



October 5, 2018

Lynn Nakashima
Berkeley Regional Office
700 Heinz Avenue, Suite 200C
Berkeley, California 94710

**Subject: Mercury Fulminate Area Excavation Pilot Study
Richmond Field Station Site
University of California, Berkeley**

Dear Ms. Nakashima:

On behalf of the University of California Berkeley, Tetra Tech, Inc. proposes to conduct a pilot study to evaluate the potential for mercury vapor emissions resulting from the proposed removal action activities at the Mercury Fulminate Area (MFA) the Richmond Field Station Site. UC Berkeley proposes to conduct pilot excavations within the areas with the highest known mercury concentrations. The goal of the pilot study is to determine which conditions or applied methods will minimize or eliminate mercury vapors as measured along the perimeter fenceline locations. Conditions or applied methods include, but are not limited to: cold ambient temperatures, water misting, surfactants, wind barriers, vapor removal through vacuum, placement of contaminated soil in sealed containers, and cautious/slow excavation activities.

All activities will be consistent with the *Final Remedial Action Workplan (RAW), Richmond Bay Campus, Richmond, California*, dated July 18, 2014.

Scope

The scope includes excavating several test pits within areas with soils with mercury concentrations above 1,300 mg/kg. All activities will be conducted consistent with Section 5.1 Soil Excavation, Removal Action Workplan, and including specific actions presented below.

Approach Summary

The following general tasks and approaches have been identified for the pilot study:

- Remove any portions of the Asphalt Pad C and clean fill located along the northwest boundary of the MFA which may be affected by pilot excavations
- Transport clean fill from the asphalt pad to staging areas
- Erect temporary silt fencing or other wind barriers up and down wind of the excavations
- Conduct excavation during morning hours (beginning at 7 am)
- Conduct perimeter fenceline monitoring for dust and mercury vapor emissions
- Excavate soils with known mercury contamination above 1,300 milligrams per kilogram (mg/kg)
- Apply construction water mist to excavation
- Apply vapor surfactant, as needed
- Apply negative air machines and vapor treatment, as needed

- Segregate soil with concentrations below 1,300 mg/kg from soil with concentrations above 1,300 mg/kg
- Conduct waste profile sampling as soil is excavated
- Line completed excavations with snow-fencing or a permeable liner, then backfill excavation with clean fill to grade.
- Stockpile excavated wastes directly into covered 1-cubic yard containers

Field conditions and measured mercury vapors will dictate the overall scope and specific tasks to be conducted. The proposed excavation areas are shown on Figure 1. Specific work areas are shown on Figure 2. The dust and vapor monitoring locations are presented directly from the RAW, Attachment D, Figure D-2.

Additional details regarding the tasks and approaches are provided below.

Health and Safety

Tetra Tech will prepare a site-specific health and safety plan addendum for this pilot study for submittal to DTSC prior to initiating any excavation activities. All staff, consultants, or contractors entering the exclusion zone during the excavation activities will read and comply with the plan; subcontractors are required to either adopt the plan or prepare one of their own. All contractors will be responsible for operating in accordance with the most current requirements of Title 8, California Code of Regulations, Section 5192 and Title 29, CFR, Section 1910.120 (29 CFR 1910.120), Standards for HAZWOPER. On-site personnel will be responsible for operating in accordance with all applicable regulations of the Occupational Safety and Health Administration (OSHA) as outlined in 8 California Code of Regulations General Industry and Construction Safety Orders and 29 CFR 1910 and 29 CFR 1926, Construction Industry Standards, as well as any applicable federal and state laws and regulations. All personnel working at the site will have reviewed and signed the plan, and a safety meeting will be conducted at the beginning of each work day to review potential site hazards and safe working procedures.

Site Preparation

The areas within the work zone limits will be cleared of debris and vegetation, and fencing will be removed as necessary. All excavations and work areas will be marked prior to mobilization. The exclusion zone will include all areas of excavation and truck loading. The decontamination zone for personnel, equipment, and vehicles exiting the exclusion zone will be located adjacent to the exclusion zone. The support zone will be located in the designated work zone but outside the exclusion and decontamination zones. The support zone will be used to temporarily store equipment, vehicles, and personnel. Temporary fencing is not necessary since the pilot study is located within a secure, fenced area.

Work areas are shown on Figure 2.

Placement of Fill Material

Excavated portions of the clean soil that was placed on top of the original ground surface in 2003 during the construction of Asphalt Pad C will be stockpiled within the exclusion zone for use as backfill material. If additional soil volume is needed, it will be imported from any DTSC-approved soil stockpile at the Richmond Field Station.

Soil Excavation

Soil at Excavations A through H will be excavated per the depths identified on Figure 1, unless groundwater is encountered, or if mercury vapors exceed the action levels as described below. Soil will be excavated with a backhoe operated by a UC Berkeley Hazardous Waste Contractor. Soil will be loaded directly into sealed, 1-cubic yard containers. Soil samples will be collected from the backhoe bucket or within each 1-cubic yard container for waste characterization. Waste characterization and waste profiling will be conducted for each 1-cubic yard container.

Once each container has been filled, it will be sealed and moved to a temporary storage area within the exclusion zone, as shown on Figure 2.

If workers observe suspected pyrite cinders, elemental mercury, or buried containers, EH&S will be notified prior to proceeding with excavation, and the locations will be documented in field notes and on the project site plan. The contractor will follow EH&S directions on handling and disposal of unusual debris found during excavation activities. Pyrite cinders are not expected based on the soil characterization data collected to date.

Vapor Vacuuming and Treatment

UC Berkeley may employ a mobile vacuum and air purification system along the downwind boundaries at each excavation. As the excavation area will not be in a sealed structure, UC Berkeley will utilize prevailing wind directions to direct vapors toward a negative air machine and carbon filter system. A moveable, solid wall would be constructed along the downwind boundary of an excavation with as many as nine negative air machines stacked in a square or rectangle configuration on the excavation side of the wall. As vapors are directed towards the system, they will be treated through a carbon filter and exhausted on the opposite side of the wall.

Vapor Surfactant

UC Berkeley is considering the use of vapor surfactant technologies (e.g. DeepEarth Technologies *Cool-Ox*[®] surfactant which claims to suppress organic odors without mobilizing metals, or heat production, <https://www.cool-ox.com/cool-ox>). These are primarily untested in reducing mercury vapors from contaminated soil and may be implemented in response to real-time mercury vapor monitoring.

Dust and Erosion Controls

Soil will be managed to prevent dust, spills to the ground, transport into storm drains, and exposure to people or the environment. Excavation, transportation, and handling of all soil must result in no visible dust at the fence line of the excavation. Any soil material proposed to be placed as fill will be kept covered or moist to facilitate eventual compaction and to control dust during earthwork operations, although this is not anticipated. A water truck or water tank will be available to supply water in sufficient quantity on the job site while excavation operations are underway. Sufficient water will be applied to suppress dust while exercising care to avoid generating runoff to any area outside the exclusion zone. Dust control measures will be implemented, as appropriate and necessary, beginning with site mobilization and continuing during the pilot excavation activities. Water will not be applied if there is a possibility of spreading contaminated soil or leaching contaminants from the soil or if it results in hazardous working conditions.

If the excavation is to be conducted when rain is possible, the site work will be carefully executed to contain potentially contaminated surface water, groundwater in excavations, muddy soils within the exclusion zone, and prevent off-site tracking of sediment and soils to adjoining roads.

Air Monitoring

Exposure monitoring and air sampling will be conducted to monitor possible airborne levels of contaminants down-wind from any excavation and stockpile areas, and ensure that all on- and off-site workers and communities are protected. The monitoring will help ensure that excavation activities do not pose unacceptable concentrations to project personnel or any down-wind human receptors.

Air monitoring will be performed during all soil disturbance and excavation activities. Real-time dust monitoring and mercury vapor monitoring will be performed during excavation activities. A complete description and rationale for the air monitoring is included within the RAW, Attachment D, Air Monitoring Plan.

Perimeter Dust Monitoring

Air monitoring will be performed at the fenced perimeter of MFA area to verify that dust control measures are adequate. Dust emissions will be minimized by spraying water on excavation-equipment buckets during excavation and dumping to eliminate visible dust. Real-time air monitoring of total dust will be performed using aerosol monitors (MIE Personal Data Rams [PDR]) with data loggers to provide immediate information for the total dust levels present. The lower detection limit for the operating range of the PDR is 0.001 milligrams per cubic meters. The particle size maximum range of response for the PDR is 0.1 to 10 micro meters.

The PDRs will be set to automatically log dust levels over 5-minute periods and will be visually checked approximately every hour during the work day and the value manually recorded in the field logs by an on-site UC Berkeley representative to verify equipment operation and compliance with the target action levels.

Dust measurements will be recorded upwind of the excavation area at the start of work in the morning and after lunch break at mid-day to determine ambient dust concentrations for that day.

The PDRs will be positioned along excavation fence lines at locations most likely to be in the direction of off-site dust migration from each excavation area depending on the identified wind direction on the day and time of work. Two PDRs will be placed at a height of 5 feet on fences in the downwind direction of the excavation area to monitor for dust being generated in the excavation and one PDR will be placed upwind of the excavation to measure ambient dust concentrations.

Wind speed and direction will be continuously monitored using a portable calibrated wind sock. Wind speed will also be measured every hour using a hand-held anemometer and the readings recorded in the daily field notes. The contractor will be notified verbally (and documented in the daily field notes) to stop work if real-time dust monitoring shows that perimeter action levels for dust are exceeded or if sustained wind speeds exceed 15 miles per hour (sustained for 15 minutes). Continual temperature measurements will be conducted at the downwind fenceline.

Dust Action Levels

The action level presented in the RAW for fugitive dust is 34 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) dust concentration, in addition to the daily measured ambient dust levels.

The methodology for calculating the dust action levels is presented in RAW, Attachment D. The perimeter dust action levels are protective of the most sensitive off-site receptors including children, elderly, and the ill.

Mercury Vapor Monitoring

Real-time mercury vapor monitoring will be performed near the work zone and the fenced perimeter of the MFA area. The mercury vapor monitoring will be conducted using Lumex RA-915 mercury vapor meters equipped with data loggers (or equivalent real time vapor monitor with equivalent detection limits). The Lumex RA-915 meter has a detection limit of 0.002 $\mu\text{g}/\text{m}^3$ for mercury. Mercury vapor monitoring in and near the work zone will be performed using a hand-held Jerome meter and the perimeter monitoring will be performed by positioning Lumex vapor meters at a height of 5 feet on fences along each side of the excavation area (a total of four monitors), as shown on Figure D-2.

The Lumex vapor meters placed along the excavation perimeter fencing will be set to log mercury vapor levels over 5-minute periods and will be visually read approximately every hour during the work day and manually recorded in the field logs by an on-site UC Berkeley representative to verify equipment operation and compliance with the target action levels.

The RAW established an action level of 0.6 $\mu\text{g}/\text{m}^3$ for mercury vapors as measured at the MFA excavation fences. The action level is based on the Cal/EPA OEHHA acute reference exposure level (REL) value for 1-hour exposures to mercury and inorganic mercury compounds (Cal/EPA OEHHA 2013). Additionally, an 8-hour average mercury concentration will be calculated daily from the Lumex vapor data and compared to the Cal/EPA OEHHA 8-hour REL of 0.03 $\mu\text{g}/\text{m}^3$ to ensure exposures over an 8-hour work day are not exceeding the REL. The 8-hour REL is also protective of on-site staff that work in nearby buildings and for off-site residents that live at the nearby Marina Bay housing development.

A stop work notice will be issued to the contractor if vapor concentrations exceed the action level in any of the four perimeter Lumex vapor meters and work will not be allowed to resume until the mercury vapor levels measured at the excavation fence line are less than the action level.

Mercury Vapor Action Plan

- If perimeter action level of 0.6 $\mu\text{g}/\text{m}^3$ is exceeded, excavation activities will stop. If the action level continues to exceed after 20 minutes of inactivity, excavation will be lined and filled immediately with clean fill.
- If the perimeter action level of 0.6 $\mu\text{g}/\text{m}^3$ is not exceeded, then excavation activities will continue for 8 hours.
- At the end of the day, if the 8-hour average 0.03 $\mu\text{g}/\text{m}^3$ is not exceeded, the excavation will be lined and backfilled, and activities will continue the following day. If it is exceeded, then excavation activities will stop.

Equipment Decontamination

An exclusion zone will be established around the excavation areas. Access to and from the exclusion zone by personnel and equipment will be controlled to mitigate risks and prevent the spread of contamination from heavy equipment. The exclusion zone is within the current fenced, secured MFA area.

A decontamination pad or area appropriately sized for storage and treatment of all anticipated rinse water will be constructed. The pad or area will be sized to collect decontamination water and overspray. Collection and removal of the decontamination water and precipitation captured in the decontamination

pads will be conducted utilizing sumps, dikes, ditches, and holding tanks as required. The decontamination pad designs will be approved by EH&S prior to construction.

All wastes, including liquid wastes and non-hazardous or hazardous contaminated soils, will be managed to prevent uncontrolled releases outside of the project area.

All vehicles exiting the site will be inspected to be free of mud on tires, wheel wells, undercarriage and other exposed surfaces outside the covered truck bed or roll-off bin. Vehicles will be cleaned as necessary prior to leaving the decontamination area.

Noise

Field activities during the proposed remedial action are not expected to exceed City of Richmond noise ordinance guidelines. Noise reduction measures, including using quiet construction equipment, particularly air compressors, will be used whenever possible. All construction equipment powered by internal combustion engines shall be properly muffled and maintained. All stationary noise-generating construction equipment such as tree grinders and air compressors are to be as far as is practical from existing residences. Unnecessary idling of internal combustion engines shall be prohibited. Sources of impulsive sound and jack hammers shall not be used on Sundays and holidays, which is not anticipated.

Waste Management

Wastes generated during excavation and waste characterization will include potential hazardous and nonhazardous soil, decontamination water, and other investigation-derived waste (IDW). Wastes will be handled and stored according to the protocols below and all state and federal laws. Storage containers will be in good condition and constructed of materials that are compatible with the material to be stored. Each container will be clearly labeled with an identification number and a written log will be kept to track the source of contaminated material in each temporary storage container. Samples of soils and liquids will be collected and analyzed for contaminated material in conformance with state and federal criteria as well as to the requirements of the treatment or landfill facility.

Hazardous or Contaminated Soils. For the storage of contaminated soil, securely covered stockpiles, drums, or metal containers will be utilized. Drums and other metal containers will be appropriately labeled per all applicable legal requirements. No excavated soil will be stockpiled. All soil will remain on-site until the final removal action activities are conducted and will be properly disposed of with the remaining excavated soils.

Decontamination Water. Liquid collected from personnel and equipment decontamination operations will be temporarily stored in drums or other suitable containers. Water from heavy equipment decontamination, excavations and stockpile areas will be temporarily stored in tanks, drums, or other suitable containers. Stored wastewater containers will be appropriately labeled per all applicable legal requirements. Aqueous waste will be analyzed per the requirements of the Richmond Field Station City of Richmond Wastewater Permit. If analytical test results show that the water is not contaminated and within limits for sanitary sewer or on-site discharge then it will be disposed of via the sanitary sewer or into an approved on site location per the current stormwater pollution prevention plan. Wastewater not suitable for on-site disposal will be temporarily stored on-site until the final removal action activities are conducted and will be properly disposed of with the remaining decontamination water.

Field Records

A daily log will be maintained to include following information will be recorded, as applicable:

- Daily activities and on-site personnel
- Air monitoring data
- Excavation activities and depths
- Communications, comments, or remarks

Field Protocols

All sampling protocols, field documentation, and quality control parameters will be implemented consistent with the RAW, Section 5.0, Removal Action Implementation, and RAW Attachment C, Exhibit C2, Sampling and Analysis Plan for the Soil Management Plan, both dated July 18, 2014. Waste profile samples will be conducted consistent with previous sampling conducted at RFS, and all equipment calibration and protocols conducted consistent with manufacturer guidelines.

Schedule

UC Berkeley has targeted the end of October or early November for the pilot study, pending DTSC approval of the workplan and a 2-week work notice period.

If you have any questions or comments regarding this submittal, please call me at (415) 497-9060.

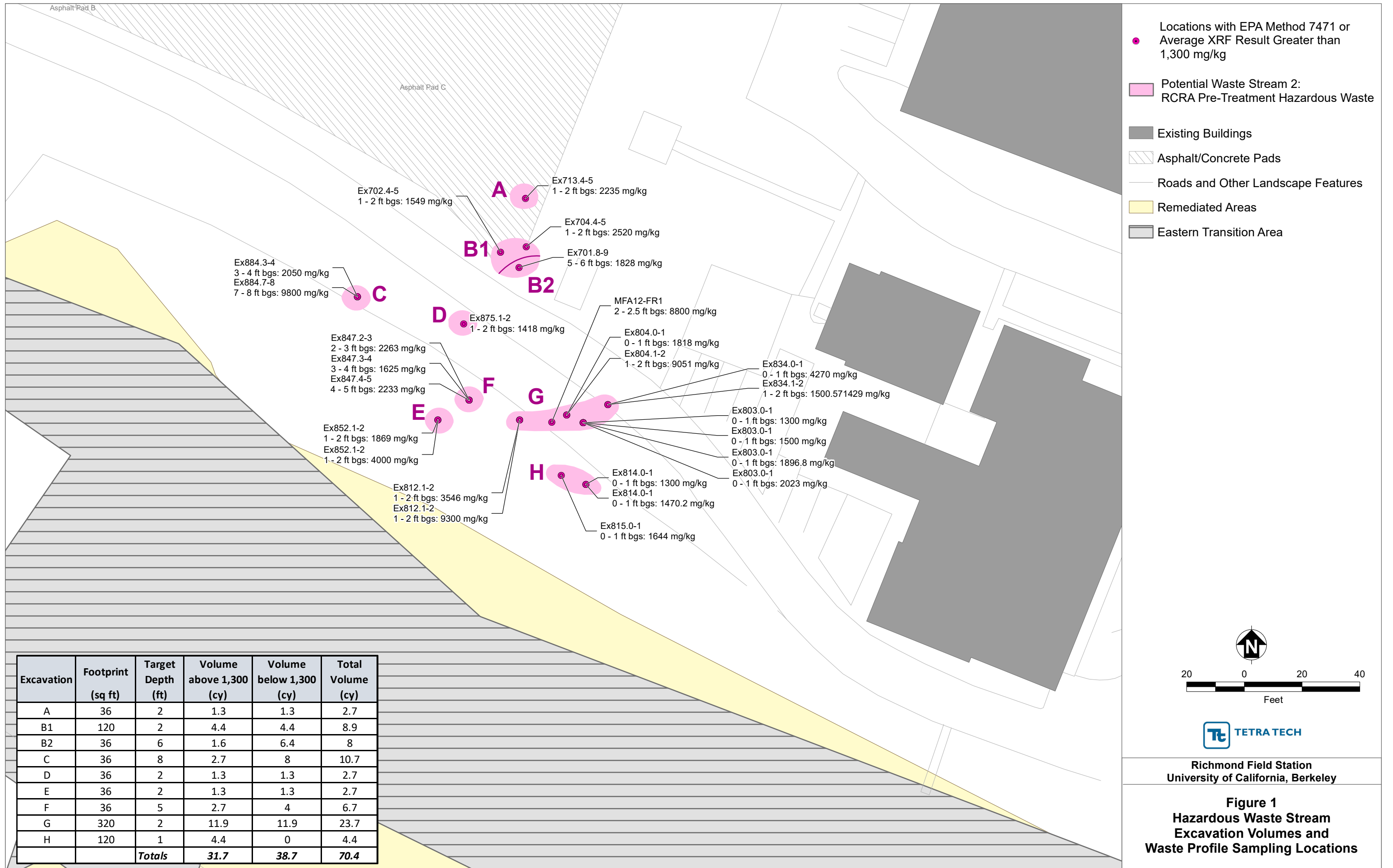
Sincerely,



Jason Brodersen, P.G.
Project Manager

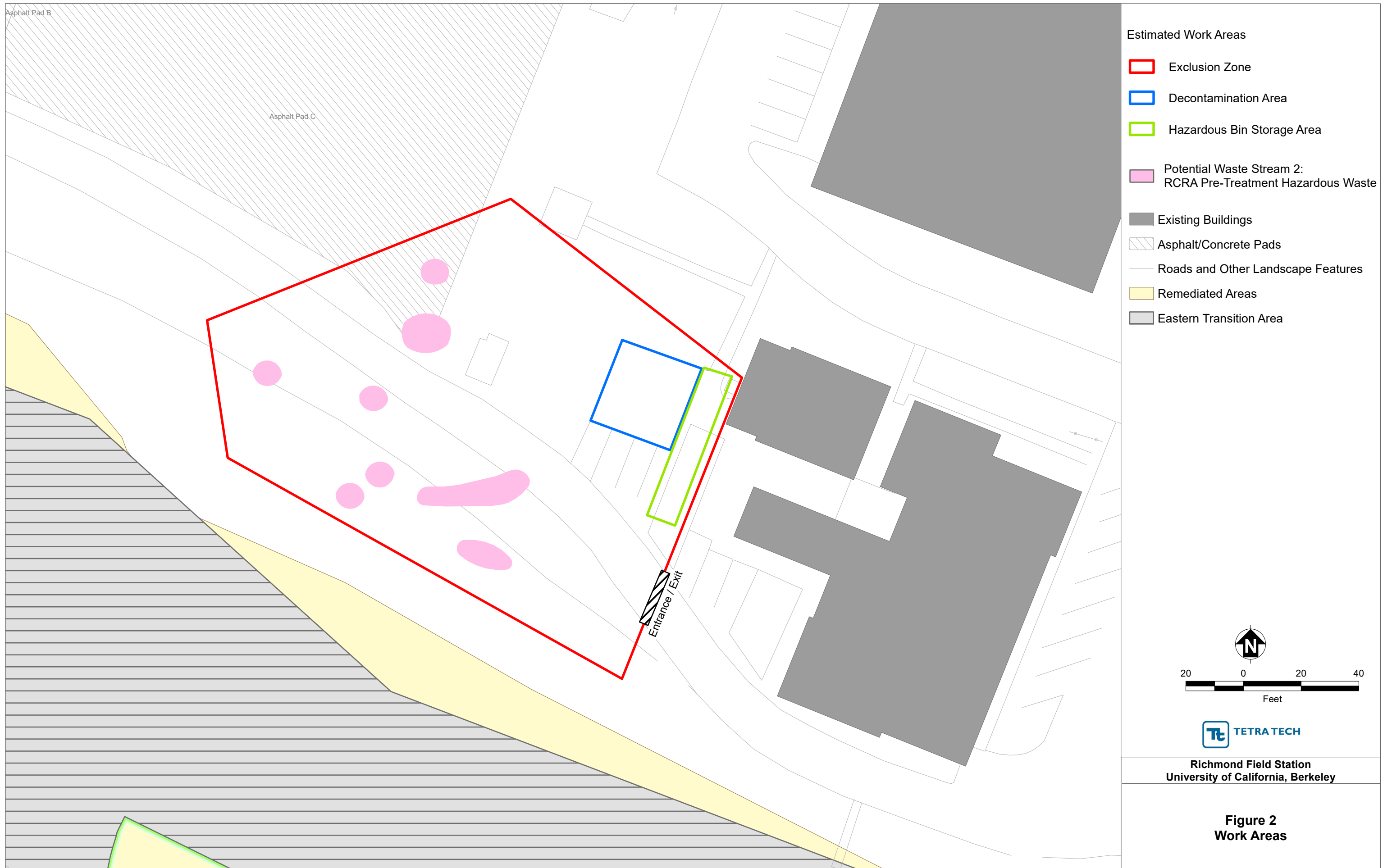
Attachments: Figures

cc: Alicia Bihler, UC Berkeley EH&S



Richmond Field Station
University of California, Berkeley

Figure 1
Hazardous Waste Stream
Excavation Volumes and
Waste Profile Sampling Locations





Proposed Air Monitoring Locations

- Perimeter Airborne Dust Monitoring Station¹
- ▲ Real-time Mercury Vapor Monitoring Station

Approximate RAW Workzones

- Exclusion Zones
- Decontamination Zones
- Support Zones
- Roll-off Bin Storage Area

Proposed Excavation Areas

- Proposed PCB Excavation Areas
- Proposed MFA Excavation Areas
- ✂ Proposed Fencing

- Existing Buildings
- ▨ Asphalt/Concrete Pads
- ⊗ Existing Fenceline
- ⋯ Portion of RFS Property Subject to DTSC order, Defined as "Site"
- Roads and Other Landscape Features

Notes:

¹ Actual perimeter airborne dust monitoring locations will be based on the wind direction(s) for each day. Two monitors will be sited downwind of the excavation and one monitor sited upwind of the excavation.

DTSC Department of Toxic Substance Control
MFA Mercury Fulminate Area
PCB Polychlorinated biphenyls
RFS Richmond Field Station



Richmond Bay Campus

**FIGURE D-2
PROPOSED LOCATIONS OF MERCURY
VAPOR AND DUST MONITORS FOR
THE MFA AND BUILDING 112
TRANSFORMER AREA EXCAVATIONS**

Removal Action Workplan
Air Monitoring Plan