grading plan elevations, a decision was made to raise the top deck area by 0.5 feet to provide additional room for landfill material placement. The raised area was bounded on the north by the slope south of the future parking area, on the west by the western channel, on the south by the southern channel, and on the east by the landfill limit. In order to meet the design intent, both the elevations of the excavation grading plan (Drawing 5) and the final grading plan

(Drawing 6) were raised within this area. This regrading was not incorporated within revised drawings, but is shown in the as-built grades in Attachment L.

3.3.2 Riprap Material Properties

On July 14th, representatives from Geosyntec visited the Vasco Road Landfill (Vasco) in Livermore, California, to meet with representatives from Guinn to visually inspect and collect samples of the on-site rock proposed for use as riprap for LFE. As shown on Sheet 13 of the Construction Drawings (see Attachment K-2) riprap rock would be needed for the rock spill pads at the end of the surface water pipes, as well as for buried grade control structures along the bottom of the channels.

During the site walk, a Geosyntec geologist identified and collected several sandstone samples which were taken to Cooper Testing Labs (Cooper) in Palo Alto to be processed and tested. At the time the samples were collected in the field, Geosyntec pointed out that although the exposed sandstone samples appeared to be brown, as requested by the Trust, fresh cut faces would likely be gray, eventually weathering to a primarily brown color.

The samples taken to Cooper were processed into smaller pieces and tested for slake durability, specific gravity and absorption of coarse aggregates, soundness of aggregate by sodium or magnesium sulfate and L.A. abrasion. Results from the tests showed that the rock was very competent and therefore Geosyntec approved its use as riprap for the LFE project.

A detailed description of the laboratory tests performed on the rock samples, the rock selection process in the field, and the processing and placement requirements for the riprap were documented as part of CM#2. A copy of the memo has been included in Attachment B.

3.3.3 Drainage Gravel Properties

On 24 August 2011, a sample of the drainage gravel to be used for the landfill gas and infiltration trenches at the LFE project was sent to TRI/Environmental Labs (TRI) in Austin, Texas, for conformance testing. Per the drainage gravel specifications (Section 02310), the sample was tested for gradation (ASTM D422) and permeability (ASTM D2434).

The results for the permeability test indicated that the sample met the requirements of the project with a permeability of 30 cm/sec (project specifications required a

permeability of 1 cm/sec). The sieve analysis results indicated that the sample met all particle size requirements, except for the ¾-inch sieve. The sample had 64.5% of the total mass passing this sieve, versus a project specification of 75-100%. Based on a review of the material properties, Geosyntec concluded that the material met the design intent and was therefore approved to be used at the site.

3.3.4 Drop Inlet Sizing

The current design for the drop inlet at location SW-0 specified interior dimensions of 30" x 30" (see Drop Inlet Dimensions table on Drawing 16). Geosyntec was notified by the Contractor and Construction Manager that this dimension drop inlet was not readily available, and would require several weeks to obtain. At the Construction Manager's request, Geosyntec contacted the drop inlet manufacturer, Jensen Precast. The representative at Jensen Precast informed Geosyntec that a drop inlet with interior dimensions of 36" x 36" was readily available. As this size drop inlet was larger than the specified 30" x 30" drop inlet, it would meet the design intent. Therefore, Geosyntec approved the use of 36" x 36" drop inlet in lieu of the 30" x 30". Two drop inlets with these dimensions would be needed for the project, both along the southeastern access road, as described in note 4 on Drawing 13 and on Note 3 on Detail W1 on Drawing 16.

3.3.5 Flared-End Sections for Surface Water Pipe Outlets and Spill Pad Dimensions

Per the Contractor's request, the use of flared-end sections, in lieu of the specified mitered pipe end, was accepted to simplify construction of the trash racks/safety grates at the various pipe outlets. The use of the flared-end sections meant that some of the spill pads increased in size in order to accommodate the wider dimensions of the flared-end sections. Dimensions for spill pads #3 and #4 were increase from a width of 4 feet at the end of the pipes, to widths of 8 feet and 6 feet respectively. Additional riprap was required to meet the new spill pad dimensions.

3.3.6 Southern Drainage Pipe Re-Alignment and Burial Depth

During trench excavation for the buried pipe along the southern access road, it was noted that the excavation was too close to a large Eucalyptus tree which could have been damaged if the trench alignment was maintained as shown on the construction drawings. Consistent with their policy for excavation adjacent to large trees, the Trust

Forestry department required that the trench alignment be modified to maintain a minimum distance of at least 20 feet from the existing tree and potential root damage. Geosyntec reviewed the proposed trench realignment and confirmed that it met the design intent for pipe slope, therefore the new alignment was approved.

Geosyntec pointed out that the new trench alignment should try to return to the original alignment as soon as possible after passing the tree roots. During Geosyntec's review of the survey as-built data for the trench alignment, it was noted that the constructed alignment had deviated from the proposed one. While the as-built alignment meets the design intent, future development at the site will need to consider the current location of the pipe.

During installation of the ADS pipe along the southern access road, it was noted that the pipe had been installed approximately 0.5 feet higher than shown on the Drawings. With the subsequent excavation of an 18 inch surface water swale above the pipe, 6 inches of cover would remain between the bottom of the swale and the top of the pipe, as opposed to the 12 inches shown on the Drawings. Due to schedule constraints, a decision was made to leave the pipe at the installed elevation, as the reduction in cover is only a concern if a heavily loaded vehicle enters the swale directly above the pipe. As this was considered a limited exposure event, and repairable if damage occurred, the Trust elected to accept the reduced cover thickness.

3.3.7 North Slope Pipe Burial Depth

During excavation for the installation of the easternmost surface water pipe along the eastern side of the north slope, the Contractor requested that the pipes be installed shallower than shown on the Drawings and with an additional bend that would allow the pipe to return to the design discharge elevation at the toe of slope. The purpose of the request was to avoid a deep excavation requiring shoring in relatively close proximity to Building 810. Geosyntec evaluated the Contractor's request and concluded that the design intent would be met, provided the elevations of the discharge points were maintained and the pipe had at least 2 feet of cover above the crown. Geosyntec personnel observed the installation of the pipe and measured the soil cover thickness above the pipe. As-built data provided by the Contractor showed that the elevations for the discharge points met the design requirements.

3.3.8 Buried Grade Control Structure Dimensions

The Contractor requested that the buried grade control structures be modified to 4 feet wide instead of the specified 2 foot width. This allowed the use of a long reach excavator for the buried grade control structures along the southern and western channels without actually entering the channels and disturbing the finished grades. Given that the new width would also meet the design intent, Geosyntec approved the modification, noting that the larger excavation dimensions would require additional riprap material. The Trust accepted this solution since the additional riprap material was already on-site.

3.3.9 Riprap Spill Pad Depths

In order to accommodate for field conditions along the southern channel, the total depth of spill pad #2 had to be modified from 3 feet to 2 feet, so as to not encroach on the underlying geosynthetics (i.e., geomembrane and drainage geocomposite, see Section 3.2.1). The original design did not include a layer of geomembrane in this area, therefore a depth of 3 feet for the riprap would have been adequate. However, to avoid any potential contact between the riprap and the geomembrane, it was decided that a foot of cover soil would be left in place above the geomembrane, and the rock riprap and filter geotextile would be placed above that.

In addition, an inspection of the riprap material that was brought to the site revealed that the rocks did not meet all of the different specified particle size requirements. Rocks brought to the site ranged in size from approximately 6 to 27 inches, with a median particle size of approximately 20-22 inches. As the quality of the rock was very good, Geosyntec allowed for the rock to be used as riprap by increasing the design depth of the spill pads so that they could accommodate the larger diameter particles. To accommodate the larger rock, the design depth of Spill Pads #4, 5 and 6 was modified from 1.5 feet to 3 feet.

3.3.10 Eastern Surface Water Ditch Alignment

Modifications made to the top deck and the southeast corner of the site made it necessary to modify the original alignment of the v-ditch along the eastern edge of the top deck to ensure that its final location met the original design intent. The original top of cover grades showed the v-ditch to be located at the toe of slope between the existing eastern and southeastern slopes and the new top deck. However, with the raising of the

top deck by 0.5 feet, the new toe of slope now occurred further east than originally intended. The field-fit modification, approved by the design engineer in the field, moved the v-ditch to the new location of the toe of slope.

3.3.11 Extent of Aggregate Base for Parking Area Ramp

The design for the ramp leading to the parking area above the north slope included the removal of a portion of the existing curb and parking area adjacent to Building 810. Due to the tight construction schedule, the Trust decided not to place the asphalt concrete for the parking area as part of this project (see Section 3.2.6). Therefore it was decided that the existing parking area adjacent to Building 810 would be left in place until the asphalt concrete for the new access ramp and parking area is placed. This resulted in a shortening of the ramp, and a local steepening of the aggregate base slope to match the grades at the western edge of the existing Building 810 parking area.

3.3.12 Trench Drain Modification

Due to material availability and lead times, the contractor requested that a trench drain with ductile iron grates, in lieu of the specified acid-resistant epoxy coated ones, be evaluated as an equivalent to the specified product. Upon Geosyntec's review of the proposed grate, it was noted that except for having wider slot spacing, the proposed grate still met the design intent therefore its use was approved for the project.

3.3.13 Soil Amendment Application

The Trust decided that the application of horticultural amendments to the soils within and adjacent to the southern and western channels was not necessary at this time due to the tight construction schedule, impending storm season, and long duration needed to incorporate amendments into these areas. There was an additional concern that amendments would result in enhanced weed growth in the channels where mulch was not placed. Amendment application was limited to the north slope only due to the ease of application in this area. The Trust elected to apply amendments in the other horticultural areas when the formal planting plan for those areas is developed.

4. EARTHWORK QUALITY ASSURANCE

4.1 Introduction

Construction quality assurance for earthwork activities included:

- observing placement and compaction of foundation, engineered, and horticultural soils and ensuring that the correct soils were used at the locations shown on the construction drawings,
- in-situ moisture/density testing (American Society for Testing and Materials [ASTM] D2922, D3017, and D2937) of each soil type, to verify that compaction requirements were met,
- off-site laboratory testing of the foundation, engineered, and horticultural soil, including modified Proctor compaction tests (ASTM D1557) for density evaluation;
- off-site laboratory testing of the drainage gravel, aggregate base and sand bedding, to evaluate compliance with the requirements of the technical specifications and the construction drawings; and
- monitoring the final subgrade preparation beneath the landfill gas geocomposite.

The foundation layer soils used for this project consisted of on-site waste which was excavated, compacted, and re-graded to meet the design excavation grades (except as noted in Section 3.3.1). Soils used for the engineered and horticultural soil layers were brought from off-site sources, previously approved for use at the Presidio, or from other Presidio sources. A detailed description of the different engineered and horticultural soils that were used at the site is included in Section 2.7 of the CCR.

4.2 Foundation Layer

As described in Section 02210 of the specifications, the foundation layer consists of compacted waste material as follows:

- **02210-2.01.B** – In areas of excavation, foundation layer will refer to the upper 1 foot of in-place waste material to be recompacted to meet the density criteria presented herein.

- **02210-2.01.C** – In areas of waste placement and compaction, foundation layer will refer to all waste material being placed, and may be thicker than 1 foot.

To develop a representative set of properties for foundation layer testing, Geosyntec obtained 3 samples of the foundation layer material by selecting excavated waste from 3 different locations around the site. In addition, one blended sample was created by combining the waste excavated from different areas. All samples were tested for Atterberg Limits (ASTM D4318), Sieve Analyses (ASTM D422) and Moisture/Density relationships (ASTM D1557). Results of testing are presented in Attachment E-1.

In order to minimize personnel contact with waste materials, and because the waste material was expected to have variable properties across the site, the Contractor prepared a test pad to demonstrate the level of effort required to meet the minimum requirement of 90% relative compaction (ASTM D1557). The construction of the test pad was consistent with Section 02210 (Part 3.02.J) of the specifications. Once the adequate level of effort was established, Geosyntec monitored consistent application of this level of effort (3 passes of the sheepsfoot compactor).

Foundation layer soil was placed in conformance with Section 02210 of the technical specifications. The fill was placed such that the maximum lift thickness was approximately 6 inches upon the completion of the compaction effort. To supplement the level of effort observations, in-situ moisture/density was measured using the nuclear method (ASTM D2922) to verify compliance with the 90% compaction requirement. The results of in-situ moisture/density tests of the foundation layer are included in Attachment F. In total:

- Twenty six (26) tests were performed on the foundation layer material placed on the north slope, the parking area and the top deck to verify that a relative compaction of 90%, as specified on Drawing 9 of the Construction Drawings, was achieved.

4.3 Engineered Soil

Four different soils were used as engineered soil: (1) EBMUD (i.e., Miller Road Stockpile soils), (2) Doyle Rocky, (3) Doyle Clayey, and (4) Kobbe. Approximately 17,100 yd³ of EBMUD soils were used between engineered soil (described here) and horticultural soil (see Section 4.4). Approximately 2,000 yd³ of Doyle Rocky and 200 to 300 yd³ of Doyle Clayey soils were used as engineered soil along the top deck, north

slope, and clean utility corridor. Very limited quantities of Kobbe soils, less than 250 yd³, were used at the conclusion of the project to achieve finish grades on the top deck. A comparison of the certified subgrade and final grade as-built drawings provided by F3 (included in Attachment L-2) demonstrates that the specified cover thickness requirement was achieved within construction tolerances.

The geotechnical properties of the EBMUD soils were evaluated during the source evaluation investigation performed in 2010. Fifteen (15) samples were collected at that time and tested for Atterberg Limits (ASTM D4318) and Sieve Analyses (ASTM D422). Five of the collected samples were also tested for Moisture/Density relationships (ASTM D1557). Results of the tests performed in 2010 were used to develop the soil properties included in Section 02229 of the technical specifications. The results of the EBMUD material laboratory testing are presented in Appendix C-1 of the CCR. The EBMUD material was used as engineered fill along the north slope, the south channel, the top deck, and underneath the aggregate base within the parking area.

Geosyntec obtained two samples of the Doyle Rocky material, one from the Doyle Rocky stockpile at LFE and one from the Doyle Rocky stockpile located in the storage area adjacent to the Trust Remediation Department's offices on Martinez Street, otherwise known as the Dust Bowl. Samples were tested for Atterberg Limits (ASTM D4318), Sieve Analyses (ASTM D422) and Moisture/Density relationships (ASTM D1557). With the exception of grain size analysis, the test results confirmed that the material satisfied the requirements of Section 02229 of the technical specifications. The Doyle Rocky sample collected from the Dust Bowl had more than 10% of material between 1 and 4 inches in diameter. This material was accepted for limited use on the top deck of LFE, sandwiched between layers of EBMUD material such that the oversized fraction would not come in contact with LFG geocomposite, or be exposed at the ground surface. Results of testing are presented in Appendix C-3 of the CCR. The Doyle Rocky stockpiled at LFE was used for the compacted clean soil corridor along the toe of the north slope. The Doyle Rocky material stockpiled at the Dust Bowl was used as engineered fill within the top deck.

Geosyntec obtained one sample of the Doyle Clayey material to test for Atterberg Limits (ASTM D4318), Sieve Analyses (ASTM D422) and Moisture/Density relationship (ASTM D1557). The test results confirmed that the material satisfied the requirements of Section 02229 of the technical specifications. Results of testing are

presented in Appendix C-4 of the CCR. This material was used as backfill for the clean soil utility corridor.

Geosyntec obtained one sample of the Kobbe material for Atterberg Limits (ASTM D4318), Sieve Analyses (ASTM D422) and Moisture/Density relationships (ASTM D1557). The test results confirmed that the material satisfied the requirements of Section 02229 of the technical specifications. Results of testing are presented in Appendix C-7 of the CCR. This material was used as backfill within the top deck of the landfill.

During construction, in-situ moisture/density was measured using the nuclear method (ASTM D2922). In total:

- Three (3) tests were performed on the EBMUD soils placed along the south channel below geomembrane to verify that a relative compaction of 90%, as specified on Construction Drawing #9, was achieved.
- Eight (8) tests were performed on the EBMUD soils placed along the north slope to verify that a relative compaction of 85%, as specified on Construction Drawing #9, was achieved.
- Ten (10) tests were performed on the EBMUD soils placed along the top deck to verify that a relative compaction of 95%, as specified on Construction Drawing #9, was achieved.
- Three (3) tests were performed on the EBMUD soils placed along the parking area to verify that a relative compaction of 95%, as specified on Construction Drawing #9, was achieved.
- Five (5) tests were performed on the Doyle Rocky soils placed along the top deck, to verify that a relative compaction of 95%, as specified on Construction Drawings #9, was achieved.
- Two (2) tests were performed on the Doyle Clayey soils placed along the clean soil utility corridor, to verify that a relative compaction of 90%, as specified on Construction Drawings #9, was achieved.
- No soil compaction tests were performed on the Kobbe soils because only small amounts of this material were placed along the top deck.

4.4 Horticultural Soil

Four different soils were used for the horticultural layer: (1) EBMUD, (2) Doyle “A”, (3) El Polin, and (4) Nike. Approximately 17,100 yd³ of EBMUD soils were used between engineered soil (see Section 4.3) and horticultural soil (described here). Approximately 800 to 850 yd³ of Doyle “A”, 450 yd³ of El Polin, and 350 yd³ of Nike soils were used as horticultural soil along the western channel. The EBMUD soils used as horticultural soil were placed primarily in the southern channel, perimeter slopes, and the slope between the central top deck and the parking area. A comparison of the certified subgrade and final grade as-built drawings provided by F3 (included in Appendix L-2) demonstrates that, except as noted below, the specified thickness of horticultural soil was achieved within construction tolerances.

In one area at the bend from the southern channel to the western channel, survey data collected by F3 prior to geomembrane liner installation indicated that channel subgrade (shown on the “Drainage” as-built) was higher than required by the construction drawings, which would have resulted in less than the Trust’s target of 3-feet of horticultural soil above the geosynthetics in the channels. Guinn regraded this area, but F3 was not able to return to the site to resurvey prior to geosynthetic installation. To accommodate the construction schedule, Guinn’s grade checker collected additional survey data which demonstrated that the regraded area met the design grades. A drawing showing F3’s survey as-built and the localized area where Guinn’s data is more representative of actual constructed conditions is included in Attachment L-3. This drawing, compiled by Geosyntec, in comparison with F3’s final cover as-built, demonstrates that thickness of horticultural soil was achieved within construction tolerances in this area as well.

Geosyntec obtained 1 sample each of the Doyle “A”, El Polin, and Nike material to test for Atterberg Limits (ASTM D4318), Sieve Analyses (ASTM D422) and Moisture/Density relationships (ASTM D1557). The test results confirmed that the material satisfied the requirements of Section 02230 of the technical specifications. Results of testing are presented in the CCR in Appendix C-2 for the Doyle “A” soils, Appendix C-5 for the El Polin soils, and Appendix C-6 for the Nike soils. Testing of EBMUD soils has been described in Section 4.3.

During construction, the in-situ moisture/density was measured using the nuclear method (ASTM D2922). In total:

- One (1) test was performed on the Doyle “A” soils placed along the western channel to verify that a relative compaction of 85%, as specified on Construction Drawing #9, was achieved.
- One (1) test was performed on the El Polin soils placed along the western channel to verify that a relative compaction of 85%, as specified on Construction Drawing #9, was achieved.
- One (1) test was performed on the Nike soils placed along the western channel to verify that a relative compaction of 85%, as specified on Construction Drawing #9, was achieved.

Evaluation of these low compaction levels for EBMUD soils in the horticultural areas was observed based on level of effort and in comparison to the testing described in Section 4.3 for engineered soils.

4.5 Drainage Gravel

Approximately 620 yd³ of drainage gravel were used around the infiltration and LFG pipes at LFE. Geosyntec monitored the placement of the gravel within the trenches and measured the thickness of the material above the crown of the pipes to verify that the gravel was placed as shown on the construction drawings and in a manner that did not damage the underlying geotextile.

One sample of the gravel material delivered to the site was collected and tested in the laboratory for grain-size distribution (ASTM D422) and hydraulic conductivity (ASTM D2434). One other sample was provided by Guinn, prior to the material being delivered to the site, to be tested for hydraulic conductivity. The sample obtained from the material delivered to the site was found to be consistent with the representative sample which had been provided earlier. Results of the tests indicate that this material conforms to the requirements of Section 02310 of the technical specifications, except as described and approved in Section 3.3.3. Results of the gravel material laboratory testing are presented in Attachment E-2.

4.6 Aggregate Base

Approximately 1,200 yd³ of aggregate base were used around the parking and access ramp area at LFE, and along the southern access road southeast of the site. Geosyntec monitored the placement of the aggregate base within the parking and ramp areas to verify that the minimum thickness shown on the construction drawings was achieved

and that the material was placed as shown on the construction drawings and in a manner that did not damage the underlying geotextile.

One sample from the aggregate base material that was proposed to be used at the site was collected at the quarry and delivered to the laboratory for grain-size distribution (ASTM D422), Moisture/Density relationship (ASTM D1557) and for Sand Equivalent (Cal 217), Durability Index (Cal 229) and R-value (Cal 301). Results of the tests indicate that this material conforms to the requirements of Section 02227 of the technical specifications. Results of the aggregate base material laboratory testing are presented in Attachment E-3.

During construction the in-situ moisture/density of the aggregate base material was measured using the nuclear method (ASTM D2922). In total:

- Twelve (12) tests were performed on the aggregate base soils placed within the parking and access ramp area to verify that a relative compaction of 95%, as specified on Construction Drawing #9, was achieved.

4.7 Riprap Rock

Geosyntec observed the delivery of the riprap material that was brought from the processing facility at the Vasco Road Sanitary Landfill. Upon arrival, the material was stockpiled and visually checked for compliance with the specified gradation. In addition, a Geosyntec geologist visited the site, to verify that the material that had been delivered met the specifications provided in Construction Memo #2 (see Attachment B and Section 3.3.2), and was similar to the rock samples that had been tested during the source evaluation program. As described in Section 3.3.2, riprap was generally oversized, but field variances were allowed as another material was not available.

5. GEOSYNTHETICS QUALITY ASSURANCE

5.1 Geomembrane

5.1.1 Introduction

Geosyntec monitored installation of the 60-mil geomembrane liner along the southern and western channels of LFE. CQA activities included:

- geomembrane conformance testing;
- monitoring site storage, deployment, and seaming operations; and
- monitoring geomembrane repairs.

These activities are summarized in the following sections.

5.1.2 Manufacturer's Certification

The geomembrane used for the LFE remediation project was manufactured by GSE and Polyflex, Inc (Polyflex). One roll of 60-mil double-sided textured HDPE geomembrane was manufactured by GSE and the other roll by Polyflex. A total quantity of approximately 14,740 ft² of double-sided textured geomembrane was installed along the southern and western channels.

GSE and Polyflex provided manufacturer quality control (MQC) certifications for the rolls of geomembrane and for the resin used to produce the geomembrane. This documentation was reviewed by Geosyntec and the test results provided for the materials were found to comply with the requirements in Section 02778 of the technical specifications. The geomembrane MQC certificates are included in Attachment I-1.

5.1.3 Conformance Sampling and Testing

Conformance data for the geomembrane rolls manufactured by Polyflex were obtained from Geosyntec's Huntington Beach office because the roll had been extra material from the recent construction at the Tajiguas Landfill in Goleta, California. Testing was performed by Precision Geosynthetic Laboratories (Precision) of Anaheim, California. The results of the conformance testing were reviewed by Geosyntec and were found to meet the requirements of Section 02778 from the technical specifications.

A sample from the GSE-manufactured geomembrane roll was collected by D&E prior to delivering the roll to the site, and sent to Precision for conformance testing. Geosyntec reviewed the results of the conformance tests and found them to meet the requirements of Section 02778 of the technical specifications.

In total, two conformance tests were performed on the material used for the LFE remediation. This corresponds to a test frequency of approximately one test per 7,369 square feet of HDPE which meets the minimum frequency required by the specifications of one sample per 100,000 ft² or one sample per resin batch, whichever results in the greater number of tests. All laboratory test results for the geomembrane samples are presented in Attachment G-1.

5.1.4 Delivery and On-site Storage

Delivery of geomembrane was observed by Geosyntec to verify that proper handling and storage procedures were followed and that on-site storage procedures provided protection from conditions that could damage the material. Prior to deployment, all rolls were carefully checked and marked for repair, if necessary.

5.1.5 Deployment and Seaming Operations

The general installation procedure consisted of placing 60-mil HDPE geomembrane panels over the LFG geocomposite and welding adjacent panels together.

Geosyntec monitored the deployment of each panel of geomembrane and marked visible defects/damage for repair. Geomembrane panels and/or rolls were visually checked for the following:

- manufacturing defects;
- evidence of damage, which may have occurred during shipping, storage, or handling; and
- damage caused during installation activities (e.g., as a consequence of placement, seaming operations, or weather).

Damaged materials were either discarded or repaired. Geosyntec identified the repair locations and monitored the repair activities. Whenever possible, the cause(s) of the damage was ascertained and addressed.

Geomembrane trial seams were prepared daily prior to seaming operations by each operator and for each piece of seaming equipment. Additional trial seams were prepared for each piece of seaming equipment at several times during the day, including when the machine was started up again after lunch or when the operator was changed. The trial seams were constructed in conformance with the technical specifications and Geosyntec observed the procedures.

For the trial seam test program, five test coupons, measuring 1 in. wide by 6 in. long, were cut from the trial seam samples. Each test coupon was tested by the geosynthetics installer, under Geosyntec's observation, using a calibrated tensiometer. Three of the test coupons were tested in peel and the other two coupons were tested in shear. If any of the trial seam test coupons failed any of the tests (passing criteria for trial seams are specified in Section 02778 of the technical specifications), the seaming equipment was adjusted, a new trial seam was fabricated, and the test procedure was repeated until passing test results were obtained.

Once a trial seam passed the tests described above, the technician proceeded with production seaming operations. A total of 5 trial seam samples were fabricated using fusion welders during the geomembrane liner installation. The trial seam logs are presented in Attachment H-2.

Geomembrane seaming operations were monitored and documented by Geosyntec personnel. Seaming documentation included the date, time, seam and panel numbers, technician, machine number, and length and location of seam. This information was recorded on Production Seaming Logs presented in Attachment H-3. In addition, geomembrane seams were visually examined for workmanship and continuity. Any portion of a seam found to be out of compliance with Section 02778 of the technical specifications was marked by CQA personnel and subsequently repaired by D&E.

D&E repaired defects or damaged areas detected by visual observation using extrusion welders to construct a patch or a cap strip, as appropriate. Repairs were performed in accordance with the technical specifications (Section 02778) and generally followed the procedures described below.

- Welding equipment used in the repair procedures had trial seams approved prior to use.
- Geomembrane surfaces were clean and dry at the time of the repair.

- Geomembrane surfaces were abraded no more than 15 minutes prior to the repair.
- Patches or caps extended at least 6-in. beyond the edge of the defect and the corners were rounded.
- Repairs were non-destructively tested.

Geosyntec personnel monitored the geomembrane repair work and documentation is provided in the daily field reports (Attachment D). Repair locations are documented in Attachment H-5.

5.2 Geocomposite

5.2.1 Introduction

Geosyntec monitored the deployment and installation of the geocomposite used for the LFE project. A double-sided geocomposite was used for the landfill gas collection system over the entire top deck and western channel areas, and as a drainage layer along the southern and western channels.

5.2.2 Manufacturer's Certifications

SKAPS manufactured the geocomposite used for the LFE project. SKAPS provided 68 rolls (one full roll was split and shipped as two smaller size rolls, i.e., 69 rolls received at the site) of Transnet TN double-sided geocomposite (270 mil geonet) for the project. A total of approximately 187,600 ft² of double-sided geocomposite were installed for the landfill gas collection and drainage layer systems at LFE. Approximately one roll of geocomposite was not used by the end of the project.

SKAPS provided MQC documentation and certification for the geocomposite rolls delivered to the site. This documentation was reviewed and approved by Geosyntec as meeting the technical specifications. These documents are presented in Attachment G-2.

5.2.3 Conformance Sampling and Testing

A representative from Precision collected geocomposite conformance samples at the manufacturer's plant. A total of two samples of 270-mil double-sided geocomposite were collected and tested from the geocomposite manufactured by SKAPS. This

represents a test frequency of approximately one test per 95,200 square feet of geocomposite. This ratio meets the minimum frequency required by Section 02774 of one sample per 100,000 ft² or one sample per lot, whichever results in the greater number of tests. The conformance samples were tested by Precision.

Geosyntec reviewed the conformance test results for the geocomposite and compared them to the technical specifications. The conformance test results were found to meet Section 02774 of the technical specifications. The laboratory test results are presented in Attachment G-2.

5.2.4 Delivery and On-site Storage

Delivery of the geocomposites was observed by Geosyntec to verify that proper handling and storage procedures were used and on-site storage procedures provided for protection from ultraviolet light exposure, precipitation, mud, dirt, dust, and other conditions that could damage the material. Geosyntec observed that protective wrapping was maintained on the geocomposite rolls until placement operations began.

5.2.5 Deployment and Seaming Operations

Geocomposite rolls were visually checked for the following:

- manufacturing defects;
- evidence of damage, which may have occurred during shipping, storage, or handling; and
- damage caused during installation activities (e.g., as a consequence of placement or weather).

Geosyntec monitored the deployment of the geocomposite to verify that measures were taken to avoid the entrapment of stones, dust, or other objects in the geocomposite that could damage the material.

Geosyntec personnel monitored the geocomposite seaming operations. Seams were formed in accordance with Section 02774 of the technical specifications by overlapping geocomposite layers by a minimum 6 in. along the length and 3 feet along the width, and secured with nylon ties every 3 feet along the length and 1 feet along the width. For adjacent panels where the Contractor was not able to peel away the geotextile prior to overlapping, the panels were tied together using nylon ties spaced at 1 foot intervals,

and then covered with a large geotextile cap strip that was lystered to the top geotextile from the geocomposite. Any portion of a seam found to be out of compliance with Section 02774 of the technical specifications was marked by CQA personnel and subsequently repaired by D&E (along the channels) or Guinn (everywhere else).

Defects or damaged areas detected by visual observation were repaired and monitored by Geosyntec in accordance with Section 02774 of the technical specifications and generally followed the procedures described below:

- Patches extended a minimum of 1 foot beyond the edge of any hole or tear, and
- Nylon ties were placed at 6-in. intervals around the patch.

5.2.6 Geotextile Protection

Placement of the overlying soil was performed in a timely manner, in order to ensure that all geotextile components of the geocomposite were covered within 15 days of deployment as described in Section 02771 of the specifications.

5.3 Geotextile

5.3.1 Introduction

Geosyntec monitored the deployment and installation of the geotextile used as filter fabric around gravel filled trenches at LFE.

5.3.2 Manufacturer's Certification

SKAPS manufactured non-woven needle punched geotextile for use during the LFE remediation project. SKAPS provided 9 rolls of GE-180 non-woven geotextile, totaling approximately 93,150 ft² of supplied geotextile. All of the supplied rolls were used for the project.

SKAPS provided MQC certifications for the geotextile rolls. Geosyntec reviewed this documentation and the test results provided for the materials were found to comply with the requirements in Section 02771 of the technical specifications. The geotextile MQC certificates are included in Attachment G-3.

Towards the end of the project, two additional geotextile rolls were brought to the site, to be used within the parking area and below the riprap spill pads. The two additional

rolls were also manufactured by SKAPS, but had a weight of 10 oz/yd², as opposed to the specified 8 oz/yd², which was acceptable. Approximately 9,000 ft² of GT110 were provided by SKAPS. All of the supplied material was used on the project.

5.3.3 Conformance Sampling and Testing

Conformance testing was performed for the geotextile as required in Section 02771 of the technical specifications. Conformance sampling of the 8 oz/ yd² geotextile was performed at the manufacturer's plant by a representative from Precision. Sampling for the 10 oz/ yd² geotextile was performed by Geosyntec personnel, once the material arrived on site.

One sample of 8 oz/yd² and one sample of 10 oz/yd² non-woven geotextile were collected for conformance testing. This meets the minimum sampling frequency of one sample per 100,000 ft² as required in the specifications.

CQA conformance sample numbers and test results are presented in Attachment G-3 for the 8 oz/ yd² and in Attachment G-4 for the 10 oz/ yd² material. Geosyntec reviewed the conformance testing results for the geotextiles and compared them to the requirements of the technical specifications. The results of the laboratory tests met the requirements in Section 02771 of the technical specifications.

5.3.4 Delivery and On-site Storage

Geosyntec observed delivery of geotextiles to verify that proper handling and storage procedures were used and that on-site storage procedures provided for protection from ultraviolet light exposure, precipitation, mud, dirt, dust, and other conditions that could damage the material. Geosyntec observed that protective wrapping was maintained on the geotextile rolls until placement operations began.

5.3.5 Deployment and Seaming Operations

Geotextile rolls were visually checked for the following:

- manufacturing defects;
- evidence of damage, which may have occurred during shipping, storage, or handling; and

- damage caused during installation activities (e.g., as a consequence of placement, seaming operations, or weather).

Damaged materials were either repaired where possible, or removed and replaced. Geosyntec monitored the deployment of the geotextile to verify that, under windy conditions, the geotextile was weighted down, and measures were taken to avoid the entrapment of any objects or excessive ultraviolet exposure that could damage the geotextile.

Geosyntec personnel monitored geotextile seaming and overlapping operations. Seams and overlaps were formed in accordance with Section 02771 of the technical specifications. All geotextile was overlapped a minimum of 6 in.

Geosyntec personnel visually checked geotextile connections to identify inadequate areas and brought them to the attention of Guinn for repair. Holes and tears were similarly identified and damaged sections were cut out and patches were placed in accordance with the technical specifications.

6. OTHER QUALITY ASSURANCE

6.1 HDPE Piping

Isco Industries manufactured HDPE pipe and fittings used for the infiltration and LFG systems for the LFE project.

Certified HDPE pipe welders performed welding of the HDPE pipes. Copies of the welder's certifications are provided in Attachment J-1. Geosyntec observed welding and placement of pipe to ensure that the welding techniques met industry standards, and that no damage occurred during pipe handling and placement.

The perforation size and spacing of the pipe holes, performed by the manufacturer prior to delivery to the site, conformed to the construction drawings.

In addition, Geosyntec observed the installation of all ADS piping used for the western and eastern surface water conveyance system, and for the surface water conveyance along the southern access road, and all installation was completed as per the manufacturer's recommendations. Pipe sizes and fittings were verified prior to installation.

6.2 Concrete

Per the requirements of Section 03300, concrete samples were collected to verify the compressive strength of the concrete used for the cast-in-place drop inlet at the end of the western channel, and for the shotcrete used for the eastern surface water v-ditch. Concrete was also used to create the pipe encasements for the buried surface water pipes on the eastern and western margins of the north slope.

One concrete pour occurred on 14 October for the pipe encasements. Four concrete pours were necessary to complete the work on the drop inlet. The first pour occurred on 19 October, and included concrete for the base of the drop inlet. The second pour occurred on 25 October, and was used to construct the wingwalls for the drop inlet. The third pour occurred on 28 October to construct the apron in front of the drop inlet. The fourth and final pour occurred on 8 December, and was used to raise the height of the wingwalls for the drop inlet. A single shotcrete application for the v-ditch occurred on 31 October.

Prior to the first concrete pour, the Contractor informed Geosyntec that the concrete mix design and the batch facility for all necessary concrete pours would be the same. Given the small volume of concrete required, and based on review of prior test data based on this mix design, it was decided that not all pours would be tested for compressive strength per ASTM C-31. The concrete pour used for the drop inlet base was sampled and tested. Additionally, samples from the shotcrete application were collected as the shotcrete mix design was different than the cast-in-place concrete mix design.

For each tested batch, a total of three or four cylinder samples were collected for laboratory testing per ASTM C-31. After the required 24-hour setting period, all samples were delivered to Consolidated Engineering Labs (Consolidated) in Oakland, California for subsequent compressive strength testing. Three samples from each pour were delivered to Consolidated each time, with one labeled for a 7-day break, and the other two for a 28-day break.

Results for the compressive strength tests are included in Attachment J-2.

6.3 Erosion Control Features

Geosyntec observed the installation of all silt fences, fiber rolls, and erosion control blankets shown on construction drawings 19 and 22. All materials were verified to meet the requirements of Sections 02372 (erosion control blankets), 02373 (fiber rolls) and 02375 (silt fences), prior to installation. In addition, all materials were observed to be installed as per the manufacturer's recommendation and the requirements of the technical specifications.

Wood chip mulch was provided by the Presidio Trust from sources originating from within the Presidio Trust and was placed in the areas shown on Drawing 22 to the target thicknesses with the exception of along the top deck. At the end of the project in 2011, sufficient mulch was not available to entirely cover the top deck per the Drawings. A limited area of the top deck around the future parking area was instead covered with straw mulch and jute netting. The Trust subsequently covered this area with wood chip mulch in January 2012.

7. AIR MONITORING

As described in the Air and Dust Monitoring Plan (ADMP, Appendix G of Geosyntec, 2011b), risk-based concentrations in air (RBC_{air}) were developed based on LFE chemicals of concern (COCs) as presented in Table 7-1. Additionally, a particulate action level for particles 10 microns or smaller in diameter (PM_{10}) of $110 \mu\text{g}/\text{m}^3$ was established based on an 8-hour workday time weighted average. As presented in the ADMP, because the dust action levels for protection of exposure to COCs are higher than the PM_{10} action levels, the $110 \mu\text{g}/\text{m}^3$ PM_{10} action level was selected as the basis for air monitoring and dust control at the site.

The activities associated with baseline and perimeter air monitoring and the collection of meteorological measurements are discussed below. The perimeter air monitoring program involved a combination of real-time monitoring and the collection and analysis of samples from stationary samplers. The layout of monitoring locations and the specific protocols utilized to conduct the perimeter air monitoring are discussed below.

7.1 Monitoring Locations

Stationary air monitoring was conducted along the site's perimeter at three locations:

- One monitor (DAEAS01) was located along the upwind side (i.e., southeast corner of the site)
- Two monitors (DAEAS02 and DAEAS03) were located on the downwind side of the site in the vicinity of buildings 810 and 812.

All locations are shown on Figure 7-1.

7.2 Air Monitoring Activities

7.2.1 Setup

Every morning, all dust monitors were calibrated, as per the manufacturer's recommendations, and all four monitors (3 stationary and 1 walk-around) were synchronized so that dust particle concentrations recorded throughout the day for all 4 monitors would have the same time intervals. The daily calibration logs are included in Attachment M-4.

A weather station was also set up every day at the site to measure wind direction, wind speed, temperature, rainfall and humidity at 15-minute intervals. Data collected by the

weather station throughout the day was downloaded at the end of the day and entered into daily weather logs. The daily weather logs are included in Attachment M-5.

7.2.2 Monitoring

Air monitoring activities for the background monitoring were conducted between 5 and 7 July, prior to the beginning of earthwork operations at the site. A description of the air sampling activities, as well as the analytical test results from the background monitoring are presented in Section 2.6 of the Construction Completion Report, and described in Section 7.3 below.

Air monitoring activities during earthwork operations began on 20 July and continued until 2 November 2011. Throughout the duration of the project, there were three days (5, 6 and 11 October) when no air monitoring was performed due to rain at the site. In addition, air monitoring and construction were stopped early on October 10th due to rain.

Perimeter air monitoring consisted of continuous monitoring during mulch and waste removal, soil placement, trench, swale, channel or gas vent excavation, etc., using stationary air monitors installed around the perimeter of the site and perimeter walks around the site using a handheld air monitor. Figure 7-1 shows the stationary monitoring locations, as well as the typical route for the perimeter walks.

Perimeter air monitoring was performed using PDR 1000 dust monitors. Every morning during calibration, the monitors were set to collect and store dust particle concentrations for the duration of the work day. At the end of the day, raw data from all four air monitors was downloaded and recorded on spreadsheets summarizing the average dust particle concentration per 15-minute interval. Dust logs for all four monitoring locations are included in Attachment M-6.

Wind direction at the site varied throughout the day such that heavy reliance was made on the walk-around dust monitor to assess the need for increased dust control measures. The maximum 15-minute time weighted average dust concentrations measured daily by the perimeter walk-around monitor are listed in Table 7-2. If during the perimeter walk-around or during the periodic check of the recorded data from the stationary air monitors an exceedance of the project action levels was noted, Geosyntec would then work with the Contractor to increase dust suppression activities until the exceedances were mitigated. Table 7-3 lists project action level exceedances that occurred throughout the length of the project.

As part of the monitoring activities, a summary memo documenting the earthwork activities and the particulate action level exceedances, if any, that occurred during the week was prepared and submitted to the client. The weekly summary memos have been included in Attachment M-3 of this report.

7.3 Air Sampling Activities

To confirm that COC concentrations did not exceed their RBC_{air} values during earthmoving activities, perimeter dust and air samples were collected for offsite laboratory analysis at each monitoring location during the work hours in which soil removal activities were performed. One perimeter dust and air sample was collected on a weekly basis for two weeks at each of the upwind and downwind monitoring locations.

7.3.1 Analytical Testing

Background air and dust monitoring was conducted from 5 July through 7 July 2011, and construction-phase air and dust monitoring was conducted from 26 July through 3 August 2011. Samples were collected weekly prior to and during earthmoving activities over 8-hour work days using a PDR 1200 dust monitor powered by a Gils Air 5 pump. One field blank was collected per analytical method per day. Samples were labeled and transported with completed chain of custody forms by ground vehicle to Curtis & Tompkins (C&T) in Berkeley, California for analysis by EPA Method 6010B (metals), or shipped via overnight courier to ALS Environmental (ALS) in Salt Lake City, Utah for analysis by NMAM Method 5600 (pesticides) and NMAM Method 5528 (SVOCs).

No LFE COCs (metals, semi-volatile organic compounds [SVOCs] and pesticides) were detected in air and dust samples collected during the background and ongoing construction-phase monitoring. Therefore, the concentrations remained below their respective adjusted risk-based concentrations in air (RBC_{air}) as defined in the Air and Dust Monitoring Plan (ADMP, Appendix G of Geosyntec, 2011b).

The Trust requested to discontinue air and dust monitoring for COCs at the Site on 8 August 2011 (Attachment M-1). This request was approved by DTSC on 12 August 2011 (Attachment M-2). Perimeter dust monitoring for PM_{10} continued throughout the remaining earthmoving activities per the ADMP and as described above.

7.3.2 Quality Assurance and Quality Control Evaluation

Geosyntec submitted Quality Assurance/Quality Control (QA/QC) samples in accordance with the Presidio-Wide Quality Assurance Project Plan/Sampling and Analysis Plan (QAPP/SAP). Upon receipt of analytical results, Geosyntec performed a QA/QC review of all analytical data received from C&T and ALS with respect to method compliance, sample holding times, analytical quantitation limits, field QA/QC samples, and laboratory QA/QC results (method blanks, blank spike/blank spike duplicates [BS/BSD] and laboratory control sample/laboratory control sample duplicates [LCS/LCSD]). Based on the data validation review, analytical data were deemed to be of acceptable quality. The following were noted during the data review:

- During the SVOC analysis of dust and air, benzo(a)pyrene had reporting limits (RLs) above its project-specific RBCair value. Lower RLs were not achievable for this compound due to method limitations. These results are italicized on Table 7-6.
- No COCs were detected in field blank samples.
- No COCs were detected in method blank samples.
- BS/BSD samples were within control limits for all methods.
- LCS/LCSD samples were within control limits for all applicable methods.

8. CERTIFICATION

Based on the observations of Geosyntec Consultants, Inc. during construction, as well as on the test results presented in the attachments of this report, the construction of the Landfill E remediation, at the Presidio of San Francisco, California, was completed in accordance with the technical specifications and construction drawings with revisions as stated in this report.



A handwritten signature in blue ink, appearing to read "C. E. Hunt", written over a horizontal line.

Christopher E. Hunt, Ph.D., P.E., G.E.
CQA Manager and Engineer-of-Record

9. REFERENCES

Geosyntec, 2011a. *Final Feasibility Study / Remedial Action Plan – Landfill E, Presidio of San Francisco, California*, prepared for The Presidio Trust, June 2011.

Geosyntec, 2011b. *Final Remedial Design and Implementation Plan – Landfill E, Presidio of San Francisco, California*, prepared for The Presidio Trust, June 2011.

10. LIMITATIONS

This report was prepared in general accordance with the accepted standard of practice which existed in California at the time this report was submitted to The Presidio Trust. Geosyntec has prepared this report for The Presidio Trust's exclusive use. No other representations, expressed or implied, and no warranty or guarantee is included or intended. No other party is authorized to use this report, unless granted permission in writing by Geosyntec.

TABLES

Table 4-1



Soil Testing Summary

SAMPLE IDENTIFICATION	SOURCE	INTENDED USE	DATE SAMPLED (day/mo/year)	TEST METHODS	QA ID
FL-01	West Channel Excavation	Foundation Layer	22-Jul-11	D-422, D-4318, D-1557	ACP
FL-02	South East Drain Channel	Foundation Layer	2-Aug-11	D-422, D-4318, D-1557	ACP
FL-03	South West Drain Channel	Foundation Layer	2-Aug-11	D-422, D-4318, D-1557	ACP
EF-Blend	Blended Stockpiles	Foundation Layer	2-Aug-11	D-422, D-4318, D-1557	ACP
DG-01	Hanson Aggregates	Drainage Gravel	24-Aug-11	D-422, D-2434	ACP
6	Vulcan Pleasanton	Aggregate Base	19-Oct-11	D-422, D-1557, Cal-Test 217, 229, 301	ACP
TP-1B	EBMUD	Horticultural/Engineered Soil	28-Sep-10	D-4318, D-422	ACP
TP-2A	EBMUD	Horticultural/Engineered Soil	28-Sep-10	D-4318, D-422, D-1557, D-5084, D-2850m	ACP
TP-3B	EBMUD	Horticultural/Engineered Soil	28-Sep-10	D-4318, D-422, D-1557, D-5084, D-2850m	ACP
TP-4A	EBMUD	Horticultural/Engineered Soil	28-Sep-10	D-4318, D-422	ACP
TP-4A-ALT	EBMUD	Horticultural/Engineered Soil	28-Sep-10	D-4318, D-422, D-1557, D-5084, D-2850m	ACP
TP-5A	EBMUD	Horticultural/Engineered Soil	28-Sep-10	D-4318, D-422	ACP
TP-6B	EBMUD	Horticultural/Engineered Soil	28-Sep-10	D-4318, D-422	ACP
TP-8A	EBMUD	Horticultural/Engineered Soil	28-Sep-10	D-4318, D-422	ACP
TP-9A	EBMUD	Horticultural/Engineered Soil	28-Sep-10	D-4318, D-422	ACP
TP-11A	EBMUD	Horticultural/Engineered Soil	28-Sep-10	D-4318, D-422	ACP
TP-12A	EBMUD	Horticultural/Engineered Soil	28-Sep-10	D-4318, D-422	ACP
TP-14B	EBMUD	Horticultural/Engineered Soil	28-Sep-10	D-4318, D-422	ACP
TP-15B	EBMUD	Horticultural/Engineered Soil	28-Sep-10	D-4318, D-422	ACP
TP-18A	EBMUD	Horticultural/Engineered Soil	28-Sep-10	D-4318, D-422, D-1557, D-5084, D-2850m	ACP
TP-19A	EBMUD	Horticultural/Engineered Soil	28-Sep-10	D-4318, D-422, D-1557, D-5084, D-2850m	ACP
Kobbe 5	Native Kobbe Material	Engineered Soil	21-Sep-11	D-4318, D-422, D-1557	ACP
EF-DRLF	Doyle Rocky	Engineered Soil/Compacted Clean Soil	27-Jul-11	D-4318, D-422, D-1557	ACP
EF-DRDB	Doyle Rocky	Engineered Soil/Compacted Clean Soil	27-Jul-11	D-4318, D-422, D-1557	ACP
EF-DCLFE	Doyle Clayey	Engineered Soil/Compacted Clean Soil	27-Jul-11	D-4318, D-422, D-1557	ACP
EF-DADB	Doyle A	Horticultural Soil	27-Jul-11	D-4318, D-422, D-1557	ACP
EF-POLIE	El Polien	Horticultural Soil	27-Jul-11	D-4318, D-422, D-1557	ACP
Nike-4	Nike Soil	Horticultural Soil	7-Sep-11	D-4318, D-422, D-1557	ACP
Bed-01	DI Aggregate Management	Bedding Soil	17-Jun-11	D-422, D-1557	ACP

Table 7-1
Action Levels Based on COCs^(a)
Construction Quality Assurance Plan, Landfill E
Presidio of San Francisco, California

Chemicals of Potential Concern	Overall Maximum Detected Concentration (mg/kg)	Risk-Based Concentration in Air (ug/m ³)	Source ^(b)	Adjusted Risk-Based Concentration in Air (ug/m ³) ^(c)	Dust Action Level (ug/m ³) ^(d)
Metals					
Antimony	410	NA	NA	NA	NA
Arsenic	96	0.015	REL	0.15	1.6E+06
Barium	4,300	0.52	RSL	5.2	1.2E+06
Cadmium	120	0.02	REL	0.2	1.7E+06
Copper	39,000	100	REL (Acute)	100	2.6E+07
Lead	40,000	2.1	DTSC	21	5.3E+05
Selenium	7.1	20	REL	200	2.8E+10
Silver	3,230	NA	NA	NA	NA
Vanadium	330	0.8	MRL (Acute)	0.8	2.4E+07
Zinc	46,000	NA	NA	NA	NA
Semivolatile Organic Compounds					
Benzo(a)anthracene	44	0.0087	RSL	0.087	2.0E+06
Benzo(a)pyrene	35	0.0087	RSL	0.0087	2.5E+05
Benzo(b)fluoranthene	69	0.0087	RSL	0.087	1.3E+06
Chrysene	35	0.0870	RSL	0.870	2.5E+07
Fluoranthene	110	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	19	0.0087	RSL	0.087	4.6E+06
Naphthalene	40	9	REL	90	2.3E+09
Phenanthrene	51	NA	NA	NA	NA
Pyrene	59	NA	NA	NA	NA
Pesticides and Herbicides					
4,4'-DDE	1	0.025	RSL	0.25	2.5E+08
4,4'-DDT	2.4	0.025	RSL	0.25	1.0E+08
Tetraethyl Lead	7.3	NA	NA	NA	NA

COC - Contaminant of Concern
mg/kg - milligrams per kilogram
ug/m³ - microgram per meter cubed

Notes:

- (a) COCs and associated analytical results from Table 3-1 and Appendix B, Tables B-1 and B-2 of the FS (Geosyntec, 2011a)
- (b) The sources for RBCair are described in Section 3 of the ADMP (Appendix G to the RDIP [Geosyntec, 2011a]). RELs are reference exposure levels established by the California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA); MRLs are minimum risk levels developed by the U.S. Agency for Toxic Substances and Disease Registry (ATSDR); RSLs are Regional Screening Levels developed by the U.S. Environmental Protection Agency; and DTSC indicates the use of the California Department of Toxic Substances Control's LeadSpread Model (Blood-Pb7).
- (c) The risk-based concentrations were adjusted by a factor of 10 to account for the short-term duration of the project relative to the lifetime exposure assumptions incorporated into the REL, chronic MRL, and RSL values. However, the adjustment factor was not applied to intermediate MRLs or lead, which is based on blood lead concentration rather than external dose.
- (d) Respirable dust action levels for individual chemical compounds were calculated using the following equation:
Dust action level = $RBC_{air}/C_{soil} \times 10^9$ ug/kg

Table 7-2**Perimeter Walk Around Summary**

Date	Time of Exceedance	PM₁₀ Concentration² (mg/m³)
7/14/2011	08:12:37	0.085
7/15/2011	09:20:51	0.057
7/18/2011	17:07:19	0.053
7/19/2011	15:53:41	0.067
7/20/2011	15:07:22	0.172
7/21/2011	14:48:49	0.108
7/22/2011	13:06:07	0.031
7/25/2011	08:30:02	0.065
7/26/2011	16:26:02	0.126
7/27/2011	14:24:22	0.069
7/28/2011	16:59:13	0.066
7/29/2011	14:15:31	0.157
8/1/2011	15:25:36	0.075
8/2/2011	12:18:01	0.132
8/3/2011	15:14:29	0.043
8/4/2011	15:05:30	0.048
8/5/2011	09:51:58	0.082
8/8/2011	15:12:48	0.061
8/9/2011	11:24:00	0.049
8/10/2011	11:00:13	0.082
8/11/2011	10:28:47	0.055
8/12/2011	10:32:13	0.043
8/15/2011	10:18:29	0.057
8/16/2011	11:44:05	0.121
8/17/2011	16:21:29	0.039
8/18/2011	11:41:24	0.146
8/19/2011	15:26:04	0.035
8/20/2011	10:37:53	0.027
8/22/2011	17:35:23	0.13
8/23/2011	12:55:35	0.046
8/24/2011	17:21:06	0.058
8/25/2011	14:41:23	0.094
8/26/2011	12:23:54	0.042
8/29/2011	14:58:22	0.129
8/30/2011	16:17:20	0.034
8/31/2011	14:51:58	0.074
9/1/2011	09:30:45	0.101
9/2/2011	10:46:33	0.03

Date	Time of Exceedance	PM₁₀ Concentration² (mg/m³)
9/6/2011	14:04:42	0.033
9/7/2011	11:30:46	0.116
9/8/2011	09:32:19	0.023
9/9/2011	11:30:43	0.067
9/10/2011	10:25:27	0.077
9/12/2011	13:00:52	0.038
9/13/2011	17:30:14	0.056
9/14/2011	13:43:13	0.236
9/15/2011	15:40:38	0.104
9/16/2011	16:51:37	0.071
9/17/2011	09:31:01	0.042
9/19/2011	12:08:49	0.057
9/20/2011	14:41:42	0.031
9/21/2011	15:10:20	0.045
9/22/2011	10:06:08	0.149
9/23/2011	10:49:12	0.028
9/26/2011	16:29:48	0.066
9/27/2011	09:03:37	0.231
9/28/2011	14:09:40	0.076
9/29/2011	13:52:54	0.044
9/30/2011	11:16:14	0.108
10/1/2011	14:55:20	0.051
10/3/2011	08:37:55	0.022
10/4/2011	13:16:03	0.015
10/5/2011	Rain Day	
10/6/2011	Rain Day	
10/7/2011	13:03:21	0.097
10/8/2011	11:11:38	0.048
10/10/2011	08:37:46	0.002
10/11/2011	Rain Day	
10/12/2011	16:22:57	0.13
10/13/2011	09:21:02	0.124
10/14/2011	09:28:45	0.117
10/15/2011	12:01:51	0.011
10/17/2011	11:32:09	0.091
10/18/2011	14:45:53	0.171
10/19/2011	16:44:58	0.015
10/20/2011	14:07:07	0.012
10/21/2011	11:53:24	0.014
10/24/2011	15:58:18	0.141
10/25/2011	12:28:04	0.03
10/26/2011	11:49:58	0.523
10/27/2011	15:34:47	0.052

Date	Time of Exceedance	PM₁₀ Concentration² (mg/m³)
10/28/2011	13:55:29	0.018
10/29/2011	13:08:41	0.045
10/31/2011	09:45:09	0.008
11/1/2011	10:40:32	0.09
11/2/2011	09:29:14	0.009

¹ Project Action Level = 0.110 mg/m³

² Concentration represent 15-minute time weighted average.

Highlighted cells represent values exceeding the action levels for the project.

Table 7-3: Exceedances Summary¹

Date	Time of Exceedance	PM ₁₀ Concentration ² (mg/m ³)			
		DAEAS01	DAEAS02	DAEAS03	Walk-around
7/19/2011	13:23:41		0.203		
	13:38:41		0.161		
7/20/2011	13:52:22				0.113
	15:07:22				0.172
7/21/2011	9:03:49	0.112			
7/26/2011	16:26:02				0.126
7/29/2011	13:45:31				0.137
	14:15:31				0.157
8/1/2011	13:10:36			0.126	
	13:25:36			0.132	
	13:40:36			0.142	
	13:55:36			0.135	
8/2/2011	12:18:01				0.132
8/3/2011	13:14:29	0.145			
8/4/2011	10:35:30			0.114	
8/10/2011	14:30:13			0.112	
8/11/2011	10:58:47			0.115	
	11:13:47			0.121	
	11:28:47			0.119	
8/12/2011	12:47:13			0.11	
	14:02:13			0.113	
	14:17:13			0.11	
8/16/2011	11:44:05				0.121
	15:29:05	0.461			
8/18/2011	11:41:24				
8/19/2011	15:41:04	0.146			
	15:56:04	0.145			
8/22/2011	17:35:23				0.13
8/23/2011	12:55:35			0.128	
8/23/2011	13:10:35			0.144	
8/24/2011	14:21:06			0.121	
	14:36:06			0.117	
	17:21:06	0.13			
8/26/2011	11:23:54			0.193	
8/29/2011	13:58:22			0.136	
	14:13:22			0.123	
	14:58:22				0.129
9/1/2011	15:45:45			0.111	
	16:00:45			0.112	

Date	Time of Exceedance	PM ₁₀ Concentration ² (mg/m ³)			
		DAEAS01	DAEAS02	DAEAS03	Walk-around
9/6/2011	10:34:42			0.11	
	10:49:42			0.119	
	11:04:42			0.134	
	11:19:42			0.13	
	13:19:42			0.134	
9/7/2011	11:30:46				0.116
	17:30:46	0.121			
9/8/2011	13:02:19			0.115	
9/14/2011	13:13:13			0.121	
	12:28:13				0.11
	12:43:13				0.191
	13:43:13				0.236
9/15/2011	13:25:38			0.133	
	15:10:38			0.137	
9/16/2011	08:51:37	0.111			
9/21/2011	14:25:20		0.122		
	14:40:20		0.125		
	14:55:20		0.118		
	15:10:20		0.129		
	15:25:20		0.116		
	16:10:20		0.111		
	16:25:20		0.113		
	16:40:20		0.11		
	13:25:20			0.121	
13:40:20			0.117		
9/22/2011	11:36:08		0.279		
	12:51:08		0.122		
	10:06:08				0.149
9/27/2011	08:48:37		0.119		
	09:03:37		0.12		
	09:03:37				0.231
9/30/2011	12:01:14		0.115		
10/4/2011	15:01:03	0.169			
	15:16:03	0.15			
10/12/2011	15:37:57				0.12
	15:52:57				0.125
	16:07:57				0.129
	16:22:57				0.13
10/13/2011	09:21:02				0.124
	09:36:02				0.121
	09:51:02				0.122
10/14/2011	09:28:45				0.117

Date	Time of Exceedance	PM ₁₀ Concentration ² (mg/m ³)			
		DAEAS01	DAEAS02	DAEAS03	Walk-around
10/18/2011	14:45:53				0.171
	15:00:53				0.14
10/24/2011	10:58:18	0.115			
	11:28:18		0.117		
	11:43:18		0.122		
	15:58:18		0.251		
	15:58:18			0.209	
	15:58:18				0.141
10/26/2011	11:49:58				0.523

¹ Project Action Level = 0.110 mg/m³

² Concentration represent 15-minute time weighted average.

Table 7-4
Laboratory Results and Dust Action Levels for Metals
Landfill E
Presidio of San Francisco, California

Location ID: Lab Sample ID: Date Sampled: Units:	Adjusted Risk- Based Concentration in Air ($\mu\text{g}/\text{m}^3$) ⁽¹⁾	Background Samples				Week 1: Construction-Phase Samples				Week 2: Construction-Phase Samples			
		DAEAS01 229200-001 7/5/2011 $\mu\text{g}/\text{m}^3$	DAEAS02 229200-002 7/5/2011 $\mu\text{g}/\text{m}^3$	DAEAS03 229200-003 7/5/2011 $\mu\text{g}/\text{m}^3$	FB070511 ⁽²⁾ 229200-004 7/5/2011 μg	DAEAS01 229776-001 7/27/2011 $\mu\text{g}/\text{m}^3$	DAEAS02 229776-002 7/27/2011 $\mu\text{g}/\text{m}^3$	DAEAS03 229776-003 7/27/2011 $\mu\text{g}/\text{m}^3$	FB072711 ⁽²⁾ 229776-004 7/27/2011 μg	DAEAS01 229919-001 8/2/2011 $\mu\text{g}/\text{m}^3$	DAEAS02 229919-002 8/2/2011 $\mu\text{g}/\text{m}^3$	DAEAS03 229919-003 8/2/2011 $\mu\text{g}/\text{m}^3$	FB080211 ⁽²⁾ 229919-004 8/2/2011 μg
Metals													
Antimony	NA	0.30 U	0.30 U	0.29 U	0.50 U	0.30 U	0.30 U	0.29 U	0.50 U	0.30 U	0.30 U	0.30 U	0.50 U
Arsenic	0.15	0.15 U	0.15 U	0.15 U	0.25 U	0.15 U	0.15 U	0.15 U	0.25 U	0.15 U	0.15 U	0.15 U	0.25 U
Barium	5.2	0.15 U	0.15 U	0.15 U	0.25 U	0.15 U	0.15 U	0.15 U	0.25 U	0.15 U	0.15 U	0.15 U	0.25 U
Cadmium	0.2	0.15 U	0.15 U	0.15 U	0.25 U	0.15 U	0.15 U	0.15 U	0.25 U	0.15 U	0.15 U	0.15 U	0.25 U
Copper	100	0.15 U	0.15 U	0.15 U	0.25 U	0.15 U	0.15 U	0.15 U	0.25 U	0.15 U	0.15 U	0.15 U	0.25 U
Lead	21	0.15 U	0.15 U	0.15 U	0.25 U	0.15 U	0.15 U	0.15 U	0.25 U	0.15 U	0.15 U	0.15 U	0.25 U
Selenium	200	0.30 U	0.30 U	0.29 U	0.50 U	0.30 U	0.30 U	0.29 U	0.50 U	0.30 U	0.30 U	0.30 U	0.50 U
Silver	NA	0.15 U	0.15 U	0.15 U	0.25 U	0.15 U	0.15 U	0.15 U	0.25 U	0.15 U	0.15 U	0.15 U	0.25 U
Vanadium	0.8	0.15 U	0.15 U	0.15 U	0.25 U	0.15 U	0.15 U	0.15 U	0.25 U	0.15 U	0.15 U	0.15 U	0.25 U
Zinc	NA	0.59 U	0.59 U	0.59 U	1.0 U	0.59 U	0.59 U	0.59 U	1.0 U	0.59 U	0.59 U	0.60 U	1.00 U

Notes:

1. Values presented in Table 1 of the Air and Dust Monitoring Plan, Landfill E (Appendix G to the RDIP - Geosyntec, 2011)
2. Field Blanks collected by exposing sample media to ambient air. No volume drawn through; therefore units reported as $\mu\text{g}/\text{sample}$

$\mu\text{g}/\text{m}^3$ - micrograms per cubic meter

Italicized values represent compounds which were not detected, but which have laboratory reporting limits above project-specific Risk-Based Concentrations in Air

Bolded values represent compounds above laboratory reporting limit

Bordered and shaded values - represent exceedances of project-specific Risk-Based Concentrations in Air

NA - screening level not available

U - undetected, associated value is the method reporting limit

Table 7-5
Laboratory Results and Dust Action Levels for Pesticides
Landfill E
Presidio of San Francisco, California

Location ID:	Adjusted Risk-Based Concentration in Air ($\mu\text{g}/\text{m}^3$) ⁽¹⁾	Background Samples				Week 1: Construction-Phase Samples				Week 2: Construction-Phase Samples			
		DAEAS01 1118913001	DAEAS02 1118913006	DAEAS03 1118913007	FB070711 ⁽²⁾ 1118913004	DAEAS01 1121008001	DAEAS02 1121008002	DAEAS03 1121008003	FB072611 ⁽²⁾ 1121008004	DAEAS01 112168005	DAEAS02 112168006	DAEAS03 112168007	FB080111 ⁽²⁾ 112168008
Lab Sample ID:		7/7/2011	7/7/2011	7/7/2011	7/7/2011	7/26/2011	7/26/2011	7/26/2011	7/26/2011	8/1/2011	8/1/2011	8/1/2011	8/1/2011
Date Sampled:		$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	μg	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	μg	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	μg
Units:													
Pesticides and Herbicides													
4,4'-DDE	0.25	0.01 U	0.01 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U	0.005 U
4,4'-DDT	0.25	0.01 U	0.01 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U	0.005 U
Tetraethyl Lead	NA	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

- Values presented in Table 1 of the Air and Dust Monitoring Plan, Landfill E (Appendix G to the RDIP - Geosyntec, 2011)
- Field Blanks collected by exposing sample media to ambient air. No volume drawn through; therefore units reported as $\mu\text{g}/\text{sample}$

$\mu\text{g}/\text{m}^3$ - micrograms per cubic meter

Italicized values represent compounds which were not detected, but which have laboratory reporting limits above project-specific Risk-Based Concentrations in Air

Bolded values represent compounds above laboratory reporting limit

Bordered and shaded values - represent exceedances of project-specific Risk-Based Concentrations in Air

NA - screening level not available

-- - Compound not analyzed

U - undetected, associated value is the method reporting limit

Table 7-6
Laboratory Results and Dust Action Levels for SVOCs
Landfill E
Presidio of San Francisco, California

Location ID: Lab Sample ID: Date Sampled: Units:	Adjusted Risk- Based Concentration in Air ($\mu\text{g}/\text{m}^3$) ⁽¹⁾	Background Samples				Week 2: Construction-Phase Samples			
		DAEAS01 1118913005 7/6/2011 $\mu\text{g}/\text{m}^3$	DAEAS02 1118913002 7/6/2011 $\mu\text{g}/\text{m}^3$	DAEAS03 1118913003 7/6/2011 $\mu\text{g}/\text{m}^3$	FB070611 ⁽²⁾ 1118913008 7/6/2011 μg	DAEAS01 1121618001 8/3/2011 $\mu\text{g}/\text{m}^3$	DAEAS02 1121618002 8/3/2011 $\mu\text{g}/\text{m}^3$	DAEAS03 1121618003 8/3/2011 $\mu\text{g}/\text{m}^3$	FB080311 ⁽²⁾ 1121618004 8/3/2011 μg
Semivolatile Organic Compounds									
Benzo(a)anthracene	0.087	0.068 U	0.069 U	0.069 U	0.1 U	0.069 U	0.069 U	0.069 U	0.1 U
Benzo(a)pyrene	0.0087	<i>0.068 U</i>	<i>0.069 U</i>	<i>0.069 U</i>	0.1 U	<i>0.069 U</i>	<i>0.069 U</i>	<i>0.069 U</i>	0.1 U
Benzo(b)fluranthene	0.087	0.068 U	0.069 U	0.069 U	0.1 U	0.069 U	0.069 U	0.069 U	0.1 U
Chrysene	0.87	0.068 U	0.069 U	0.069 U	0.1 U	0.069 U	0.069 U	0.069 U	0.1 U
Fluoranthene	NA	0.068 U	0.069 U	0.069 U	0.1 U	0.069 U	0.069 U	0.069 U	0.1 U
Indeno(1,2,3-cd)pyrene	0.087	0.068 U	0.069 U	0.069 U	0.1 U	0.069 U	0.069 U	0.069 U	0.1 U
Naphthalene	90	0.068 U	0.069 U	0.069 U	0.1 U	0.069 U	0.069 U	0.069 U	0.1 U
Phenanthrene	NA	0.068 U	0.069 U	0.069 U	0.1 U	0.069 U	0.069 U	0.069 U	0.1 U
Pyrene	NA	0.068 U	0.069 U	0.069 U	0.1 U	0.069 U	0.069 U	0.069 U	0.1 U

Notes:

1. Values presented in Table 1 of the Air and Dust Monitoring Plan, Landfill E (Appendix G to the RDIP - Geosyntec, 2011)
2. Field Blanks collected by exposing sample media to ambient air. No volume drawn through; therefore units reported as $\mu\text{g}/\text{sample}$

$\mu\text{g}/\text{m}^3$ - micrograms per cubic meter

Italicized values represent compounds which were not detected, but which have laboratory reporting limits above project-specific Risk-Based Concentrations in Air

Bolded values represent compounds above laboratory reporting limit

Bordered and shaded values - represent exceedances of project-specific Risk-Based Concentrations in Air

NA - screening level not available

U - undetected, associated value is the method reporting limit

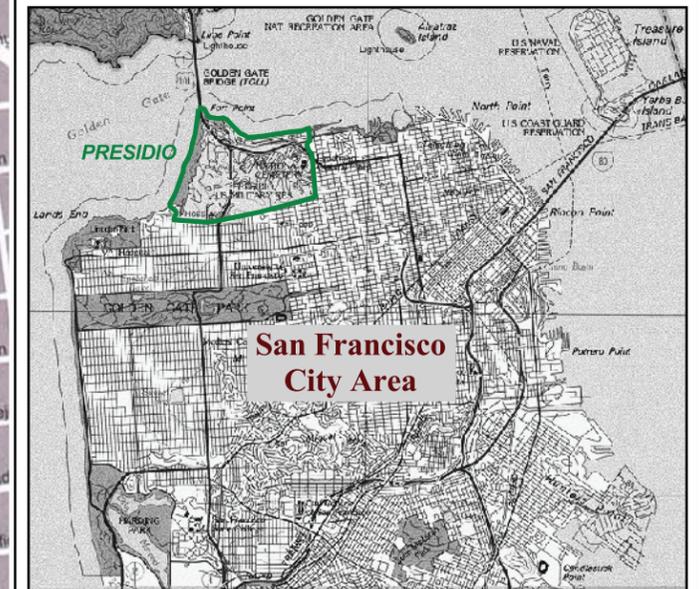
FIGURES



LEGEND

— — — — — Area A and B boundary

Notes:
 Area A Stewardship by the National Park Service.
 Area B Stewardship by the Presidio Trust.



Geosyntec

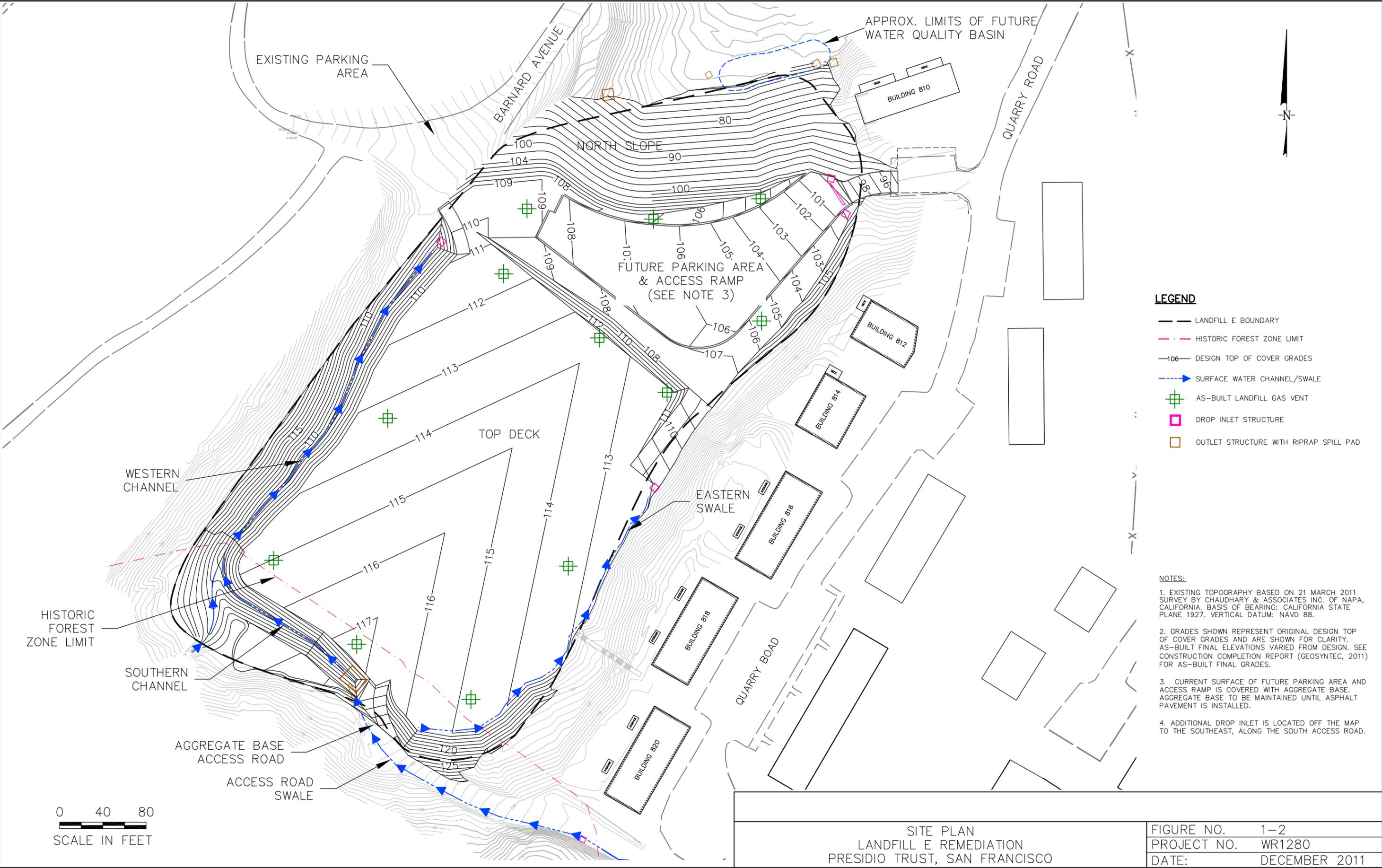
SITE LOCATION MAP
 LANDFILL E CQA
 PRESIDIO TRUST
 SAN FRANCISCO, CA



DECEMBER 2011
 FIGURE 1-1

SOURCE: Base map provided by Treadwell & Rollo, November 2004. Draft Small Arms Firing Range Feasibility Study Report, Figure 6.

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- LEGEND**
- LANDFILL E BOUNDARY
 - - - HISTORIC FOREST ZONE LIMIT
 - 106- DESIGN TOP OF COVER GRADES
 - ▶— SURFACE WATER CHANNEL/SWALE
 - ⊕ AS-BUILT LANDFILL GAS VENT
 - DROP INLET STRUCTURE
 - OUTLET STRUCTURE WITH RIPRAP SPILL PAD

- NOTES:**
1. EXISTING TOPOGRAPHY BASED ON 21 MARCH 2011 SURVEY BY CHAUDHARY & ASSOCIATES INC. OF NAPA, CALIFORNIA. BASIS OF BEARING: CALIFORNIA STATE PLANE 1927. VERTICAL DATUM: NAVD 88.
 2. GRADES SHOWN REPRESENT ORIGINAL DESIGN TOP OF COVER GRADES AND ARE SHOWN FOR CLARITY. AS-BUILT FINAL ELEVATIONS VARIED FROM DESIGN. SEE CONSTRUCTION COMPLETION REPORT (GEOSYNTEC, 2011) FOR AS-BUILT FINAL GRADES.
 3. CURRENT SURFACE OF FUTURE PARKING AREA AND ACCESS RAMP IS COVERED WITH AGGREGATE BASE. AGGREGATE BASE TO BE MAINTAINED UNTIL ASPHALT PAVEMENT IS INSTALLED.
 4. ADDITIONAL DROP INLET IS LOCATED OFF THE MAP TO THE SOUTHEAST, ALONG THE SOUTH ACCESS ROAD.



SITE PLAN LANDFILL E REMEDIATION PRESIDIO TRUST, SAN FRANCISCO		FIGURE NO.	1-2
		PROJECT NO.	WR1280
		DATE:	DECEMBER 2011



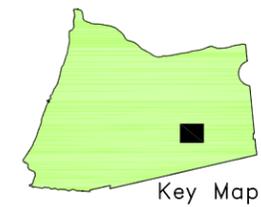
0 40 80
SCALE IN FEET

LEGEND

-  LIMIT OF LANDFILL E
-  APPROXIMATE LIMIT OF EARTHWORK
-  APPROXIMATE AIR & DUST MONITORING LOCATIONS
-  APPROXIMATE PERIMETER WALK-AROUND ROUTE

NOTES:

1. TOPOGRAPHIC MAP SHOWN WAS PREPARED BY CHAUDHARY & ASSOCIATES, INC. IN FEBRUARY 2011.



Geosyntec



AIR MONITORING
LOCATIONS
LANDFILL E
PRESIDIO TRUST
SAN FRANCISCO, CA

NOVEMBER 2011
FIGURE 7-1

ATTACHMENT A
Photographic Documentation



Photo 1: Grubbing and mulch removal along the north slope area (looking south).



Photo 2: Existing asphalt pavement removal (looking south).



Photo 3: Rough grading of existing waste along western channel (looking south).



Photo 4: Typical waste encountered during excavation operations.



Photo 5: Mulch removal operations along southwest corner of LFE (looking east).



Photo 6: Mulch stockpiling for future offsite disposal (looking north).



Photo 7: Clean soil layer placement along the toe of the north slope (looking north).



Photo 8: Rough grading of existing waste along southeast corner of LFE (looking south).



Photo 9: Foundation layer (i.e., waste) test pad preparation (looking south).



Photo 10: Field density testing for foundation layer test pad.



Photo 11: Initial waste placement over compacted clean soil at toe of north slope (looking east).



Photo 12: Waste compaction along the toe of the north slope (looking southeast).



Photo 13: Foundation layer placement along north slope (looking west).



Photo 14: Soil confirmation sampling along the western channel (looking south).



Photo 15: Over-excavation along areas of the western channel that were not clean closed; i.e. subsequently lined with geomembrane (looking south).



Photo 16: Placement and compaction of foundation layer along the top deck (looking north).



Photo 17: Imported mulch stockpiling at the northern perimeter of LFE (looking north).



Photo 18: Excavation along the southern channel (looking west).



Photo 19: Foundation layer and compaction along the north slope (looking east).



Photo 20: Trench excavation for central LFG collection pipe (looking north).



Photo 21: Cannonball unearthed during waste excavation along the north slope.



Photo 22: UXO ground survey prior to excavation operations (looking east).



Photo 23: Compaction of clean soil along clean utility corridor (looking north).



Photo 24: Final grading along the top hinge point for the north slope (looking southeast).



Photo 25: EBMUD soil stockpiling along eastern portion of the top deck (looking north).
Note storage of fused HDPE pipe along southeast.



Photo 26: HDPE pipe butt fusion operations.



Photo 27: Central LFG collector trench (looking north).



Photo 28: LFG collector pipe trench excavation along the north slope (looking east).



Photo 29: Drainage gravel and geotextile placement along the LFG trenches on the north slope (looking east).



Photo 30: Western infiltration pipe trench excavation (looking north).



Photo 31: Western infiltration pipe and drainage gravel placement within trench (looking south).



Photo 32: Drainage gravel thickness measurement.



Photo 33: Typical geotextile burrito wrap around drainage gravel and pipes.



Photo 34: Subgrade preparation along the western channel (looking south).



Photo 35: Foundation layer compaction along top deck (typical).



Photo 36: Engineered soil placement along the top deck showing Doyle "Rocky" material (looking south).



Photo 37: Geocomposite roll stockpiling within parking area (looking east).



Photo 38: Smooth drum rolling of western half of top deck prior to geocomposite deployment (looking north).



Photo 39: Geocomposite deployment along western channel (looking west).



Photo 40: Geocomposite panel seaming using zip ties (typical).



Photo 41: Geotextile seaming using “double prayer” sewn seams (typical).



Photo 42: Gas vent construction (typical).



Photo 43: Gas vent construction above ground (typical).



Photo 44: LFG header pipe and vent installation along top of north slope (looking east).



Photo 45: LFG geocomposite deployment along the top deck (typical).



Photo 46: 60-mil HDPE geomembrane deployment along western channel (looking north).



Photo 47: Trial fusion weld coupons testing using tensiometer (typical).



Photo 48: Fusion welding of HDPE geomembrane panels (typical).



Photo 49: Drainage geocomposite deployment above geomembrane panels in southern channel (looking east).



Photo 50: Geosynthetics deployment over areas of the western channel that were not clean-closed (looking south).



Photo 51: Horticultural soil placement over geosynthetics along the western channel (looking south).



Photo 52: Engineered soil placement along the north slope (typical).



Photo 53: Compost spreading along the north slope (typical).



Photo 54: Gypsum and sulfur application along the north slope, as part of amendment application (typical).



Photo 55: Soil ripping to incorporate the amendments applied along the north slope (typical).



Photo 56: Typical air monitoring equipment set-up.



Photo 57: Air monitoring perimeter walk-around (looking east).



Photo 58: Installation of 24-inch corrugated HDPE stormwater pipe within southern access road (typical).



Photo 59: Drop inlet installation (typical).



Photo 60: Formwork construction for drop inlet at SW-4 (looking east).



Photo 61: Grading work around the entrance to the drop inlet at SW-4 (looking east).
Note that SW-4 was subsequently modified to raise wing walls.



Photo 62: Eastern infiltration pipes installation within north slope.
Note placement of concrete encasement around pipe bends.



Photo 63: Flare end construction at end of eastern infiltration pipe.



Photo 64: Completed pre-cast drop inlet (typical).



Photo 65: Excavation for buried control structures along the western channel (looking north).



Photo 66: Riprap rock placement within buried grade break along western channel.



Photo 67: Erosion control matting along new swale on southern access road.



Photo 68: Erosion control mat and fiber roll installation along the western channel.



Photo 69: Mulch spreading above erosion control blanket on north slope (looking west).



Photo 70: Completed southern channel (typical).



Photo 71: V-ditch excavation along eastern side of top deck (typical).



Photo 72: Shotcrete placement along eastern drainage v-ditch (looking south).



Photo 73: Subgrade preparation within parking area (looking west).



Photo 74: Non-woven geotextile deployment within parking area (typical).



Photo 75: Aggregate base placement within parking area (typical).



Photo 76: Aggregate base compaction and smooth-drum rolling along parking area (looking east).



Photo 77: Mulch placement above top deck (typical).



Photo 78: Gas vent fence installation (typical).



Photo 79: Fencing around gas vents (typical).



Photo 80: Final view of parking area and vicinity (looking southeast).



Photo 81: Completed spill pad, flare end and trash rack at end of western infiltration pipe (looking west).



Photo 82: Nearly completed top deck area (looking north).



Photo 83: Completed north slope area (looking east).



Photo 84: Final configuration for drop inlet at north end of the western channel (including trash rack and rip rap protection)



Photo 85: Final configuration around the northwest entrance to the site, including jute netting over straw, with fiber rolls.



Photo 86: Completed Topdeck.