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Acronyms

AOC	area of concern
BBL	Blasland, Bouch & Lee, Inc.
BCDC	Bay Conservation and Development Commission
bgs	below ground surface
BMPs	best management practices
Cap Company	California Cap Company
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CKD	cement kiln dust
COC	chemical of concern
CWA	Clean Water Act
E-SSTLs	ecological site-specific target levels
EBRPD	East Bay Regional Parks District
EPA	Environmental Protection Agency
H-SSTL	human health site-specific target levels
LDR	land disposal restrictions
LFR	Levine Fricke
mg/kg	milligram per kilogram
MSOU	Meade Street Operable Unit
NGVD	National Geodetic Vertical Datum
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollution Discharge Elimination System
PAHs	polynuclear aromatic hydrocarbons
PCBs	polychlorinated biphenyls
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RFS	Richmond Field Station

RWQCB	California Environmental Protection Agency, Regional Water Quality Control Board, San Francisco Bay Region
SCR	Site Cleanup Requirements
SSTL	site-specific target levels
SVOC	semivolatile organic compound
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
STLC	Soluble Threshold Limit Concentration
TC	toxicity characteristic
TCLP	Toxicity Characteristic Leaching Procedure
TPH	total petroleum hydrocarbons
TSCA	Toxic Substances Control Act
TTLC	Total Threshold Limit Concentration
UC Berkeley	University of California Berkeley
UHC	underlying hazardous constituent
URS	URS Corporation
USACE	United States Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UTS	Universal Treatment Standard
VOC	Volatile Organic Compounds
WDID	Waste Discharger Identification
Western Stege Marsh	western portion of Stege Marsh
Zeneca	Zeneca, Inc.

Executive Summary

This Remedial Action Plan (RAP) has been prepared for the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) in compliance with the California Environmental Protection Agency, Regional Water Quality Control Board, San Francisco Bay Region's (RWQCB) Order Number 01-102 (the Order), Tasks 2d, 4b, and 4c. This RAP presents a summary of remedial activities planned for the 2005 Phase 4 cleanup activities to be conducted at the University of California, Berkeley (UC Berkeley) Richmond Field Station (RFS) property located at 1301 South 46th Street, Richmond, California. The location of the RFS is shown on Figure 1. The RFS has been designated as Subunit 2 of the Meade Street Operable Unit (MSOU) identified in the RWQCB Order. Subunit 2 was further divided into Subunits 2A and 2B as shown on Figure 2. Task 2d requires that remedial design details be submitted to the RWQCB for Subunit 2A upland areas. Task 4b requires a technical report providing the results of investigations of Subunit 2B soil and groundwater. Task 4c of the Order requires a RAP be submitted to the RWQCB for the upland portion of Subunit 2B. This RAP discusses remedial activities for portions of the Subunit 2A and 2B uplands to be remediated in 2005.

This document reports the delineation of upland areas of concern (AOC) as defined by results of additional investigations performed since October 2002. It summarizes these additional analytical data, including data previously reported to the RWQCB in the following documents:

- Field Sampling and Analysis Plan (URS, 1999);
- Field Sampling and Analytical Results (URS, 2000); and
- Results of Additional Investigations, Upland Portion of Subunit 2B (URS, 2002b).

This document also discusses the major remedial design elements for Phase 4 consisting of the excavation and backfilling of the following:

Subunit 2A:

- AOC U5;
- West Area 4, an area with subsurface pyrite cinders west of the portion of Area 4 excavated during Phase 2;

Subunit 2B:

- AOC U7, the former Cap Co. mercury fulminate area; and
- Possibly various upland areas with surficial pyrite cinders.

A completion report documenting completed Phase 4 remedial actions will be submitted to the RWQCB in a separate report in spring 2006.

1. Introduction

On the behalf of the University of California, Berkeley, Blasland, Bouck and Lee (BBL) and URS Corporation (URS), UC Berkeley's environmental consultants, have prepared this Phase 4 Remedial Action Plan (RAP) in compliance with Tasks 2d, 4b, and 4c of the California Regional Water Quality Control Board, San Francisco Bay Region's (RWQCB) Order No. 01-102 Site Cleanup Requirements (SCR) for Subunit 2B of the Meade Street Operable Unit.

The Richmond Field Station (RFS) is owned by the UC Regents and operated by the University of California, Berkeley (UC Berkeley). It is designated as Subunit 2 of the Meade Street Operable Unit. The RFS is located at 1301 S. 46th Street in Richmond, California as shown on Figure 1. Subunit 2 was divided by the RWQCB into two subunits. Subunit 2A consists of the southeastern portion of the RFS for which UC Berkeley and Zeneca are named as joint responsible parties. Subunit 2B consists of the northern and western portion of the RFS for which UC Berkeley is named as the sole responsible party. The location of Subunit 2A and 2B and their respective boundaries are shown on Figure 2. A large portion of the RFS property was previously owned by the California Cap Company (Cap Company), a manufacturer of blasting caps from 1877 to 1948. The majority of the impacts to upland soil are believed attributable to Cap Company operations. Since its purchase in October 1950, UC Berkeley has used the RFS uplands and marsh for research and educational activities.

Remediation of the marsh portion of Subunit 2 has been scheduled in multiple phases primarily due to permit restrictions that permit work in the marsh only from September 1st through January 31st. Marsh work is not permitted outside this period due to the endangered California clapper rail breeding season. Phases 1 and 2 were performed in 2002 and 2003, respectively, to remediate the upland and marsh portions of Subunit 2A and two areas in the marsh portion of Subunit 2B. Phase 3 was performed in 2004 to remediate six Areas of Concern (AOCs) in the upland portion and grading in a marsh portion of Subunit 2B. Phase 4, the subject of this RAP, will address remediation in two AOCs and additional areas as shown on Figure 3. Remediation of the remaining marsh portion of Subunit 2B is not anticipated to begin before fall 2006.

The SCR Task 2d states:

"The dischargers shall submit a technical report, acceptable to the Executive Officer, which provides the remedial design for addressing metal and metalloid pollution and acidic conditions in soil and groundwater in the upland portion of MSOU Subunit 2A..."

As required by Task 2d, this RAP presents the results from investigations performed by BBL and URS in Area 4 of Subunit 2A following Phase 2 remedial activities.

The SCR Task 4b states:

"The dischargers shall submit a technical report, acceptable to the Executive Officer, which provides the results of investigations implemented as described in the technical report required in Task 4a. If necessary, the report shall propose additional soil and/or groundwater sampling in order completely define the extent of pollution in the upland portion of Subunit 2B."

As required by Task 4b, this RAP presents the results from investigations performed by BBL and URS following submittal of "Results of Additional Soil and Groundwater Investigation" (URS, 2002b). Sampling methodology and rationales are described in "Workplan for Additional Soil and Groundwater Investigation,

Upland Portion of Subunit 2B, Richmond Field Station” (Workplan) (URS, 2002a). The Workplan was submitted to the RWQCB as required in Task 4a.

The results of previous sampling events in the upland area are discussed in the following reports submitted to the RWQCB:

- Field Sampling and Analysis Plan (URS, 1999);
- Field Sampling and Analytical Results (URS, 2000); and
- Results of Additional Investigations, Upland Portion of Subunit 2B (URS, 2002b).

The objectives of the investigation performed under Task 4b were to delineate the extent of chemicals of concern (COCs) in the upland portion of Subunit 2B and develop information necessary to complete the RAP for Subunit 2B. This report presents the Phase 4 RAP.

The SCR Task 4c states:

“The dischargers shall submit a technical report, acceptable to the Executive Officer, which provides a remedial action plan for the upland portion of Subunit 2B. The report shall include detailed design criteria, construction details, and procedures and schedule for implementation of the remedial measures, as well as a residual Risk Management Plan for pollutants that may remain on-site post remediation.”

To develop the Phase 3 and 4 RAPs, the investigation focused on the AOCs, identified through previous sampling events, where soil contains elevated concentrations of metals in the upland portion of Subunit 2B. The AOCs are defined as areas that have concentrations of COCs that exceed levels of acceptable risk to human health or the environment as identified in UC Berkeley’s report titled “Human Health and Ecological Tiered Risk Evaluation, University of California Berkeley, Richmond Field Station/Stege Marsh” (risk assessment) (URS, 2001). The investigated areas were initially identified during a review of historical operations at the RFS. Following the discovery of elevated COCs in these areas, subsequent rounds of sampling were performed to delineate the horizontal and vertical extent of the AOCs. AOCs U5 and U7, that are to be remediated under the Phase 4 RAP and presented on Figure 3, are a subset of the AOCs identified in the risk assessment. AOC U5 includes a section of a former storm drain trench that was partially backfilled with pyrite cinders. AOC U7 is located in the former mercury fulminate manufacturing area of the California Cap Company, the former owners of the RFS property.

An additional area of subsurface cinders was discovered west of Area 4 during Phase 2 excavation activities. This area is now called West Area 4. An investigation consisting of Geoprobe borings was performed to delineate the area with a subsurface layer of cinders greater than 2 feet thick. This area of cinders will be excavated during Phase 4 as discussed in this report. In addition, surficial cinders in 12 upland areas may be removed during this phase.

1.1 Site Description

The RFS site consists of both upland and offshore areas. The offshore area consists of an inner and outer portion of Western Stege Marsh. The outer portion of Western Stege Marsh (approximately 60 acres) is located south of the East Bay Regional Parks District’s (EBRPD) Bay Trail and includes tidal mud flats, marsh, and open water. The upland area occupies approximately 90 acres. The inner marsh including the fill area known as the bulb occupies approximately 12 acres. A 100-foot strip of Western Stege Marsh on either side of the EBRPD Bay Trail is owned by the EBRPD. Meeker Slough, the source of tidal flushing for Western Stege Marsh, is located along the western boundary of the RFS property and is owned by the City of Richmond.

1.2 Report Organization

This report is organized as follows:

- Section 2 presents the methods and results of additional soil and groundwater investigations in the upland portion of Subunit 2B;
- Section 3 discusses the remedial design details for Phase 4;
- Section 4 discusses permits and regulatory requirements; and
- Section 5 lists references relating to this report.

2. Results of Investigation

2.1 Field Activities

This section provides a summary of the field activities performed by URS and BBL to delineate AOC U5, AOC U7, West Area 4, and surface cinders in upland areas. Beginning with the initial investigation by URS in 2000, URS and BBL have collected 145 soil samples from 73 Geoprobe borings to define the boundaries of AOC U5, AOC U7, and West Area 4. During the earlier rounds of the investigation in AOC U7, borings were generally installed to 10 to 15 feet below ground surface (bgs). As the shallow extent of COCs became apparent, borings were installed to 4 to 8 feet bgs. At all locations, the vertical extent of COCs was defined by the deepest sample with an analytical result below the screening criteria. The horizontal extent of the AOCs was defined by stepping out from locations with concentrations of COCs that exceeded the screening criteria. This process of stepping out was repeated until soil sample analytical results were below the screening criteria. Boring logs for each boring are presented in Appendix A.

2.2 Soil Sampling

Prior to 1999, several environmental investigations were performed at the RFS. These investigations are summarized in the Field Sampling and Analysis Plan and Tiered Risk Evaluation (URS, 1999). During file reviews of previous investigations prior to 1999, historical sampling locations were shown on maps but surveyed coordinates were not available. Since the locations of previous samples are approximate, they were not used to delineate AOCs but were used as a guide to establish sample areas. Locations sampled by URS and BBL since 1999 have been surveyed and are shown on the appropriate figures cited below.

Site-Specific Target Levels for human (H-SSTLs) and ecological (E-SSTLs) receptors were developed and submitted to the RWQCB in the risk assessment (URS, 2001). SSTLs are used to identify areas that may pose unacceptable risk. Relevant ecological receptors on the RFS are the red-tailed hawk and ground squirrel. Human health receptors considered in the risk assessment are industrial and commercial office workers and maintenance workers (outdoor exposure) and construction/excavation workers (exposure in enclosed trenches). Analytical results for metals and polychlorinated biphenyls (PCBs) in soil were screened against SSTLs and are summarized in tables. The lateral and vertical boundaries of the AOCs were defined by the midpoints between the location of samples that exceeded the lowest of the H-SSTLs and E-SSTLs and the location of samples below the SSTLs. .

Curtis & Tompkins Laboratory in Berkeley, California, a state-certified analytical laboratory, analyzed samples for priority pollutant metals by EPA Method 6010B, pH by EPA Method 9045C, and moisture content. Selected samples were analyzed for PCBs by EPA Method 8082. The results of the metal analysis for soil samples are discussed below in Section 2.2. Metals and pH data are summarized in Table 1. The PCB sample results are presented in Table 2. The results of other analyses including moisture content, pH, bulk density, grain size and total organic carbon (TOC) are presented in Table 3. The Quality Assurance/Quality Control review of the analytical data is presented in Appendix B.

The history and analytical results within each of the Phase 4 remediation areas are discussed below.

2.2.1 Subunit 2A Upland

2.2.1.1 AOC U5 – South End of Western Storm Drain

AOC U5 is located just south of the U.S. Environmental Protection Agency (EPA) laboratory and just north of Western Stege Marsh as shown on Figure 3. This area includes an approximately 147-foot long section of the Western Storm Drain, a pipe that conveys storm water from the western portion of the upland RFS. This pipeline was formerly a sanitary sewer overflow originating within a manhole just north of the RFS property. As part of the Phase 3 remedial activities in 2004, the connection between the off-site manhole and the next manhole downstream was grouted to sever the sanitary sewer connection. This pipe still conveys storm water from the western area of the RFS. AOC U5 includes the pipeline trench backfill between the two southern-most manholes.

In 2000, two Geoprobe borings, SD101 and SD102, were placed within the former trench at locations shown on Figure 4. The boring logs are shown in Appendix A. Several discrete layers of pyrite cinders and cinders mixed with backfill material were encountered totaling up to approximately 3 feet thick. A cross section of the area showing the pipe and cinder layers is shown on Figure 5. The location of the cross section is shown on Figure 4. Analytical results for soil samples are summarized in Table 1. Backfill material within the former trench will be removed as a remedial measure in this AOC as discussed in Section 3.1.1.

2.2.1.2 West Area 4

West Area 4, as shown on Figures 3 and 4, is located just west of Area 4, an area that was remediated during Phase 2. Prior to Phase 2 excavating, this area was believed to contain a thin layer of pyrite cinders (less than 2 feet thick) beneath the fill layer and overlying the former tidal flat sediment. However, during the Phase 2 remedial activities and the installation of a new sanitary sewer line, sufficient cinders were encountered to warrant a further investigation. As a result, BBL installed 28 Geoprobe borings between May 2004 and April 2005 from the ground surface (approximately elevation 8 feet) to the sediment surface (approximately elevation 1 foot) that underlies an approximately 7-foot-thick layer of fill placed in this area in the 1950's. The borings were logged and the boring logs are shown in Appendix A.

In the samples recovered from the borings, a thin layer of cinders less than 1 inch thick was observed at most locations south of the former seawall beneath the fill and overlying sediment of the former tidal flat. At many locations the cinders occur as laminae in an approximately 6-inch zone of interbedded cinders and sediment. At many locations, the samples also contained a layer of cinders varying in thickness from 1 inch to 3.2 feet. The thickness of the cinder layer is shown on Figure 4. The area where cinders occur in a layer greater than 2 feet thick was delineated. This area, shown on Figure 4 and in a cross section shown on Figure 5, is planned for excavation as discussed in Section 3.1.2.

At eight locations, samples of the material at the fill/sediment interface were collected and analyzed for mercury. In each of the eight samples from locations shown on Figure 4, mercury exceeded its E-SSTL (42 mg/kg). The maximum concentration is 170 mg/kg as shown on Table 1. In addition, three samples from locations shown on Figure 4 were analyzed for the full suite of priority pollutant metals to verify whether the cinder-related metals were present. In one or more of these samples, arsenic, copper, and zinc as well as mercury exceed their respective SSTLs.

Based on history, the stratigraphy in the borings, and the analytical results, the following conclusions may be drawn. In the early 1900's, a seawall marked the boundary between the upland areas and tidal mud flats of San Francisco Bay. The seawall extended through the West Area 4 area from southeast to northwest. However, the

exact location of the seawall and its westward extent are uncertain. Pyrite cinders and mercury appear to have migrated westward into this area, possibly washed by tidal flow and waves, leaving scattered mounds of cinders and a thin veneer of mercury-bearing cinders across the tidal flat.

2.2.2 Subunit 2B Upland

2.2.2.1 AOC U7 – Mercury Fulminate Area

AOC U7 is located in an area believed to have been used by the Cap Company for production of mercury fulminate, the explosive used in blasting caps manufactured on the site prior to UC Berkeley's purchase of the property in 1950. The location of AOC U7 is shown on Figure 3.

URS and BBL installed 43 soil borings and collected 130 soil samples to vertically and horizontally delineate this AOC. Eighteen of the 19 sampling locations that exceeded SSTL screening values exceed the mercury E-SSTL of 42 mg/kg. The maximum concentration of mercury detected was 1,100 mg/kg. The maximum depth of a mercury exceedance was 11 feet bgs. Of those 19 locations, one sample contained copper exceeding the E-SSTL of 412 mg/kg at the ground surface. The concentration of copper in this sample was 670 mg/kg. The analytical results for metals and PCBs are shown in Tables 1 and 2. The sampling locations, AOC boundary, and COC exceedances are shown on Figure 6. Cross sections of the AOC are presented on Figures 7, 8, and 9. Sample exceedance locations and depths are also indicated. The locations of the cross section lines are shown on Figure 10. Soil within the AOC boundary will be removed as a remedial measure as discussed in Section 3.1.2.

2.2.2.2 Upland Surficial Cinders

During an inspection of the upland ground surface over a three day period in March 2005, 12 areas were identified with exposed pyrite cinders. On two of the three days, efforts were concentrated on the historical Cap Co. property because the cinders were placed during Cap Co. operations. The cinder areas are shown on Figure 3 and 11. The surface area of the cinder areas totals approximately 33,000 square feet and the thickness of the cinder layer in these areas varied from less than 1 inch up to approximately 3 inches. Samples of this material were not collected for chemical analysis.

2.3 Groundwater Sampling

Analytical results for most RFS groundwater samples have previously been reported to the RWQCB in the Draft report "Groundwater, Surface Water, and Sediment Monitoring Plan, Subunit 2, Meade Street Operable Unit" (Groundwater Monitoring Plan), dated December 3, 2004. This document is currently under review by the RWQCB. Following submittal of that report, additional grab groundwater data were collected for the West Area 4 area. These results are summarized in Table 4 along with groundwater results previously reported for AOC U7.

Results for two groundwater samples at locations CD9 and CD12 within the planned West Area 4 excavation exceeded screening criteria. A monitoring well, MW106, has been proposed down gradient of this area. These data will be included and evaluated in the final Groundwater Monitoring Plan following RWQCB review.

2.4 Groundwater Flow Direction

In 2002, URS constructed three piezometers at locations PB18 through PB20. The piezometers were installed to assess the direction of groundwater flow. Piezometers were constructed using 3/4" PVC to a depth of 16 feet bgs.

Numerous rounds of groundwater measurements indicate that the groundwater flow direction in the southeastern portion of the RFS site is southwesterly (S 36° W). The approximate groundwater flow direction is shown on Figure 3.

3. Phase 4 Remedial Activities

This section presents the Phase 4 RAP including remedial activities for the following upland areas:

Subunit 2A

- AOC U5 – south end of Western Storm Drain;
- West Area 4;

Subunit 2B

- AOC U7 – former Cap Co. Mercury Fulminate Area; and
- Possible upland surficial cinder areas.

On behalf of UC Berkeley, BBL and URS prepared this RAP in compliance with the RWQCB Order Number 01-102, Task 2d and 4c for remedial activities to be conducted on the RFS.

The major remedial design elements for Subunit 2B consist of the following:

- survey of the remediation/excavation areas;
- excavation of impacted;
- disposal of excavated soil at an appropriate off-site facility; and
- compaction and grading of soil certified clean through testing criteria discussed in Section 3.2.

Variations from this general plan are discussed in the appropriate sections below. Following remediation, disturbed areas will be landscaped or developed by UC Berkeley. A Completion Report documenting the completed Phase 4 remedial action will be submitted to the RWQCB under a separate report in spring 2006.

The goal of the upland remediation activities is to remove soil containing COCs that:

- were delineated in AOCs (e.g. AOC U7 shown on Figure 6) through soil sampling discussed in Section 2;
- pose a potential for groundwater contamination; or
- pose a potential for migration to the marsh (e.g. AOC U5 and West Area 4 shown on Figure 4).

Areas were identified by screening analytical data for each sample collected in Subunits 2A and 2B against the lower of E-SSTLs or H-SSTLs developed for the RFS. Soils with metals in excess of proposed SSTLs or visual surface pyrite cinders are identified for excavation. Delineation soil sampling, as discussed verbally with the RWQCB and in Section 2, adequately established the lateral and vertical extent of concentrations of COCs that exceed the SSTLs. Therefore, confirmation sampling will not be performed. Excavated soil will be disposed in an appropriate landfill, either Class I or Class II depending on the results of waste characterization sampling discussed in Section 3.3. Erosion control measures will be implemented per the Storm Water Pollution Prevention Plan (SWPPP). Landscaped areas will be returned to their original condition. The following sections detail activities to be performed during Phase 4 activities. A summary of characteristics of each AOC, including COCs, area, volume to be excavated, and soil disposal locations, are shown on Table 5.

3.1 Subunit 2A

3.1.1 AOC U5

AOC U5 lies in an open field in the southern portion of the RFS at an elevation of approximately 10 to 12 feet National Geodetic Vertical Datum (NGVD) as shown on Figures 3 and 4. At two boring locations, SD101 and SD102 shown in cross section on Figure 5, pyrite cinders occur in the storm drain trench backfill. Remedial activities in this area will include removal of the backfill over the pipe and evaluation of the nature of the backfill along the sides of the pipe. Any backfill material consisting of cinders or a mix of cinders, gravel, and/or soil will be removed and segregated for off-site disposal. The storm drain pipe will be removed as necessary to access the cinder backfill beneath the pipe at approximately elevation 2 feet NGVD. Following the removal of cinder backfill, the storm drain pipe will be replaced as necessary and the trench will be backfilled with clean material. The area will be compacted and graded to the surrounding elevation.

3.1.2 West Area 4

West Area 4 lies at an elevation of approximately 8 feet NGVD in an open field west of the Phase 2 Area 4 excavation as shown on Figures 3 and 4. This 3,842-square-foot area will be excavated to a depth of approximately 8.5 feet bgs (-0.5 feet NGVD). An approximately 4-foot-layer of clean fill will be excavated from the ground surface (approximately elevation 8 feet NGVD) to elevation 4 feet NGVD and stockpiled for backfill. The approximately 2 to 3-foot-thick layer of cinders will be excavated between elevations 4 feet NGVD to -0.5 feet NGVD and stockpiled for disposal. The excavation, shown in the cross section on Figure 5, will be backfilled with the excavated fill plus additional imported backfill material currently stockpiled on site that meets the backfill criteria discussed in Section 3.2. The area will be compacted and graded to the surrounding elevation.

It should be noted that additional remedial measures may be necessary in this area in a later phase due to the wide-spread occurrence of cinders and mercury and the threat they may pose to the quality of groundwater migrating to the marsh. UC Berkeley recommends that this issue be addressed in the final Groundwater Monitoring Plan.

3.2 Subunit 2B

3.2.1 AOC U7

AOC U7 lies at an elevation of approximately 8 feet (NGVD) in an open area just west of Buildings 102 and 110 and north of Area 4 in Subunit 2A as shown on Figures 3 and 6. A western portion of the area lies beneath the eastern portion of an asphalt pad constructed for Phase 2 treatment activities. The portion of the pad overlying AOC U7 will be removed and recycled. The fill between the asphalt pad and the original ground surface will be removed and stockpiled for use as backfill. Soil within the excavation boundary shown on Figures 6 and 12 will be excavated and disposed at Kettleman City Landfill, a Class I landfill.

The surface area of the excavation is approximately 23,400 square feet. The excavation has been subdivided into cells based on the deepest occurrence of a COC exceedance as shown on the cross sections (Figures 7 through 9). The depth of each of the excavation cells is shown on Figure 12. The bottom of the deepest excavation cell will be approximately 12 feet bgs and approximately elevation -3 feet NGVD. The excavation will be backfilled with imported backfill material currently stockpiled on site that meets the backfill criteria discussed in Section 3.2. The area will be compacted and graded to the surrounding elevation.

3.2.2 Surface Cinder Areas

A thin layer of pyrite cinders measuring up to approximately 3 inches thick occurs in scattered areas shown on Figures 3 and 11 and totaling approximately 33,000 square feet. An approximately 6-inch layer of soil including the exposed cinders in these areas may be scraped into a stockpile and loaded into trucks for hauling to a temporary stockpile on the asphalt treatment pads. If this material is removed, it will then be hauled to a landfill for disposal.

The shallow 6-inch excavations will be backfilled with imported backfill material currently stockpiled on site that meets the backfill criteria discussed in Section 3.2. The area will be compacted and graded to the surrounding elevation.

3.3 Backfill Acceptance Criteria

Soil designated for excavation during Phase 4 will be disposed at an appropriate offsite facility. Excavated areas will be backfilled with clean material. The total volume of backfill required is approximately 5,300 cy. Excavation volumes are shown in Table 5. These volumes are estimates and are not final replacement volumes. A portion of the required backfill is currently stockpiled at the RFS. This material has already been tested using the protocol discussed in this section. Any additional material required will be tested using the analytical protocol below.

Samples of backfill material will be collected from a secure stockpile of material located either onsite or at the borrow site. Samples may also be collected in-situ prior to excavating fill material. Characterization samples will be collected from soil representative of material to be used in excavation areas. Backfill material will be sampled at the rate of one four-point composite sample per 1,000 to 5,000 cubic yards depending on the volume and homogeneity of the source. Each composite sample will be analyzed for priority pollutant metals, PCBs, pesticides, VOCs, polynuclear aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPH) as motor oil and diesel. The following table summarizes the analytical parameters and analytical methods:

Parameter	Analytical Method
Priority Pollutant Metals	USEPA 6010
PCBs/Pesticides	USEPA 8081/8082
VOCs	USEPA 8260
SVOCs/PAHs	USEPA 8270 (low detection limits)
TPH motor oil	SM 8015M
TPH diesel	SM 8015M

Material used for backfill in upland Phase 4 areas will be sampled and compared to the criteria listed in Table 6. If low concentrations of organics are detected in a potential source, the borrow source may be considered on a case by case basis and will be discussed with the RWQCB.

3.4 Air Monitoring

UC Berkeley regards any degradation of air quality as a result of Phase 4 remedial activities as a serious concern. This potential problem will be mitigated in two ways. First, specifications will be included in the Plans and Specifications and the Remediation Contractor's (RC) contract requiring suppression of dust to below visible levels. Anytime dust becomes visible, dust control measures will be implemented. Dust control measures include modifying construction activities (method, speed, equipment), spaying surfaces with water, covering trucks leaving the site, and street sweeping. The Plans and Specifications will include the following regarding dust and odor control, as well as other measures:

- RC will employ measures to prevent the creation of dust, air pollution, and odors;
- Unpaved areas where vehicles are operated will be periodically wetted down to eliminate dust formation;
- Stockpiles of excavated materials will be covered;
- RC will provide daily street sweeping, or more frequently as needed, whenever silt from construction site is carried out of the Work Area;
- RC will operate a water truck full-time for the duration of the project to mitigate dust; and
- RC will implement appropriate dust control measures to ensure that no dust leaves the fenced work area.

Secondly, the potential for air quality degradation will be mitigated by real-time air monitoring by Construction Quality Assurance (CQA) personnel. Dust monitoring will include wind direction and speed monitoring, total dust level monitoring, and chemical analysis of dust. Dust meters will be placed along the perimeter of the work area. If dust becomes visible or exceeds fence-line monitoring thresholds, the RC must stop work until the dust emissions can be properly abated. The dust levels will be recorded at 1 minute intervals throughout the work period. These results will be tabulated for record retention.

Additional measures will be implemented during the remediation of AOC U7, the former Cap Co. mercury fulminate area. CQA personnel will also monitor for mercury vapors using a Jerome mercury vapor analyzer during excavation activities. Work will be stopped if vapor concentrations exceed the stop work level. These results will also be tabulated for future reference. In addition, the RC will excavate the soil into covered bins, if available, for overnight storage pending hauling to the Class I landfill. The excavated soil may be placed in a stockpile, which will be covered overnight, if bins are not available or if logistics preclude the use of bins.

3.5 Schedule

Under the current schedule, the Phase 4 Plans and Specifications will be prepared in June 2004 for contracting. Work is anticipated to begin in August 2005. Work is anticipated to be complete prior to the rainy season.

4. Permitting and Regulatory Requirements

The RWQCB is the lead agency designated for oversight of the remedial investigation and cleanup activities at the site. UC Berkeley submitted a California Environmental Quality Act (CEQA) Initial Study (URS, 2003) as part of the permitting process. Additional permitting requirements for Phase 4 remediation activities are presented in the following sections.

4.1 Bay Conservation and Development Commission

Because excavation activities are proposed for backfill material in the Bulb, a modification to the Bay Conservation and Development Commission (BCDC) permit number M01-52(b), as issued to UC Berkeley on June 27, 2002 and modified in 2004, will be required if excavation occurs within 200 feet of the marsh shoreline.

4.2 Army Corps of Engineers

The United States Army Corps of Engineers (USACE) issued a Nationwide 38 permit (NWP 38; File Number 28135S) to UC Berkeley on September 4, 2003 for work to be performed in jurisdictional “waters of the United States”, including wetlands, on the RFS (i.e., areas in Western Stege Marsh at or below 5 feet NGVD). 401 Water Quality Certification was automatically issued with the NWP 38. The permit covers activities for a period of two years. The NWP 38 permit permits activities in jurisdictional waters until September 4, 2005. Renewal of this permit will not be required for Phase 4.

4.3 State Water Resources Control Board

A State Water Resources Control Board (SWRCB) General Permit was issued for Phase 2 activities. A SWPPP was developed and submitted to the SWRCB in addition to a Notice of Intent to obtain a Waste Discharger Identification and the General Permit. The SWPPP will be updated as necessary to include the new Phase 4 work areas.

5. References

California Regional Water Quality Control Board, San Francisco Bay Region. 1998. Order No. 98-072. Adoption of Site Cleanup Requirements for: Catellus Development Corporation and SF Pacific Property, Inc., Proposed Eastshore Park Property, Berkeley and Albany (Alameda County) and Richmond (Contra Costa County).

URS Corporation, 1999. Field Sampling and Analysis Plan and Tiered Risk Evaluation. Prepared for University of California Berkeley.

URS Corporation, 2000. Field Sampling and Analytical Results. Prepared for University of California Berkeley. December.

URS Corporation, 2001. Human Health and Ecological Tiered Risk Evaluation. Prepared for University of California Berkeley. November.

URS Corporation, 2002a. Workplan for Additional Soil and Groundwater Investigation, Upland Portion of Subunit 2B. Prepared for University of California Berkeley. February 28.

URS Corporation, 2002b. Results of Additional Investigations, Upland Portion of Subunit 2B. Prepared for University of California Berkeley. October 31.

URS Corporation, 2003. California Environmental Quality Act Initial Study. Prepared for University of California Berkeley.